Mindsets Matter: How Beliefs About Facebook Moderate the Association Between Time Spent and Well-Being

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ABSTRACT

"Time spent on platform" is a widely used measure in many studies examining social media use and well-being, yet the current literature presents unresolved findings about the relationship between time on platform and well-being. In this paper, we consider the moderating effect of people's mindsets about social media — whether they think a platform is good or bad for themselves and for society more generally. Combining survey responses from 29,284 participants in 15 countries with server-logged data of Facebook use, we found that when people thought that Facebook was good for them and for society, time spent on the platform was not significantly associated with well-being. Conversely, when they thought Facebook was bad, greater time spent was associated with lower well-being. On average, there was a small, negative correlation between time spent and well-being and the causal direction is not known. Beliefs had a stronger moderating relationship when time-spent measures were self-reported rather than coming from server logs. We discuss potential mechanisms for these results and implications for future research on well-being and social media use.

CCS CONCEPTS

• **Human-centered computing → Empirical studies in collaborative and social computing**.

KEYWORDS

social media, well-being, beliefs, mindsets, Facebook

1 INTRODUCTION

Well-being is a broad concept that spans social, psychological, and physiological factors. A growing body of scholarship has attempted to describe and theorize whether, how, and under what circumstances social media relates to well-being: whether use of these tools helps or hinders our ability to access social support and information, nurture social bonds with others, and manage our moods and emotions, among other facets of daily life. Consequently, the relationship between well-being and time spent using social media has been a key area of research in multiple fields, including human-computer interaction and social computing.

Looking across the body of literature exploring the association between social media use and well-being (see [29] for review), a clear picture has yet to emerge. Meta-analyses generally find very small average effects [29, 39, 40], and individual empirical studies have found both positive and negative outcomes associated with social media use [4, 13, 41, 45, 50]. Published work has identified a host of factors implicated in the connection between social media use and well-being (broadly construed), including but not limited to: active communication vs. passive use (see [54] for review), interactions with close friends vs. others [13], envy [49], responsiveness to friends' requests for help [23], network composition [26], procrastination [34] and authenticity [42].

An additional factor that has not been widely explored is the role of mental orientation, or mindset [18, 22] towards use. In other words, do people's perceptions of whether they are doing something that is "good" or "bad" for themselves or society – e.g., using Facebook – relate to how they behave or how they feel? Because people's mindsets might have implications for both behavior and psychological state, considering a person's positive or negative orientation towards social media might resolve discrepancies in past research and support development of models that better explain the relationship between social media use and well-being. In this paper, we consider the role of these beliefs on the association between subjective well-being and time spent on one social media platform, Facebook.

Accounting for people's beliefs about platform use is important because technology use is deeply intertwined with people's social and cultural contexts, including personal and commonly-shared understandings of possible outcomes of use. Similar to beliefs about how social media feed algorithms function, people's beliefs about the degree to which social media is good or bad may be driven

by endogenous or exogenous sources [21]. Endogenous sources include reflections on one's prior experiences online, such as being bullied, feeling social comparison, or receiving a kind comment from a friend. In this case, people's beliefs about social media may be accurate evaluations of its impact based on their own prior use. Exogenous sources include media narratives. For instance, some academic and popular press coverage has proposed that social media use is associated with depression, loneliness, low self-esteem, and other harms [50]. Teens are aware of narratives that frame their smartphones as antisocial and addictive [32]. Although more recent meta-analyses have argued that the effect sizes related to outcomes like depression and loneliness are small [29, 38–40], salient narratives in both the global popular press and many everyday conversations continue to emphasize that social media use is bad for one's well-being. The degree to which these exogenous narratives as well as individuals' endogenous reflections on their own past experiences shape people's attitudes toward their own social media use might have important consequences for well-being.

Measures of individuals' beliefs about social media's impact are rarely included in empirical well-being research. Therefore, this study attempts to understand how beliefs about the effects of social media are related to individuals' assessments of their own well-being, with important implications for well-being scholarship and methodology. Beliefs may be important in their own right, and they may also serve to crystallize and help organize a host of other important behaviors and outcomes.

As research related to social media [13], gaming platforms [46] and the internet more broadly [8] has documented, crude measure of time spent on platform, independent of what users are doing on those platforms, is a poor predictor of well-being in and of itself. As Odgers and Jensen [38] write in their recent summary of the literature on adolescents' media use and well-being, "The reliance on screen time metrics is a problem given that all screen time is not equal with respect to potential risks and benefits." That said, how much one uses a particular medium is a key variable in many studies, and in some cases is one of the only usage measures available to researchers. Furthermore, researchers often use self-reported time spent on social media because more accurate server-logged data are unavailable. Yet time spent on social media is difficult for people to report accurately [27, 30], and may be biased, in part, by their beliefs about whether their use is good or bad. By considering user beliefs in conjunction with time spent, this research provides new insights into how well-being can be better understood when including beliefs in the equation and whether the association between time spent and well-being differs for people with different beliefs.

In sum, this research paper aims to answer the following questions:

RQ1. Does the association between time spent on a social media platform and well-being vary with people's beliefs about that platform?

RQ2. If so, how does the role of beliefs differ in the association between time spent and well-being, when time spent is self-reported vs. gathered from server logs?

We contribute empirical evidence that people's beliefs about the platform play a differentiating role in understanding well-being and provide methodological guidance for future work on social media use and well-being.

2 BACKGROUND

2.1 Social Media, Well-Being, & Moderators

One of the enduring questions about contemporary technology practices focuses on well-being. Like earlier technologies, social media have reshaped communication practices in ways that enable us to connect with others in both positive and negative ways (see [14, 40, 51, 54] for reviews of the literature.)

In work that theorizes positive outcomes, the literature focuses on affordances of social media which enable people to find social support among new and existing networks [10, 43, 55], maintain connections with ties that would otherwise have deteriorated over time [24], and lower the barriers to social connectedness [5]. Much of this work presumes people are actively engaged with one another on social media, through posts and comments visible to others or through more intimate private communication [13, 26, 54]. Information-seeking, uses for entertainment and news, or connecting with weak ties (and the informational resources they represent) are also important components of frameworks that highlight positive outcomes from use [11, 20].

A second stream of work highlights negative consequences of social media use for various facets of well-being. A combination of affordances come into play, but consumption is a key process here, as opposed to active connection and communication [45, 54]. For instance, for self-esteem issues, one potential pathway presumes that individuals consume content from others that highlights more positive aspects of the others' lives, resulting in upwards (negative) social comparison [9, 16, 56]. Alternatively, social media introduces feelings of ostracism or being left out of social activities, captured by the term Fear of Missing Out [28].

Out of these two sets of outcomes, an unresolved question is whether there are additional variables that act as moderators in the relationship between social media use and well-being. Research has identified many potential moderators; here we highlight four that figure prominently in the literature. First, in summarizing the two streams of outcomes above, Verduyn et al. [54] highlight an important factor: "active use" versus "passive use," where active use is associated with positive outcomes via social connectedness, while passive use remains negatively associated with well-being (via self-esteem); see [25] for critique of this dichotomous active v. passive approach to social media use. Second, Burke and Kraut identify additional key variables: communication partner and effort (e.g., a written comment rather than a single-click Like) [13]. Someone "receiving targeted, composed communication from strong ties" experienced improved well-being. A third factor is social comparison orientation, or how people pay attention to the way others behave and their own behavior in kind. This process of social comparison has been shown to be a moderator between platform use and well-being outcomes [56, 57]. Lastly, asking for and providing support [23, 26] is also known to play a role in social capital benefits people draw from platform use.

As described above, subjective mindsets of platform impact may be an additional moderating factor. Below, we explore the reasoning behind mindsets and behavior change, followed by an exploration of current literature on the connection between mindsets and social media.

2.2 Mindsets About Social Media

Decades of research have shown that people's subjective attitudes and beliefs can impact their own and others' behavior [22]. In particular, mindsets are "core assumptions about the nature and operation of things in the world that can help explain differences in people's thoughts, feelings and behaviors" [35]. They are "simplified understandings of what is possible or likely" – such as whether a person thinks the effects of stress are debilitating or enhancing – which can lead to changes in attitude or behavior [19]. Mindsets are important not only because they can shape one's attitudes about the world but also affect behavior in powerful ways: for instance, hotel housekeepers who were told that their daily work activities constituted physical exercise (but reported no other significant behavior changes) showed differences in weight, blood pressure, and body mass index one month later compared to a control group [17].

People's mindsets of social media's impact – such as whether they believe use of a platform is good or bad – is shaped by their past experiences as well as how these tools are discussed or understood by peers and society more broadly. DeVito and colleagues [21] describe these beliefs as coming from two kinds of sources: endogenous sources, which in this case might include individuals' reflections on well-being outcomes they have experienced directly as a result of social media use (e.g., affirmation from others in a parenting support group, or loneliness as a result of seeing former friends), and exogenous sources, such as narratives in the press. Social narratives evoking the dangerous and addictive nature of social media and smartphones are especially salient, and thus serve, in conjunction with past experiences, to frame "how people understand their lives, their behaviors, and their role in society" [32]. People may also have attitudes about the benefits of social interaction online, the risks of sharing private information, or the ability to access credible news. These attitudes are wrapped up in particular mindsets about the individual and societal impact of social media. Prior literature on social media non-use also highlights the role of beliefs in whether and how people spend time on social media. For instance, dimensions such as volitionality [47, 58], disenchantment or disinterest [44], and resistance [58] are used to characterize different types of social media non-use. Beliefs related to privacy, data misuse, productivity, banality, etc., are identified as motivations and justifications for limiting the use of social media or not using these platforms at all [6].

In the research literature, the relationship between social media use and well-being is mixed. Could mindsets about social media use be a part of the equation? Some research suggests that mindsets can impact aspects of well-being. For instance, interventions using growth mindsets increased well-being and relationship satisfaction [52] and reduced depressive symptoms in teens [36]. In the particular case of social media, early work has found that "people who have more positive mindsets of social media use report better well-being, including lesser experiences of depressive symptoms, than people who have more negative mindsets of social media" [33].

3 METHODS

To understand whether beliefs about social media moderate the association between time on platform and well-being, we surveyed Facebook users between June and July, 2019. We combined survey responses with server logs of the participants' time spent on Facebook in the four weeks prior to the survey. Facebook has a large user base, with 2.7 billion people using it each month [2], and is used throughout the globe, allowing us to investigate the research questions across multiple countries. To protect participants' privacy, all data were de-identified after matching, then aggregated and analyzed on Facebook's servers. No identifiable or individual-level data were viewed by researchers. The research went through two rounds of review at Facebook. First, the research plan was reviewed by a five-person panel of experts in the research area, research ethics, law, and policy. This panel reviewed the proposal for potential benefits, such as improvements for people on Facebook or contributions to general knowledge, as well as participant risks and required regulation adherence, such as data privacy, security, or impact to vulnerable populations. More about this research review is available online [1]. After the research was completed, this manuscript was reviewed by the company prior to publication. No findings were changed in this review. All research questions in this paper were developed by the authors prior to the first Facebook review.

3.1 Participants

Participants (N = 29,284, 50% female, Mean age 34.2) were recruited via an invitation to take a survey that was shown at the top of their Facebook News Feeds on web and mobile interfaces with the text: "<Name>, we'd like to hear from you. Please tell us about your experience using Facebook." The survey was targeted at random samples of people on Facebook in the following 15 countries: Australia (364), Brazil (5938), Canada (485), France (1154), Germany (420), India (2359), Indonesia (1519), Mexico (5704), Philippines (897), Spain (1074), Thailand (1961), Turkey (1386), United Kingdom (865), United States (3196), and Vietnam (1962). These countries were selected for their large numbers of Facebook users or for appearing in prior published literature on social media use and well-being. Participants saw the survey translated into their local language; translated versions of the survey are available to researchers at https://osf.io/c5yu9/. The survey was voluntary and no additional consent text was included. On average, participants took approximately 3 minutes to complete the survey and were not compensated.

The survey response rate was approximately 2%. The count of survey invitations was not retained so the exact response rate was not possible to calculate. Table 1 presents descriptive statistics about the respondents. To assess response bias, we compared respondents to a random sample of 0.01% of people globally who had used Facebook in the past month (approximately 200,000 people). Survey takers were 2.4% older, 7% more likely to be female, had 60.4% more friends and spent 136% more time on the site in the past month than this random sample (all p < 0.001). How this selection bias

Table 1: Descriptive statistics for survey questions and demographic covariates.

Variable	Mean	Median	Std	Range
Demographics and Activity				
Gender		50.0% female		
Age	34.2	31.0	13.8	(13, 99)
Friend count	941	513	1112	(0,4958)
Account tenure (in days)	2400	2635	1271.8	(29, 5629)
Time spent (minutes per month)	2223	1870	1622	(0, 36559)
Subjective well-being ($\alpha = 0.80$)	3.28	3.33	0.54	(1,5)
Life satisfaction - How satisfied are you with your life?	3.56	4.0	1.01	(1, 5)
Positive affect - How good do you feel most of the time?	3.52	4.0	0.93	(1, 5)
Negative affect (reversed) - How bad do you feel most of the time?	4.06	4.0	0.98	(1, 5)
Loneliness (reversed) - How lonely do you feel?	3.99	4.0	1.12	(1, 5)
Belonging - To what extent do you feel a sense of belonging in your community?	3.20	3.0	1.10	(1, 5)
Social support - To what extent are there people who give you support and encouragement?	3.34	4.0	1.08	(1, 5)
Beliefs about FB				
Beliefs (1) - To what extent do you think Facebook is good or bad for you?	6.69	7.00	2.38	(0, 10)
Beliefs (2) - To what extent do you think Facebook is good or bad for society?	6.44	7.0	2.47	(0, 10)

affects the interpretation of results is discussed in the limitations section.

3.2 Survey content

Subjective well-being (6 items, alpha = 0.8): The survey contained six questions about subjective well-being adopted from The Comprehensive Inventory of Thriving [48]: one question each in random order on life satisfaction, positive affect, and negative affect followed by one question each on loneliness, social support, and belonging, again in random order (see Table 1). The original CIT has 18 constructs with three questions each. We selected the six constructs that were most likely to be affected by Facebook use and the question that loaded highest onto the construct's factor was chosen. The scales were revised to be unipolar rather than agree/disagree scales to reduce acquiescence bias [31]. Responses to negative affect and loneliness were re-coded in decreasing order, and a composite well-being score was created as the mean of the six questions, such that a higher score represented greater subjective well-being. Items were shown in randomized order to prevent ordering bias.

Beliefs about Facebook: Participants answered two questions eliciting their beliefs about Facebook from Allcott et al. [3]: "To what extent do you think Facebook is good or bad for society?" and "To what extent do you think Facebook is good or bad for you?" Responses to both questions were on an 11-point slider with labels for: "Very bad" (0), "Neutral" (5), and "Very good" (10). Question order was flipped between participants. To reduce priming effects, these two questions always came after the well-being block. Responses to the two belief questions were highly correlated ($r = 0.69, p < 0.001$) and thus were combined by taking their average. Moderation results were qualitatively similar when analyzing the questions separately.

Perceived time spent on Facebook: A secondary motivation of this work is to understand whether the role of beliefs differs when time-spent measures come via self-reports (i.e., on the same survey as beliefs about the platform) versus independent server logs. Thus, following the method of [27], we included some of the most commonly used self-reported time-spent survey questions from the literature (e.g., "In the past week, on average, approximately how much time PER DAY have you spent actively using Facebook?"

from [24]). Participants were shown one question from a counterbalanced set of 10 questions about how much time they spent or how many times they checked Facebook (see Appendix Table 4 for full text). Approximately 3000 participants answered each question. Because the specific self-reported time-spent questions are not the main focus of the present paper (see [27] for an analysis of question performance), responses are pooled across questions and analyzed in aggregate after converting to standard deviation units, thus creating a comparable "self-reported time-spent" measure for each participant. Well-being and perceived time-spent blocks were presented in counterbalanced order between participants.

3.3 Server log data

Actual time spent: For each participant we included log data from Facebook servers of the average daily number of minutes they spent in the foreground of Facebook.com or the Facebook mobile app across the previous 30 days, up to and including the day before the survey. These data were used in two ways: (1) to understand how actual time spent on Facebook was associated with well-being and whether beliefs about Facebook moderated that association, and (2) to understand whether beliefs about Facebook were associated with error in self-reported time spent on the platform. To calculate this error for respondents who answered a perceived time spent question about sessions (i.e. how many times they visited the platform rather than how much time they spent on it), we included from Facebook's server logs their session count: the number of distinct times they logged in or opened one of those interfaces at least 60 seconds after a prior session. Results were qualitatively similar using sessions at least 300 seconds apart.

Demographic variables: We include demographic variables from respondents' Facebook profiles including age, gender identity, and country, as well as friend count and account tenure in days to control for demographic differences likely to affect Facebook use, well-being, and beliefs about Facebook.

3.4 Method of analysis

To determine how beliefs about Facebook moderate the association between time spent on Facebook and well-being, we performed two sets of linear regressions with well-being as the outcome: one set using perceived (self-reported) time spent on Facebook, and another
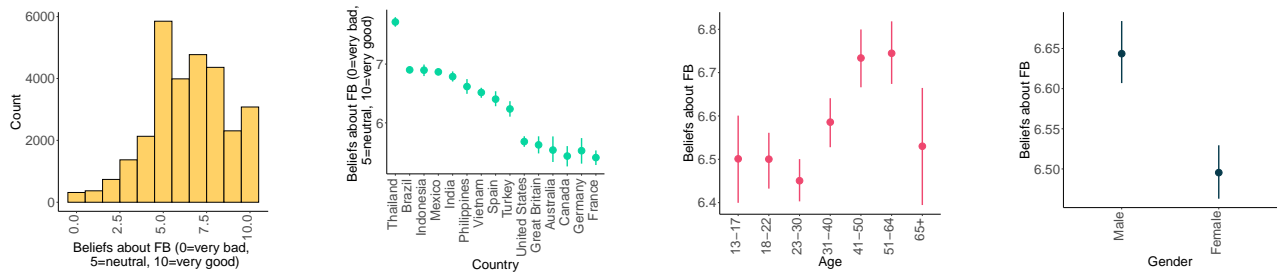
Figure 1: On average, respondents felt that Facebook was moderately good for them and for society (M = 6.6, out of 10). Average responses varied by country, age, and gender identity. Bars represent bootstrapped 95% confidence intervals.

using actual time spent on Facebook from the server logs (see Table 2). In both cases, we created two versions of the model: one that did not include respondents' beliefs about Facebook, and another that did include their beliefs about Facebook plus an interaction effect between beliefs and the time-spent variable.

All four regressions controlled for age, gender identity, country, friend count, and account tenure in days. The two regressions about perceived time spent also control for which question the respondent answered. All continuous variables were standardized, so beta values indicate the increase in well-being in standard deviation units for one standard deviation increase in the covariate. More complex non-linear models did not improve regression fit.

4 RESULTS

We first report descriptive statistics about respondents' beliefs about Facebook, then present regressions showing how beliefs moderate the association between perceived time spent and well-being. We discuss how the results differ when using actual time spent rather than perceived time spent, and note potential priming effects due to question order.

4.1 Beliefs about Facebook

On average, participants believed that Facebook was moderately good for them personally ($M = 6.7$ out of 10) and for society ($M = 6.4$ out of 10), with a combined belief score of $M = 6.6$. Figure 1 shows how beliefs varied by country, age, and gender identity. Participants in globally western countries, teens and adults up to age 30, and women generally reported believing that Facebook was worse than people in eastern and global south countries, adults over age 30, and men. Beliefs about Facebook also varied by friend count, account tenure, and time spent on the platform. Controlling for demographic differences (in age, gender and country), people with more friends on Facebook ($\beta = 0.10$), those with less tenure on the platform ($\beta = -0.09$), those who spent more time on the platform according to server logs ($\beta = 0.04$), and those who perceived spending more time on the platform ($\beta = 0.17$) all reported higher average beliefs about Facebook being good for themselves and society (all $p < 0.001$).

Association between beliefs and other variables of interest. The better people believed Facebook was for them personally and for society, the more likely they were to overestimate how much time they spent on the platform ($\beta = 0.05, p < 0.001$): not only did they actually spend more time on Facebook than people

who believed the platform was bad, they also perceived spending even more time than they actually did. People who believed Facebook was good also reported higher average levels of subjective well-being ($\beta = 0.16, p < 0.001$). The causal direction is not known; it could be that higher well-being causes people to think more positively about Facebook, or the reverse, or that another underlying variable such as having a good day when taking the survey caused people to report both higher levels of well-being and more positive beliefs about Facebook.

4.2 Perceived time spent and well-being

The base model shows that after controlling for demographics, friend count, account tenure, and the specific survey question about time spent the participant answered, participants who perceived spending more time on Facebook (standardized and pooled across all survey questions) reported modestly lower levels of well-being ($\beta = -0.02, p = 0.008$, see Model 1a in Table 2).

A model that includes a main effect for beliefs as well as an interaction between beliefs and perceived time spent (Model 1b in Table 3) also shows that participants who perceived spending more time on Facebook reported modestly lower levels of well-being ($\beta = -0.05, p < 0.001$) after accounting for their beliefs. Further, there was a significant interaction between beliefs and perceived time spent ($\beta = 0.04, p < 0.001$). Figure 2(a) shows the regression lines for three levels of beliefs about Facebook: the mean ($M = 6.6$, roughly "moderately good" on the response scale), and one standard deviation above ($M = 8.8$, roughly "very good") and below the mean ($M = 4.4$, roughly "moderately bad"). The three diverging lines show that people's beliefs about whether Facebook was good significantly moderated the association between perceived time on platform and well-being: When people believed that Facebook was very good for them and for society, time they thought they spent on the platform was not significantly associated with their well-being. Conversely, when they believed that Facebook was bad, the more they thought they used the platform, the lower their well-being.

4.3 Actual time spent and well-being

The results discussed to this point are based on perceived time spent, as reported on surveys. However, we find that beliefs about whether Facebook is good also significantly moderate the association between actual time spent (as collected from server logs) and well-being. A base model that controls for demographics, friend count, and account tenure shows that actual time spent had a small

Table 2: Models predicting well-being, controlling for demographics, friend count, account tenure, time spent, and beliefs about Facebook. Models 1a and 2a are base models with perceived and actual time spent, respectively. Models 1b and 2b include main and interaction effects for beliefs about Facebook. *** p < 0.001 ** p < 0.01 * p < 0.05

	1a. Base (Perceived time)			1b. Base + Beliefs (Perceived time)			2a. Base (Actual time)			2b. Base + Beliefs (Actual time)		
	β		S.E	β		S.E	β		S.E	β		S.E
Intercept	−0.14	**	0.05	−0.07		0.05	−0.14	***	0.04	−0.08		0.04
Age	0.21	***	0.006	0.19	***	0.006	0.22	***	0.006	0.19	***	0.006
Is Female	−0.01		0.01	−0.01		0.01	−0.01		0.01	−0.01		0.01
Friend count	0.03	***	0.006	0.02	**	0.006	0.04	***	0.006	0.02	***	0.006
Account tenure	0.06	***	0.006	0.08	***	0.006	0.06	***	0.006	0.08	***	0.006
Perceived time spent	−0.02	**	0.006	−0.05	***	0.006						
Actual time spent							−0.07	***	0.006	−0.07	***	0.006
Beliefs about FB				0.17	***	0.006				0.17	***	0.006
Beliefs about FB X time spent				0.04	***	0.005				0.02	***	0.006
	Adj. $R^2 = 0.11^{***}$			Adj. $R^2 = 0.13^{***}$			Adj. $R^2 = 0.11^{***}$			Adj. $R^2 = 0.14^{***}$		

negative correlation with well-being ($\beta = -0.07$, $p < 0.001$). Every standard deviation increase in actual time spent (approximately 54 min in a day) was associated with 7% of a standard deviation lower well-being, approximately 0.04 points on the 5-point scale. Of course, as this is cross-sectional data, the causal direction is unknown; it could be that spending more time on Facebook contributes to lower well-being, or it may be that people who have lower levels of well-being try to mitigate this by spending more time on Facebook, e.g., to build connections or entertain themselves.

As before, people's beliefs about whether Facebook is good or bad for themselves or society significantly moderated the association between actual time spent and well-being (interaction $\beta = 0.02$, $p < 0.001$), as indicated by the three diverging lines in Figure 2(b). All three lines have a negative slope, meaning that for those who believe Facebook is moderately bad, moderately good, and very good for themselves and for society, greater time spent was associated with moderately lower well-being. But the slope is the least negative for people who think that Facebook is very good (those with average beliefs of 8.8, which is one standard deviation above the mean). On the other hand, the slope is the most negative—time spent on the platform has the most negative correlation with well-being—for people who think that Facebook is moderately bad for themselves and society (beliefs of 4.4, one standard deviation below the mean).

4.4 How belief moderation differs when using perceived vs. actual time measures

Thus far, we have demonstrated that people's beliefs about whether Facebook is good or bad for themselves and society have a significant moderating effect on the association between time spent on platform and well-being, regardless of whether the time-spent variable was perceived (self-reported on surveys) or actual time (from server logs).

The data also show that beliefs have a stronger moderating effect on perceived time rather than actual time data. Table 3 shows the results of a regression that combines all time-spent measures (whether perceived or actual) into standard-deviation units and includes an additional variable time-spent source indicating whether the time-spent measure was perceived or actual, as well as interactions between beliefs, time, and time-spent source. The interaction

Table 3: Model pooling all time-spent measures (perceived and actual) in standard-deviation units, with an additional variable, time spent source, indicating whether the time spent measure was perceived or actual. This model includes interactions between beliefs about Facebook, time spent, and time spent source. The model shows that beliefs about Facebook have a stronger moderating effect on well-being when the time-spent data is self-reported than when it comes from server logs.

|	β S.E, p
Intercept	-0.001 0.006
Beliefs about FB	0.18 0.006***
Time spent (transformed to z-scores)	-0.04 0.006***
Time spent source: Perceived time	-0.003 0.008
Beliefs about FB X Time spent	0.01 0.006*
Beliefs about FB X Source (Perceived time)	0.001 0.008
Time spent X Source (Perceived time)	0.01 0.008
Beliefs about FB X Time spent X Source (Perceived time)	0.02 0.008*
Adj. $R^2 = 0.08^{***}$	

effect between time spent source, time spent, and beliefs is statistically significant ($\beta = 0.02$, $p = 0.01$), indicating that when time spent measures come from survey self-reports, beliefs have a more positive moderating effect on the association between time spent and well-being. Figure 3 depicts this visually: the changes in slope due to beliefs are significantly greater for self-reported time spent (right panel) than actual time spent (left panel).

4.5 Time-spent questions prime well-being responses

Respondents were randomly assigned to answer either the time-spent or well-being survey questions first. Those who answered time-spent before well-being reported 1.9% higher levels of well-being ($p < 0.001$), suggesting that the time-spent questions had a small, but significant, priming effect on well-being. Table 5 in the Appendix shows the priming effect of each time-spent question individually. Well-being questions, when asked first, did not have a priming effect on self-reported time-spent ($p = 0.36$).

(a)   (b)
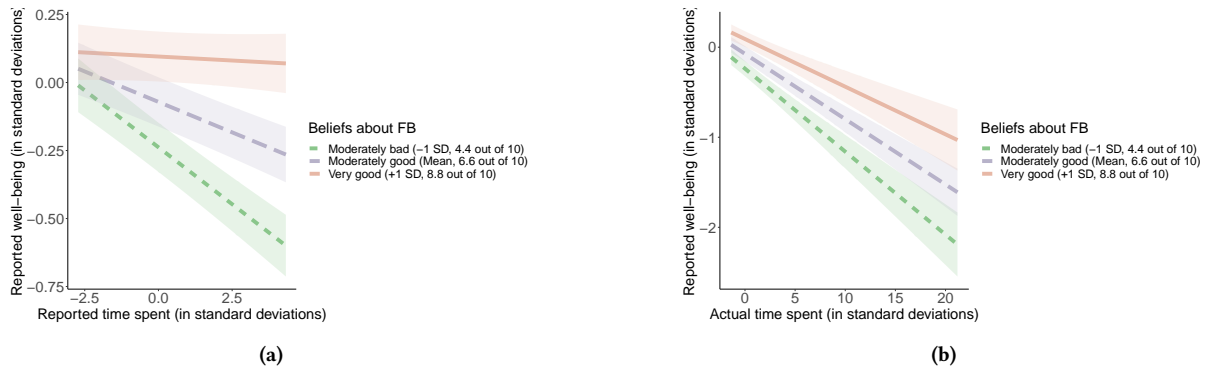
Figure 2: (a) Beliefs about Facebook significantly moderate the association between perceived time spent on the platform and well-being. When people believe that Facebook is very good for themselves and for society, there is no association between time they think they spent on Facebook and their well-being. Conversely, when they believe that Facebook is bad for them and society, the more they think they use the platform, the lower their well-being. (b) Beliefs about Facebook significantly moderate the association between actual time spent on the platform and well-being. Actual time spent has a moderately negative correlation with well-being; the slope is the most negative for people who believe that Facebook is bad for themselves and society.
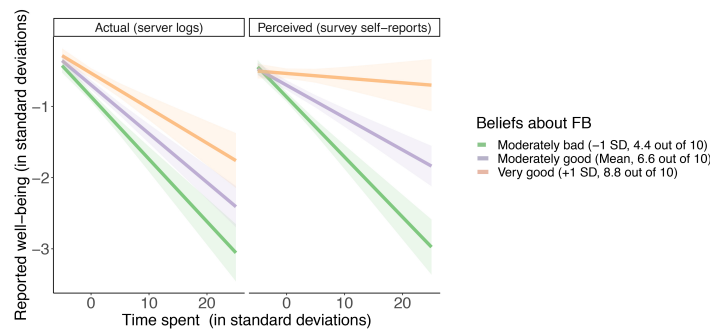
Figure 3: Beliefs about whether Facebook is good or bad have a stronger, more positive moderating effect when using perceived time data rather than actual time data.

5 DISCUSSION

In this paper, we show that the relationship between time spent on a social media platform and well-being is related to people's beliefs about whether the platform is good or bad for themselves and society. When people think that Facebook is good, the time they think they spent on the platform is not associated with their subjective well-being. Conversely, and importantly, when they think that Facebook is bad and use it more, they report lower well-being. This moderation effect of beliefs is stronger when the time spent data is self-reported than when it comes from server logs. As noted in other studies [40], all effect sizes here were very small, on the order of hundredths of a standard deviation in well-being measures.

These results have unique methodological and theoretical implications for how researchers conduct and interpret both observational and causal studies of social media use and well-being. Specifically, we recommend researchers account for participants' beliefs in models and methods employed to study social media use and well-being. Below, we discuss methodological implications in

detail as well as the underlying mechanisms that may explain why beliefs matter.

5.1 Methodological implications

Accounting for beliefs in observational well-being studies. Prior work identifies several factors that may shape the association between social media use and well-being, including differences in active versus passive use [12, 53], communication partners and effort [13], and asking for and providing support [23, 26], as well as other factors like geographic region [9]. Extending this prior work, this paper shows that people's beliefs about Facebook also matter, resulting in different well-being patterns from people with positive and negative beliefs.

Further complicating these diverging patterns, our results show demographic differences in beliefs about Facebook. Teens, women, and participants in globally western countries reported believing that Facebook was worse than adults over 30, men, and people in eastern and global south countries. While more research is needed to understand why we observe demographic differences in beliefs

about Facebook, factors like different use patterns, cultural norms around technology use, privacy perceptions, differences in online experiences and the emphasis of social media's impact in local media may play an contributing role. For instance, recent work found that social comparison frequency varies substantially by country and in some countries, women experience social comparison more frequently than men [15].

These differences in beliefs have methodological implications for how sampling pools are constructed. For instance, teens and young adults reported thinking Facebook was worse than did people over the age of 30. Similarly, people in Global North countries thought Facebook was worse compared to people in the Global South. These trends are notable because much of the literature on Facebook use and well-being relies on teens and college-age samples in the Global North, groups that are more likely to report believing that Facebook is worse. Previous research could be re-evaluated in light of these differences. For instance, our findings suggest that studies using samples from countries with lower general perceptions of the platform – such as Germany or the US – using college-aged participants who are reporting on their own platform use would be more likely to find detrimental effects of platform use, whereas studies conducted in countries with generally more positive shared beliefs about the consequences of Facebook use, using older samples and objective platform use measures, would be more likely to find more positive associations between platform use and well-being. Future research could probe this further, using meta-analytic techniques (e.g., extrapolating country-wide perceptions from media coverage).

Beyond acting as a moderator, beliefs also directly relate to well-being. Every standard deviation increase in beliefs was associated with an increase of 17% in well-being (Model 1b). In fact, self-reported time spent had a much smaller association with well-being: every standard deviation increase in perceived time spent was associated with a change of 5% in well-being (Model 1b). Put another way, beliefs about whether Facebook was good or bad had a 3.4x stronger association with well-being than self-reported time spent on Facebook did. We recommend researchers account for participants' beliefs when studying the association between social media use and well-being.

Accounting for beliefs in causal well-being studies. Experiments are often considered among the most appropriate methods for assessing the causal impact of social media use on well-being. One limitation of causal experiments is the existence of "demand effects," or potential error introduced by changes in participant behavior because of cues or expectations about appropriate or expected behavior [37, 59]. These demand effects can occur in both laboratory and survey experiments, and they are driven by expectations regarding what the research (or researcher) might signal as the intended outcome, or even giving participants any information about the tested hypotheses (e.g., through priming [35]). This paper's findings indicate that people's beliefs about whether social media is good or bad for individuals or society may produce significant demand effects in causal experiments, with serious implications for results. For example, in an experiment in which people quit social media for a month, those who believe social media is bad may report greater improvements in well-being as a result of quitting, in line with their expectations rather than being caused by the treatment directly.

One key question for understanding these demand effects is how strong the effect of those expectations are compared to other variables. As shown in Model 2b, beliefs had a stronger association with well-being than actual time spent (from server logs) did ($\beta = 0.17$ vs. -0.07, respectively, or a 2.4x greater impact due to beliefs). These findings suggest that causal experiments that investigate time spent and well-being may suffer from expectation demand effects rather than the effects of not using Facebook. Measuring and accounting for experiment participants' beliefs about social media is thus important, though obtaining that measure before the experiment (e.g., from a questionnaire or interview) may further inflate demand effects. However, as demand effects researchers note, "There may be substantial variation in how respondents react to knowledge of an experiment's hypothesis across substantive areas" [37], so further research is required for specific well-being outcomes, different populations, and different social media platforms.

Implications for studies using self-reported time in well-being studies. The mismatch between people's self-reports of their social media use and objective indicators (such as server logs of social media use) is well-documented (see [27]). Our study suggests that beliefs about a social media platform may exacerbate this self-report error, because people who thought that Facebook was better were more likely to overestimate their Facebook use. Furthermore, specific choices in time-spent question wording produced different amounts of error and had different associations with well-being (sometimes positive and sometimes negative, see Table 5 in Appendix). While our results suggest that accounting for participants' beliefs about a social media platform may help to reduce some of the error coming from self-reported time measures, we recommend using objective measures of time where possible. For example, tools such as Your Time on Facebook (in the Facebook app), Apple Screen Time, Android Digital Well-being, or the Moment app track phone use, which can be directly reported to researchers by participants. We note that these tools have their own limitations and may not be appropriate for some studies. For instance, they may not capture time spent on other devices, may not be available in all countries, or may be cumbersome to use. When researchers do require self-reported time-spent measures, they should be asked after any well-being questions to mitigate priming effects on the dependent variable observed here. In a recent meta-analysis, Hancock and colleagues find similar priming effects: when social media use measures were framed negatively (e.g., referencing addiction), well-being reports were significantly lower than in studies where social media use measures were framed in a neutral way [29, 35].

5.2 Mechanisms: Why mindsets matter

The findings identified in this paper suggest the important role of mindsets, which lead to consideration of several potential underlying mechanisms, discussed below.

First, people may be influenced by public narratives that shape individual behavior in line with perceived harms or benefits. While people may feel either positively or negatively about their own platform use, popular press coverage of harms is highly salient in much of the contemporary media coverage of social media use, especially during the COVID-19 pandemic. For instance, early social

media research in 2007 – which had documented positive outcomes of social media use – even remarked, "Our empirical results contrast with the anecdotal evidence dominating the popular press" [24]. This discrepancy between public narrative and empirical outcomes is documented in more recent work as well, such as teens expressing that mobile phone use is addictive and harmful, but being unable to point to specific harms they've experienced [32] or users expressing ambivalence about perceived value of use [7]. At the individual level, people may attempt to reconcile these conflicting perspectives in their behavior in order to protect against perceived harms or increase perceived benefits.

Second, we highlight the importance of considering mindsets in future scholarship on well-being and social media use. When considered alongside other factors such as social media experiences, mindsets may provide a valuable lens for conceptualizing and understanding differential well-being outcomes for people with different beliefs. The mindsets approach highlights the way in which individuals understand, or frame, various experiences; whether users see their social media use as positive or negative may call their attention to different aspects of their use, amplifying the salience of some experiences while dampening the focus on others. Our findings suggest that capturing user beliefs about their social media use might sharpen our ability to identify trends in future work and potentially shed light on past empirical work, especially given the disparity of these beliefs across countries, age, and other demographics.

6 LIMITATIONS & FUTURE RESEARCH

The present study has the following limitations. First, the analysis is correlational, and cannot determine the causal relationship between well-being, beliefs about Facebook, and time spent on the platform. It is not clear whether beliefs about Facebook caused changes in both well-being and time-spent, or if other factors such as major life events, the composition of friend groups, or having a good day when taking the survey influenced all three variables of interest. As noted above, neither time spent nor beliefs alone predict well-being. Instead, other variables related to how people use the platform, and factors such as self-esteem, network composition, socio-economic status, etc. are likely important to understanding well-being outcomes. More research should extend these findings to establish both causal relationships between social media use and well-being, as well as the specific uses that support well-being, and how those specific uses are driven by or themselves drive mindsets.

Second, though we discuss potential mechanisms to explain why beliefs about Facebook moderate the relationship between time spent on the platform and well-being, we are unable to prove any particular mechanism with the present data. We do not know the degree to which the participants' beliefs were shaped by external forces such as the news media (exogenous) versus by their own past experiences (endogenous), both good and bad, on Facebook [21]. And we do not know whether participants' mindsets simply acted as lenses which changed their perspective about social media use, or whether their mindsets directly changed their behaviors. It is also possible that the relationship between social media use and well-being could influence one's beliefs about the platform. For instance, negative experiences on the platform and subsequent time spent on it would likely change people's beliefs about social

media. Factors such as media exposure, awareness of peers' beliefs about social media, and past positive or negative experiences on the platform are important variables for future study. New research should examine the origin of people's beliefs, how they impact motivations for use, and how beliefs shape user practices.

Third, the data for this study come from only one platform, Facebook. Social media platforms differ in several aspects, including motivations for use, network composition, norms, affordances, and media types. Additionally, perceptions of use may relate to the scale at which the user base has expanded in different markets, as well as the various positive and negative outcomes for people in particular regions, given various sociopolitical and cultural contexts. Therefore, people might have different beliefs or mindsets about other social media platforms. The specific questions about beliefs used in the present study may need to be adapted for use on different platforms and in different cultural contexts. The present study is age-agnostic; additional research may be needed to understand the association between social media use and specific age groups, such as teens and young adults.

Finally, the results reflect the beliefs and usage patterns of people who were monthly active Facebook users who chose to respond to a voluntary survey. As a result, respondents were more active on the platform than a random sample of Facebook account holders, and thus the experiences of people who rarely use the platform or who have left the platform are not represented. It is possible that the moderating effect of belief would be smaller than what was observed in the present study if the sample had included a larger proportion of people who spend very little time on the site. Survey respondents spent approximately twice as much time on the site. Other potential factors may account for both time-spent and well-being that are not accounted for in the present study, and thus results should not be overgeneralized. Social desirability biases also may cause respondents to report more positively (or more negatively, depending on the desire relevant to the community) about their beliefs about Facebook. In this study, participants' average response to the belief scale skewed positively, so people who believed that Facebook was very bad for themselves or for society comprised a smaller proportion of responses. Though the sample in the present study is biased by focusing on more active Facebook users, we control for demographics, account tenure and friend count in regressions to account for these differences. Notwithstanding these limitations, the study has the benefit of a large sample size, and thus a wide variety of people, including people from 15 countries. Future research can investigate the global distributions of mindsets related to social media impact and improve upon sampling.

7 CONCLUSION

This paper finds evidence that people's beliefs about whether social media is good or bad moderate the relationship between time spent on social media and well-being. When people think that Facebook is bad, the more time they think they spend on the platform, the lower their well-being. When people think that Facebook is good, time they think they spend on the platform is not associated with well-being. These results help explain some disparate findings in the research literature on social media's impact on well-being: it depends on your mindset. We encourage researchers who want to

establish better models of social media and well-being to include participants' mindsets about social media into their approaches. The paper also shows that mindsets have a stronger moderating effect when time spent measures are self-reported rather than coming from more objective sources such as server logs. This finding reinforces the importance of including social media use measures that are not participants' estimates, but rather that come from logging applications or time-use software instead. Considering mindsets as a key factor in social media use and well-being may produce novel insights into the impact that social media can play in shaping our everyday experiences.

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A APPENDIX

Table 4: Perceived time spent questions. Each participant answered one of these ten questions.

Label	Question text	Response	Mapped server log data
A	How many hours a day, if any, do you typically spend using Facebook?	Open text	Average hours per day for the seven days prior to the survey.
B	In the past week, on average, approximately how many minutes PER DAY have you spent actively using Facebook?	Open text	Average minutes per day for the seven days prior to the survey.
C	In the past week, on average, approximately how much time PER DAY have you spent actively using Facebook?	__ hours __ minutes	Average minutes per day for the seven days prior to the survey.
D	In the past week, on average, approximately how much time PER DAY have you spent actively using Facebook?	Less than 10 minutes per day 10–30 minutes per day 31–60 minutes per day 1–2 hours per day 2–3 hours per day More than 3 hours per day	Average minutes per day for the seven days prior to the survey.
E	On average, how many times per day do you check Facebook?	Open text	Average daily sessions for the 30 days prior to the survey.
F	How many times per day do you visit Facebook, on average?	Less than once per day 1-3 times per day 4-8 times per day 9-15 times per day More than 15 times per day	Average daily sessions for the 30 days prior to the survey.
G	How much time do you feel you spend on Facebook?	Definitely too little Somewhat too little About the right amount Somewhat too much Definitely too much	Total minutes for the 30 days prior to the survey
H	How much do you usually use Facebook?	Not at all A little A moderate amount A lot A great deal	Total minutes for the 30 days prior to the survey
I	How much do you usually use Facebook?	Slider (not at all [0] to a lot [100])	Total minutes for the 30 days prior to the survey
J	How much do you usually use Facebook?	Much less than most people Somewhat less than most people About the same as most people Somewhat more than most people Much more than most people	Average daily minutes for the 30 days prior to the survey capped at the 99th percentile and converted to z-scores. Mean and std come from a random sample of FB users.

Table 5: Characteristics of the 10 different self-reported Facebook use measures, including error in self-reports, association with well-being, and priming effects: how much well-being measures change when asked this after this time-spent question.

Label	Question text	Avg. magnitude of error in self-reports	Association between reported time and well-being (β)	Adjusted R^2 in model of well-being	Priming effects: How much well-being changed when this question was asked before well-being
A	How many hours a day, if any, do you typically spend using Facebook?	196.7 minutes	-0.13***	0.13***	0.11**
B	In the past week, on average, approximately how many minutes PER DAY have you spent actively using Facebook?	87.5 minutes	-0.04	0.13***	0.06
C	In the past week, on average, approximately how much time PER DAY have you spent actively using Facebook?	261.1 minutes	-0.04	0.12***	-0.02
D	In the past week, on average, approximately how much time PER DAY have you spent actively using Facebook?	1.2 buckets	-0.03	0.11***	0.07*
E	On average, how many times per day do you check Facebook?	13.7 sessions	-0.02	0.11***	0.02
F	How many times per day do you visit Facebook, on average?	1.0 bins	0.01	0.10***	0.12***
G	How much time do you feel you spend on Facebook?	1.2 bins	-0.02	0.09***	0.08*
H	How much do you usually use Facebook?	1.2 bins	0.05**	0.10***	0.08*
I	How much do you usually use Facebook?	29 points	0.05**	0.11***	0.06
J	How much do you usually use Facebook?	1.5 bins	-0.01	0.09***	0.07*