

Logging Out or Leaning In? Social Media Strategies for Enhancing Well-Being

Amori Yee Mikami, Adri Khalis, and Vasileia Karasavva

Department of Psychology, University of British Columbia

Social media use is endemic among emerging adults, raising concerns that this trend may harm users. We tested whether reducing the quantity of social media use, relative to improving the way users engage with social media, benefits psychological well-being. Participants were 393 social media users (ages 17–29) in Canada, with elevated psychopathology symptoms, who perceived social media to negatively impact their life somewhat. They were randomized to either (a) assistance to engage with social media in a way to enhance connectedness (tutorial), (b) encouragement to abstain from social media (abstinence), or (c) no instructions to change behavior (control). Participants' social media behaviors were self-reported and tracked using phone screen time apps while well-being was self-reported, over four timepoints (6 weeks in total). Results suggested that the tutorial and abstinence groups, relative to control, reduced their quantity of social media use and the amount of social comparisons they made on social media, with abstinence being the most effective. Tutorial was the only condition to reduce participants' fear of missing out and loneliness, and abstinence was the only condition to reduce internalizing symptoms, relative to control. No condition differences emerged in eating pathology or the tendency to make social comparisons in an upward direction. Changes in social media behaviors mediated the effects of abstinence (but not of tutorial) on well-being outcomes. Participant engagement and perceptions of helpfulness were acceptable, but the abstinence group possibly perceived the content as less helpful. In conclusion, using social media differently and abstaining from social media may each benefit well-being.

Public Significance Statement

Young adults today use social media a lot, and this has led to concerns that social media may be harming their well-being. This study found that young adults can be coached to use social media in a smarter way that helps them to build meaningful, supportive, online connections with others. Results suggested that coaching to build connections on social media, as well as cutting back on social media, may each improve users' psychological well-being in different ways.

Keywords: social media, Facebook, Instagram, well-being, connectedness

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Amori Yee Mikami  <https://orcid.org/0000-0001-5821-0674>

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Correspondence concerning this article should be addressed to Amori Yee Mikami, Department of Psychology, University of British Columbia, 2136 West Mall, Vancouver BC, V6T 1Z4, Canada. Email: mikami@psych.ubc.ca

Social media platforms are digital technologies designed to support users exchanging content (video, pictures, text) with their network. Today, 81% of emerging adults in North America regularly use social media, with Instagram (71%) and Facebook (70%) being the most popular platforms, and most check social media at least daily (Pew Research Center, 2024). Over the COVID-19 pandemic, active users increased by 16% (Instagram) and 19% (Facebook), and time spent on social media increased by 20% (Statista, 2022). The common reasons why emerging adults use social media are for social communication, to alleviate boredom, and for information seeking (Stockdale & Coyne, 2020). However, some scholars express concern that social media use may be detrimental, while others argue that it helps fulfill social needs (Kross et al., 2021). The present study tested whether reducing emerging adults' quantity of social media use, versus improving the way they engage with social media, could enhance psychological well-being.

Social Media and Well-Being

Psychological well-being encompasses individuals' subjective experiences of affect and their satisfaction in specific life domains as well as globally (Diener et al., 1999). Distinctions are made between the positive (satisfaction, positive affect) and the negative (dissatisfaction, negative affect) aspects of well-being, as they may have some different correlates (Huppert, 2009). The present study focuses on negative affect (symptoms of depression, anxiety, eating pathology) and dissatisfaction with social relationships (loneliness scale, composed of items about loneliness and about social connection) because these are the most common outcome measures in existing research about the effects of social media use.

As of May 21, 2024, Haidt et al. (in press) report 28 experimental studies finding greater quantity of social media use to result in poorer well-being and eight studies finding no effects or mixed positive/negative effects. Nearly all studies involved adolescents or emerging adults in samples not selected for psychopathology. Common outcome measures were depression or anxiety symptoms, body image dissatisfaction, negative affect, and loneliness, though some measured life satisfaction and happiness. Other influential studies find very small correlations between adolescents' quantity of social media use and poorer well-being (higher depression, lower life satisfaction and happiness), but with effect sizes so minuscule as to not be practically meaningful (Orben & Przybylski, 2019a, 2019b). Nonetheless, negative associations between social media use and well-being may be somewhat larger when the sample is limited to girls (Orben et al., 2019; Twenge et al., 2022). Kross et al. (2021) summarized this literature to conclude that on average or in general, there may be a slight negative effect of social media use on well-being. A caveat, however, is that we rarely measure what people do on social media. Heterogeneity exists in the correlations between the quantity of social media use and well-being across users (Valkenburg et al., 2021) and studies (Marciano et al., 2022), which could reflect differences in what people do when on social media. Kross et al. (2021) highlighted two putative, contrasting processes that are likely relevant to individuals who use social media for social communication motives: *social connection* and *self-presentation*.

On the positive side, social media has great potential to facilitate social connection, given the ease in which someone can be in touch with hundreds if not thousands of friends at a time. Social media

lowers the effort required for both the establishing of weak ties and the deepening of close friendships (Chen & Li, 2017). Adolescents report using social media to strengthen their friendships (Popat & Tarrant, 2023), and 80% name the ability to stay in touch with friends and family as a benefit of social media (Pew Research Center, 2023a, 2023b). The connection aspect of social media creates opportunities for giving and receiving support. When emerging adults get social support from Facebook friends, this may predict lower depression and anxiety symptoms and offset the effects of poor in-person relationships on these symptoms 1 year later (Szwedo et al., 2012). Social support on social media can buffer against anxiety and hostility, and feelings of disconnection, among emerging adults undergoing a stressful transition (Mikami et al., 2019). People with minoritized or stigmatized identities may especially benefit from bonding with similar others (who may live far away) via social media (Naslund et al., 2016). To the extent that users engage in social connection in their social media activities, this could improve well-being.

On the negative side, self-presentation pressures, or being highly focused on one's online image and how it is perceived by others, may be elicited by the visualness, publicness, and permanence of social media (Nesi et al., 2018). Concerns about self-presentation drive users to make social comparisons between themselves and others in their social network (Verduyn et al., 2020), and this may most occur when passively consuming others' social media content (but see Valkenburg et al., 2022, for a critical review). Most work focuses on the damaging implications of upward social comparisons—or perceiving others as doing better than oneself (McComb et al., 2023). That said, the total amount of social comparisons on social media, not just whether they are oriented upward, may increase distress (Yoon et al., 2019). This is because constant comparison is stressful, even when people judge themselves as better than others. In addition, also related to self-presentation pressures is the fear of missing out on rewarding experiences that others are having (Fear of Missing Out [FOMO] Scale; Przybylski et al., 2013). It is easy to instantly keep tabs on multitudes of online friends, making users aware of things on which they are, in fact, missing out. FOMO is triggered by loneliness and few social connections online (Bonfanti et al., 2023) and may lead to poorer well-being (envy, rumination, negative self-image; Tandon et al., 2021). Because self-presentation pressures encourage users to curate a disingenuous online image, this can magnify social comparisons and FOMO. That is, pressure to selectively post about impressive or fun activities one is doing, or pictures where one looks attractive, may accentuate observers' perceptions that they are missing out on experiences or doing more poorly than the poster.

The contrasting processes of social connection and self-presentation could explain a potentially nonlinear association between social media use and well-being. Przybylski and Weinstein (2017) found a pattern in adolescents' smartphone use (presumably where most social media activity occurs), where the highest well-being (positive affect and satisfaction with social relationships) was associated with a small-to-moderate amount of daily use; those who used less than this had poorer well-being, and exceeding this amount of use was associated with steep well-being declines. This pattern may occur because there are positive and negative effects of social media use for well-being. Eliminating social media can increase isolation and deprive people of meaningful social connections. However, the self-presentation concerns engendered by social

media can hurt well-being, and this may be exacerbated at high levels of use (Kross et al., 2021). Interestingly, some scholars theorize that users with psychopathology may have the most to gain from the benefits of social media and also the most to lose from its downsides (Naslund et al., 2020). Opportunities to find similar others or to leverage asynchronous communication options in social media may offer unique connection opportunities for individuals with psychopathology. However, this group may also be more vulnerable to comparing themselves with others while lacking coping strategies to keep this information in perspective.

Efforts to Change Social Media Use

Concerns about harm from social media use have led some researchers to call for interventions (Kross et al., 2021), while others argue that policy to restrict social media use is still unwarranted at this point (Orben & Przybylski, 2019a). To date, any intervention approaches have largely, if not nearly exclusively, focused on reducing the quantity of social media use. A literature on digital self-control tools supports this contention; most options are block/removal tools (lockout mechanisms, timers) or strategies to make social media less enjoyable (forced delay before access, removing newsfeed), to stop overuse (Roffarello & Russis, 2023).

Several randomized experiments have asked users to stop social media for a period of a few days to up to 4 weeks. As summarized by Haidt et al. (in press), the majority find benefits for well-being, but there are mixed results. For instance, Vanman et al. (2018) asked people to give up Facebook for 5 days versus a control condition where they did not change their use. Stopping social media resulted in users having lower stress (cortisol levels) but also reporting lower well-being (life satisfaction). Those who gave up social media were also less satisfied than those in the control group, raising questions of acceptability. In a different study, asking emerging adults to stop social media for 1 week, relative to a control group, resulted in declines in perceived stress but increases in loneliness and poorer life satisfaction (Vally & D'Souza, 2019). In a third study, stopping social media for 1, 2, 3, or 4 weeks, compared with a control group, did not affect loneliness, positive or negative affect, or life satisfaction (Hall et al., 2021).

Other experiments have instructed people to restrict social media use but not abstain entirely. In one, people were asked to reduce their social media use by 20–30 min daily for 2 weeks (Brailovskaia et al., 2020, 2023). There were some positive effects relative to a control group on users' depression symptoms, life satisfaction, and happiness; interestingly, this was mainly evident at follow-ups 3 and 6 months later and not during the 2-week period itself. Another study asked emerging adults to limit their social media use to 10 min per day for 3 weeks and found improvements in depression and loneliness, though not FOMO and anxiety (Hunt et al., 2018). In one of the longest intervention periods to date, Collis and Eggers (2022) asked university students to restrict their social media use to 10 min per day for around 2.5 months. No effects were found relative to a control group on subjective well-being or academic performance, perhaps because participants substituted other digital activities for social media. However, Reed et al. (2023) randomized 50 users to reduce their social media use by 15 min a day for 3 months, versus to a control group, and found that this led to improvements in self-reported health, depression, and loneliness. Finally, Lyngs et al. (2020) randomized 58 emerging adults to one of three digital

self-control tools for Facebook: (a) goal reminder pop-ups that ask users what they got on social media to do, (b) cutting the newsfeed (which gives updates about social media friends), and (c) white background (control). Though the first two conditions reduced the quantity of social media use relative to control (and effects persisted in a 2-week follow-up), participants found the goal reminders annoying, and those whose newsfeed was eliminated reported increased FOMO. In addition, participants used social media on their phones to get around the tools (which only worked on browsers).

This literature is interpreted by Vanman et al. (2018) as reflecting users' ambivalence about giving up social media. The negative affect (depression, anxiety) engendered by social media drives people to stop use, but the resultant disconnection from others is an impetus to resume use. Haidt et al. (in press) argue that social media is addictive, so stopping makes people feel worse in the short term as they experience cravings, but stopping in the long term (they propose at least 1 month) should benefit well-being. Crucially, though, with rare exceptions (Collis & Eggers, 2022; Reed et al., 2023), we cannot find a study where people have stopped or reduced social media for longer than 4 weeks. We also largely lack data about whether the effects of abstinence-based approaches persist over time. Many users find it hard to abstain from social media. If this difficulty increases over longer periods, as people return to using social media, they may again experience negative effects of self-presentation pressures on their well-being.

Alternative to Abstinence-Based Approaches

Reducing the negative aspects of social media use, while accentuating the positive ones, is an understudied idea. As opposed to asking users to blanket abstain from social media, such an approach would mean coaching people to change the situations, behaviors, or cognitions on social media that contribute to poor well-being while maximizing those that contribute to good well-being. This type of strategy is in line with calls to stop focusing on only the quantity of social media use and to instead consider how someone is using social media, with the idea that actions have unequal implications for well-being (Kross et al., 2021).

As one intervention example, two studies showed participants Instagram content while reminding them that people post their best days and flattering images online, relative to a control condition where no such message was provided. In the first study, adolescents initially high in tendencies to make upward social comparisons reported lower negative affect if given the reminder; however, this did not occur for other adolescents nor did the message influence positive affect (Weinstein, 2017). In the other study, this manipulation had no effect on envy, social comparisons, or self-esteem (Weber et al., 2022). There are other examples specific to eating pathology. Given research that social media use may engender body dissatisfaction and thin ideal internalization, the #bodypositivity online movement critiques unrealistic Instagram photos as an attempt to reduce this link (Stein et al., 2023). Practicing self-compassion before seeing Instagram images may also help emerging adults prevent body dissatisfaction over 1–2 weeks (de Valle & Wade, 2022; Gobin et al., 2022). Though the success of these efforts is modest, it raises the idea that users could be helped to engage with social media differently, to disrupt the self-presentation pressures that result in poor well-being. To our

knowledge, though, no study has tried to maximize the social connection aspects of social media (as opposed to only focusing on disrupting self-presentation pressures) or evaluated effects for longer than 2 weeks—all of which we attempt to do in the current investigation.

The Present Study

We designed a tutorial aimed at minimizing the negatives (which we view to result from self-presentation pressures), and maximizing the benefits (which we view to result from genuine social connection), of social media use for well-being. Though the tutorial never asked people to reduce their quantity of social media use, we thought this might happen naturally if people stopped the type of use that negatively affected them. We randomly assigned social media users (ages 17–29, selected for perceiving some negative effects of social media use on their life and for having elevations in psychopathology) to either (a) *tutorial*, as described above, focused on altering the way users engage with social media; (b) *abstinence*, focused on giving up social media; and (c) *control*, where users were not asked to change behavior. This study has three aims.

Primary Aim 1

The first aim was to test the condition effects on potentially problematic social media behaviors (quantity of use, social comparisons on social media, passive use) and on well-being (FOMO, loneliness, internalizing symptoms, eating pathology). Hypothesis: Both tutorial and abstinence will be superior to control in reducing social media behaviors and improving well-being. Abstinence will be better than tutorial in reducing the quantity of social media use; abstinence and tutorial will be equal in reducing social comparisons and passive use. Tutorial will be superior to abstinence, which will be superior to control, in maximizing well-being.

Primary Aim 2

The second aim was to test whether condition-related effects on well-being are mediated by changes in social media behaviors. Hypothesis: Effects on well-being for tutorial versus control, and abstinence versus control, will be explained by improvements in social media behaviors.

Exploratory Aim

Another aim was to examine the preliminary feasibility and acceptability of tutorial and abstinence conditions, as assessed by users' engagement and perceptions of helpfulness.

Method

Participants

Participants were 393 emerging adults (ages 17–29, $M_{\text{age}} = 20.93$) living in Canada. Most identified as cisgender women and reported their cultural background as East Asian, White, Southeast Asian, or South Asian. Most participants ($n = 262$) were recruited through the psychology human subject pool at a public university in Western Canada. They were undergraduates enrolled in an introductory

psychology course who completed the study in exchange for partial course credit. The remainder ($n = 131$) were recruited through community advertisements and could not be a full-time student at any university at the time of participation; they were paid \$50 for participating. We recruited from both sources in an effort to increase the generalizability of study results. Reflecting the demographics of undergraduates in psychology courses, the human subject pool sample contained proportionately fewer cisgender men than the community sample (of those who reported their gender) and were slightly younger (see Table 1).

Procedure

Study procedures were approved by a research ethics board, and participants gave active, written consent. Data were collected between September 2019 and May 2021, which overlapped with the COVID-19 pandemic. We considered March 16, 2020, to be the start of the pandemic because this was when the university at which we were recruiting shut down. Owing to the timing of recruitment, 99 participants from the human subject pool and zero community participants completed the study before this date. See Figure 1 for the Consolidated Standards of Reporting Trials diagram.

Prescreening

Prospective participants answered prescreening questions upon registering for the human subject pool or, for community participants, upon expressing interest in our study. To meet the inclusion criteria, participants needed to be between the ages of 17 and 29 because social media use is common in this age group and reported using either Facebook or Instagram at least once per day because these were the platforms targeted by our interventions. They also reported the impact of social media use on their life, using the following scale: 1 (*mostly positive*), 2 (*more positive than negative*), 3 (*mix of positive and negative*), 4 (*more negative than positive*), 5 (*mostly negative*), or 6 (*no impact*). Eligible participants scored 3, 4, or 5 to ensure a minimal threshold of motivation for changing their social media use. Participants needed to be at risk for common forms of psychopathology because those with psychopathology may be most sensitive to both the positive and negative effects of social media (Naslund et al., 2020) and to reduce ceiling effects in the well-being outcomes. Symptoms of depression, anxiety, and attention-deficit/hyperactivity disorder (ADHD) are common, found in around 35.5%, 48.3%, and 18.8% of North American university students, respectively (W. Li et al., 2022; Mak et al., 2022), based on self-report questionnaires. Potential participants answered two items about internalizing symptoms ("I've been feeling depressed, down, sad, empty, or hopeless" and "I've been continually worried or anxious about a number of events or activities in my daily life") on a 4-point scale (0 = *never or rarely* to 3 = *very often*) and two items about ADHD symptoms ("I say or do things without thinking them through first" and "I have difficulty organizing things or staying organized about things") on a 5-point scale (0 = *not at all* to 4 = *extremely*). Eligible participants had a total score ≥ 4 on the internalizing items or ≥ 4 on the ADHD items; these cutoffs correspond to the at-risk range if the full scale had been used. Community participants also needed to live in Canada; this was not required in the human subject pool because they were students at a Canadian university. The prescreening contained other demographic

Table 1
Participant Demographics

Variable	Total <i>N</i> 393	Human subject pool	Community	Difference between samples
		<i>N</i> (%) 262	<i>N</i> (%) 131	
Gender				
Cisgender woman	296	199 (76.0)	97 (74.0)	$\chi^2(2, N = 346) = 10.36, p = .006$
Cisgender man	39	18 (6.9)	21 (16.0)	
Another option	11	4 (1.5)	7 (5.4)	
Did not disclose ^a	47	41 (15.6)	6 (4.6)	
Race/ethnicity				
White/European	73	42 (16.0)	31 (23.7)	$\chi^2(9, N = 346) = 6.32, p = .707$
East Asian	109	68 (26.0)	41 (31.3)	
South Asian	50	36 (13.7)	14 (10.7)	
Southeast Asian	51	36 (13.7)	15 (11.5)	
Black/African	5	2 (0.8)	3 (2.3)	
Hispanic/Latino	6	4 (1.5)	2 (1.5)	
Middle Eastern	10	7 (2.7)	3 (2.3)	
Indigenous	2	1 (0.4)	1 (0.8)	
Another option	30	20 (7.6)	10 (7.6)	
Did not disclose ^a	57	46 (17.6)	11 (8.4)	
Born in a country where social media is blocked				
No	310	195 (74.4)	115 (87.8)	$\chi^2(1, N = 346) = 1.21, p = .271$
Yes	36	26 (9.9)	10 (7.6)	
Did not disclose ^a	47	41 (15.6)	6 (4.6)	
Completed any part of the study after March 16, 2020				
No	99	99 (37.8)	0 (0.0)	$\chi^2(1, N = 393) = 66.17, p < .001$
Yes	294	163 (62.2)	131 (100.0)	
Variable	Total	Human subject pool	Community	Difference between samples
	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	
Age	20.93 (2.76)	19.96 (1.96)	22.62 (3.14)	$F(1, 333) = 90.54, p < .001$

^aIn the human subject pool sample, there are more participants in this category than expected. This is because demographics are collected for the entire human subject pool in a centralized fashion. All but 10 of the participants for whom demographic data are missing in the human subject pool sample provided us with an incorrect ID to link their demographic data to their participant data in the present study.

questions that were not in the inclusion criteria. Participants reported their gender (options in Table 1) and sex assigned at birth, race/ethnicity (options in Table 1), and country of origin (write-in variable). We coded whether the country of origin was one in which Facebook and Instagram were blocked (China, Iran) because this might affect usage patterns on these websites.

Study Conditions

People who met the inclusion criteria were invited to participate in the study. Upon scheduling a time for their initial visit, they were randomly assigned to one of three conditions. Each condition consisted of three separate online modules created using instructional software (EdX). Each module was around 15 min in length and contained videos, infographics, and activities to encourage participants to engage with the content. All participants were given a new module to complete every 2 weeks (see the Timeline section), which we did as an attempt to maintain their motivation. The difference between the three conditions was the content in the online modules.

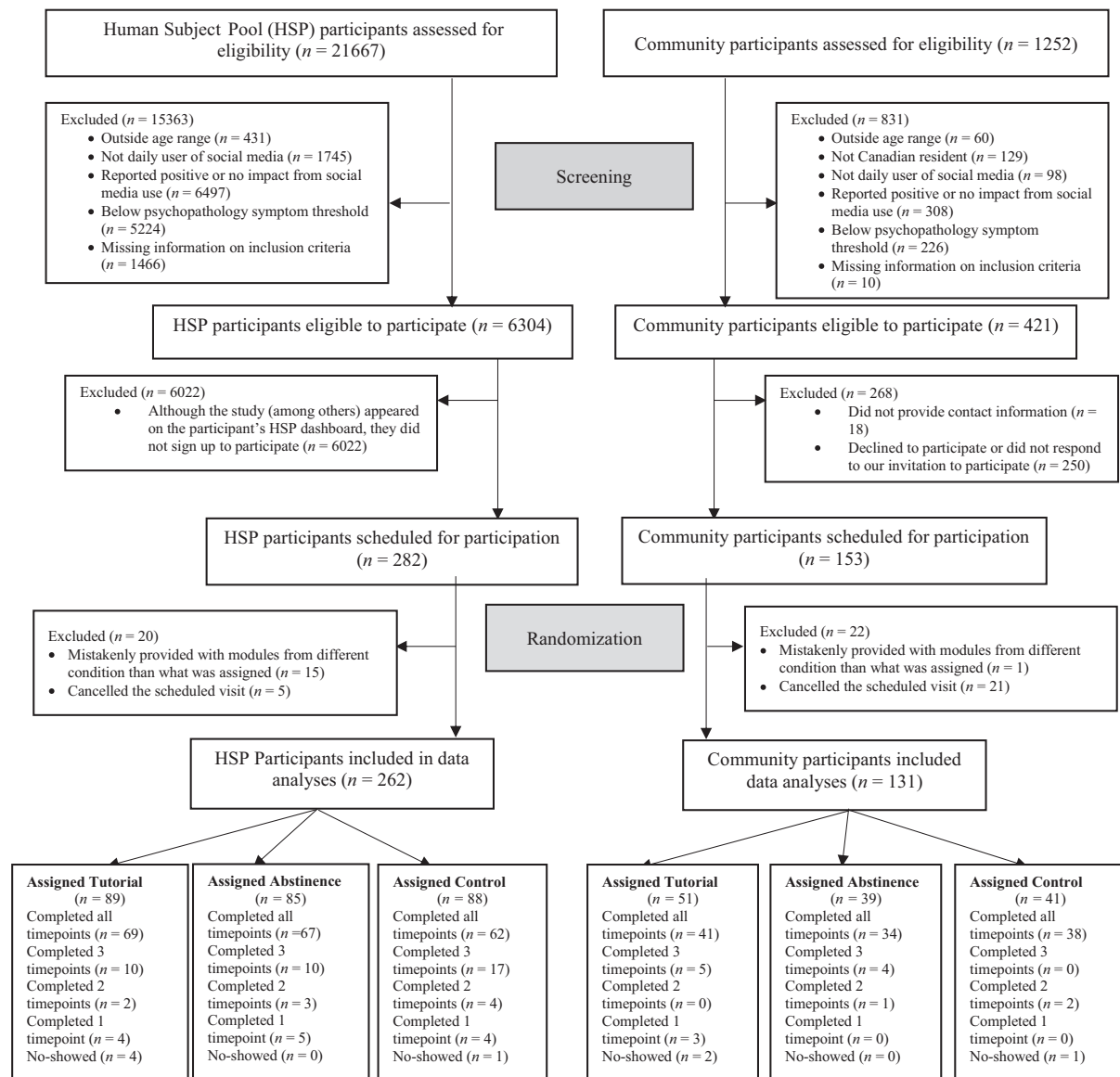
Tutorial. To design the tutorial, we first identified the benefits (social connection) and the downsides (self-presentation pressures) of social media use. Drawing from cognitive behavioral therapy, which has strong evidence for treating anxiety, depression, and (to a lesser extent) ADHD in emerging adults (Coull & Morris, 2011; Knouse &

Fleming, 2016), we borrowed strategies for encouraging users to reduce cognitions leading to self-presentation pressures and to try online behaviors to connect with others in positive, meaningful ways. In focus groups, social media users in the human subject pool offered feedback on our tutorial ideas (no focus group members participated in the present study). We made the tutorial into three, 15-min modules because focus group members indicated that this was the maximum module length that they would realistically complete.

The final version of the tutorial offered participants tools and strategies to help them use social media in ways that maximized social connection and minimized self-presentation pressures. Modules guided participants to reflect on when their social media use was having a positive effect on their life, versus when it was not, to increase mindfulness about their use patterns. Participants were asked to consider the extent to which posts may be curated and not reflect reality, so as to help combat social comparisons, and were encouraged to unfollow or mute accounts that were leading to unhealthy social comparisons. Finally, participants were coached in ways to actively engage with people on social media with whom they wanted to deepen a friendship or get to know better, to engage in behaviors on these platforms that aligned with their larger social goals, and to prioritize effective active engagement over passive use.

Abstinence. Our condition differed from that in most research, where participants are typically told to stop social media without any

Figure 1
Consolidated Standards of Reporting Trials Diagram



Note. There was more attrition over subsequent timepoints in the HSP versus community sample. This may be because HSP participants received a certain amount of course credit for every study visit they attended. Once participants reached the amount of credit they needed or wanted, there was no incentive to finish the rest of the study timepoints. HSP = human subject pool.

tips on how to do so. We designed our abstinence condition under the assumption that (like tutorial) it was an active intervention, drawing from the randomized trial literature where active treatments are compared. Thus, we aimed to equate participants' time spent, and expectations for improvement, across tutorial and abstinence. We also wanted to maximize the chance that participants would succeed, so we designed our abstinence condition by drawing from online programs that successfully encouraged behavior change in people trying to break habits (such as programs to improve diet and exercise).

In our abstinence condition, participants were asked to cease (or cut back as much as possible on) their social media use for the

duration of the 6-week study. They were provided information on the potential benefits of taking a break from social media and were presented with testimonials from people who had stopped social media and how they found that to benefit their well-being. Modules also offered participants tips on how to abstain from social media and resist the temptation to check it. For instance, we suggested that participants delete or log out of the apps on their phones or that they use software that restricts their social media use to certain hours or to a total amount of time per day. Participants were helped to develop self-statements that they could use to refrain from checking social media if they felt the urge to do so.

Control. Participants viewed information about the history of and culture around social media but were not asked to change their behavior. For instance, participants got information about social media platforms in China, the rise and identities of social media influencers, and the role of social media in world events like Brexit.

Timeline

There were four timepoints, each spaced 2 weeks apart. The study was 6 weeks in total.

Timepoint 0 (T0; Week 0). Participants attended an initial study session via online video conferencing with a research assistant. They were directed to an online survey with baseline measures of social media behaviors and well-being. The research assistant showed participants how to take a screenshot of the screen time tracker on their phone to email to the study and asked participants to do so at this visit. With participants' consent, the research assistant used our study account to add them as a friend or follow participants on their primary social media account, out of Instagram or Facebook. This was so that we could observe participants' social media profiles to record the interaction quality (e.g., supportiveness, hostility) with friends in their social network for the past 2 weeks. Note that we were unable to use these observational data; see the Data Analytic Plan section. The final activity was that the research assistant helped participants load the first of the modules associated with the study condition to which they had been assigned and asked them to view the module; it was only at this point that participants learned their condition assignment.

Timepoint 1 (T1; Week 2). Participants were sent an email containing links to an online survey where they repeated the social media behaviors and well-being measures. The email also contained a link to the next online module associated with their study condition. Participants were asked to take a screenshot of the screen time tracker on their phone to email to the study. We observed participants' social media pages again to record interaction quality.

Timepoint 2 (T2; Week 4). The procedure at T1 was repeated at T2. Participants were given the third and final online module associated with their study condition.

Timepoint 3 (T3; Week 6). The T2 procedure was repeated at T3; however, there was no online module as this was the final study visit. Participants were debriefed and offered the opportunity to take any of the modules from other study conditions.

Measures

Social Media Behaviors (Aim 1 Outcomes and Aim 2 Mediators)

Quantity of Use. We obtained this information from two sources. We considered each source separately, with the idea that the first misses social media use on other devices or outside of the 7-day range, and the second may be vulnerable to social desirability biases. (a) Study staff recorded the number of minutes that Instagram or Facebook was open in the past 7 days from the screenshots of the screen time tracker on participants' phones. A total score was calculated by summing the number of minutes participants spent on both Facebook and Instagram. (b) Participants self-reported the total number of minutes they estimated having spent on Instagram and on Facebook in the past 2 weeks; these two values were summed.

Intensity of Use. The Multidimensional Facebook Intensity Scale (MFIS; Orosz et al., 2016) contains 13 items about the intensity of use, which we modified to ask about Facebook or Instagram. Unlike the quantity of use measures, the MFIS has indicators of excessive, addictive use. Participants reported on their social media use in the past 2 weeks (e.g., "I spent more time on Facebook or Instagram than I would like to") on a 5-point scale (1 = *strongly disagree* to 5 = *strongly agree*). Orosz et al. (2016) reported good internal consistency, test-retest reliability, and convergent and criterion validity. We summed all items to create a total score; higher values indicated more intense use (Cronbach's α in our sample = .80–.91 across T0–T3).

Active/Passive Use. The Passive and Active Use Measure (Gerson et al., 2017) has 13 items about active and passive use patterns on Facebook. We modified this scale (and edited two items) to fit both Facebook and Instagram. Participants reported how often in the past 2 weeks they engaged in behaviors (e.g., "Posting pictures, videos, or status updates on your own page") on a scale of 1 (*never—zero percent of the time*) to 5 (*very frequently—close to 100% of the time*). Confirmatory factor analysis in our sample showed a four-factor solution at each timepoint, which aligned with theoretical considerations: passive use (scrolling or browsing; four items; Cronbach's α = .71–.86), active use on own page (posting or commenting on one's own page; four items; Cronbach's α = .76–.81), active use on friends' pages (posting or commenting on friends' pages; three items; Cronbach's α = .70–.76), and other active use (commenting on pages of businesses or celebrities; two items; Cronbach's α = .64–.69). We extracted the factor score estimates to compute a score for each subscale. Supplemental Table 1 has the scale items, and Supplemental Figures 1–4 contain graphical models with factor loadings, standardized covariances, and fit statistics of competing models at each timepoint.

Social Comparisons. This was measured in two ways. We considered each as a separate outcome, as the first assesses the total amount of social comparisons and the second assesses directionality. (a) The Iowa-Netherlands Comparison Orientation Measure-Modified (INCOM; Gibbons & Buunk, 1999) measures the degree to which one engages in social comparisons (regardless of the direction of those comparisons) and has been adapted for the social media context (Cramer et al., 2016). Our scale had 11 items about participants' social comparisons on Instagram or Facebook in the past 2 weeks ("I often compared how I am doing socially [e.g., social skills, popularity] with other people"), with each item answered on a 5-point scale (1 = *strongly disagree* to 5 = *strongly agree*). A total score was calculated by reverse-scoring appropriate items and summing all items (Cronbach's α = .80–.88); higher values indicated greater social comparison. (b) The Social Comparison Rating Scale (SCRS; Allan & Gilbert, 1995) captures the tendency to make social comparisons in an upward versus downward direction, with no indication of the amount of comparisons. It has been adapted for the social media context (Lup et al., 2015). Participants read 11 items and selected a number between 1 and 10 that described their perceived position between two poles when comparing themselves to others on Facebook or Instagram (e.g., *inferior/superior, unlikeable/more likeable*). We created a total score by summing all items, with higher values indicating a more positive self-view (downward direction; Cronbach's α = .92–.95). The SCRS has demonstrated good internal consistency and correlates with psychopathology in expected ways (Lup et al., 2015).

Psychological Well-Being (Aim 1 and Aim 2 Outcomes)

FOMO. The 10-item FOMO Scale (Przybylski et al., 2013) asks about experiences on Facebook or Instagram in the past 2 weeks. Participants responded using a 5-point metric (1 = *not at all true of me* to 5 = *extremely true of me*) to items such as “I fear others have more rewarding experiences than me.” The sum of the items was used to indicate more FOMO. Internal consistency in our sample was Cronbach’s $\alpha = .83-.89$. This scale has shown adequate reliability and validity in various, diverse samples (e.g., Y.-Y. Li et al., 2021).

Loneliness. The 20-item UCLA Loneliness Scale (Russell, 1996) asks about feelings of loneliness and connection in the past 2 weeks. It has 11 items about loneliness (“How often do you feel alone?”) and nine items about connection (“How often do you feel part of a group of friends?”). Participants responded to each item on a 4-point scale (1 = *never*, 2 = *rarely*, 3 = *sometimes*, 4 = *always*). All items (with connection items reverse scored) were summed; higher scores indicate more loneliness (Cronbach’s $\alpha = .92-.93$ in our sample). This is the most commonly used scale to assess loneliness in emerging adults (Buecker et al., 2021).

Internalizing Symptoms. The Depression Anxiety Stress Scale-21 (DASS-21; Lovibond & Lovibond, 1995) has 21 items about the physical and emotional symptoms of depression, anxiety, and stress. Participants rated how much each symptom applied to them over the past 2 weeks on a 4-point metric (0 = *did not apply to me at all* to 3 = *applied to me very much or most of the time*). The DASS-21 has good internal consistency and convergent validity (Lovibond & Lovibond, 1995) and is sensitive to changes over 2 weeks (Brailovskaia et al., 2020). As recommended by the scale authors, we calculated the total score by summing all items and then multiplying the summed score by 2 (as the DASS-21 is a short form of the original DASS-42). Higher scores represent greater symptoms (Cronbach’s $\alpha = .91-.94$ in our sample).

Eating Pathology. Participants completed two subscales of the Eating Disorder Inventory-2 (Garner, 1991), which are demonstrated to relate to social media use (de Valle et al., 2021). (a) Drive for thinness (seven items) reflects the idealization of thin body types, and (b) body dissatisfaction (nine items) assesses unhappiness with one’s body weight or shape. Items for both subscales are answered on the following metric: 1 = *always*, 2 = *usually*, 3 = *often*, 4 = *sometimes*, 5 = *rarely*, 6 = *never*. Following recommendations from the scale authors when used in community samples (Garner, 1991), we calculated the total score of all items (with appropriate items reverse scored) for each subscale; higher scores indicated more eating pathology. We summed the two subscales because correlations between them were high ($r_s = .67-.69$). Internal consistency in our sample of the summed score was Cronbach’s $\alpha = .92-.93$ (16 items). Both subscales have extensive data on reliability, internal consistency, and validity (Garner, 1991).

Feasibility and Acceptability (Exploratory Aim Outcomes)

Engagement. From the EdX software used to deliver the modules, we counted participants as having engaged if the software record showed that they had watched at least part of the video,

completed any open-ended reflection questions, or interacted with any activity.

Helpfulness. After each module in the tutorial and abstinence conditions, participants were asked how helpful they found the material. Unfortunately, we asked this question in different ways, which was an oversight. In the abstinence group, they reported on a 5-point scale (1 = *not helpful at all*, 2 = *not so helpful*, 3 = *somewhat helpful*, 4 = *very helpful*, 5 = *extremely helpful*). In the tutorial group, they were asked to check anything that got in the way of them enacting the strategies, and one option was “strategies were not helpful.” In the control group, helpfulness was only assessed after Module 1, using the 1–5 scale. Participants were coded as perceiving the content to be helpful if they responded as a 3 or higher on the 1–5 scale when this was the question or if they did not check the box indicating that strategies were not helpful when this was the metric and they had engaged in the module otherwise.

Data Analytic Plan

Data analyses were conducted using Mplus Version 7 (Muthén & Muthén, 2015).

Primary Aim 1

We created a multilevel growth curve model with the four timepoints (T0, T1, T2, T3) nested in participants. The Condition \times Time cross-level interaction tested Primary Aim 1, involving whether participants’ average trajectory over the four timepoints differed based on the study condition. These analyses tested the linear slope across the four timepoints and did not examine other trajectories (e.g., quadratic, cubic); however, patterns looked relatively linear, and Supplemental Figures 5–17 show spaghetti plots of our data. All model variables were manifest. Parameters were calculated using robust standard errors. We used intent-to-treat analysis, where participants remained in the condition to which they were assigned, even if they did not engage with the modules or comply with the condition. Effect sizes for each contrast (tutorial vs. control, abstinence vs. control, tutorial vs. abstinence), and their confidence intervals, were estimated as recommended by Feingold (2015) for growth modeling in clinical trials. Effect sizes are reported using Cohen’s d (0.2 = *small*, 0.5 = *medium*, and 0.8 = *large*; Cohen, 1988). We report results with and without the Benjamini–Hochberg procedure applied to control for the expected proportion of false discoveries (Thissen et al., 2002).

Below are the equations for this analysis (see Equation 1). Each outcome variable (Y_{ij}) is predicted by the intercept (β_{0j}) and timepoint (T0–T3; β_{1j}) at Level 1. At Level 2, the Level 1 intercept (β_{0j}) is predicted by the study condition, as indicated by the contrasts between tutorial versus control (γ_{01}) and abstinence versus control (γ_{02}). The key value of interest is the cross-level interaction ($\gamma_{11, 12}$) between the study condition ($\gamma_{01, 02}$) and the slope of timepoint (β_{1j}). A statistically significant γ_{11} indicates that the tutorial condition differs from the control condition in the linear slope across the four timepoints, and the sign of γ_{11} indicates whether the slope for a tutorial is more positive or negative than control. The interpretation of a significant γ_{12} is that abstinence differs from the control condition in the linear slope across the four timepoints; the sign of γ_{12} indicates direction. The equations were repeated with the contrasts of tutorial versus abstinence and control versus abstinence

to generate the coefficient for the tutorial versus abstinence contrast. Thus:

$$\begin{aligned} \text{Level 1 (Timepoint): } Y_{ij} &= \beta_{0j} + \beta_{1j}(\text{timepoint}) + r_{ij} \\ \text{Level 2 (Participant): } \beta_{0j} &= \gamma_{00} + \gamma_{01}(\text{tutorial versus control}) \\ &\quad + \gamma_{02}(\text{abstinence versus control}) + u_{0j} \\ \beta_{1j} &= \gamma_{10} + \gamma_{11}(\text{tutorial versus control}) \\ &\quad + \gamma_{12}(\text{abstinence versus control}) \\ &\quad + u_{1j}. \end{aligned} \quad (1)$$

Figure 1 shows the amount of missing data per timepoint. An attrition analysis in the human subject pool sample, and repeated in the community sample, compared participants who completed all four timepoints with those who did not on all outcome variables at all timepoints and on all demographic variables. Supplemental Tables 2–3 show that only four of 104 comparisons on outcome variables were significant at $p < .05$, and we saw no pattern in the results. However, most tests of demographic variables were significant, such that more participants who completed all timepoints provided answers to these questions. Full information maximum likelihood estimation handled the missing data, so that all 393 cases who began the study were included.

Random assignment equalized most demographic variables across the three conditions: age, gender, race/ethnicity, recruitment source (human subject pool vs. community), and country of origin (one where Facebook and Instagram are blocked vs. not blocked), all $ps > .05$. There was one exception: Condition was associated with whether any part of the study occurred during the COVID-19 pandemic ($\chi^2 = 6.01$ [$df = 2$], $p = .049$); this was no longer significant when the Benjamini–Hochberg correction was applied. We conducted a robustness check where we reducted all analyses including each demographic covariate as a predictor of the intercept (main effect) and the slope (covariate by timepoint cross-level interaction).

Primary Aim 2

We created a multiple mediator model with study condition (tutorial vs. control and abstinence vs. control; assigned at T0) as the independent variables. We calculated the mean of each social media behavior at T1 and T2 and then entered all of them simultaneously as mediators. The outcome variable was the measure of well-being at T3; we created separate models for each well-being outcome. Models controlled for the values of the well-being measure at T0, and of all social media behaviors at T0, because we wished to capture changes in these variables. Bias-corrected bootstrapping with 1,000 samples was used to examine the significance of total, direct, and indirect effects and to generate confidence intervals. The conditions for mediation were met if the indirect effect from the study condition to well-being outcome, via all social media behaviors, had a 95% confidence interval that did not cross zero. In that situation, we then examined the indirect effect for each mediator specifically.

Exploratory Aim

To test feasibility and acceptability, we reported descriptive statistics of the engagement and helpfulness metrics of the tutorial

and abstinence conditions. We conducted analyses of variance (ANOVAs) with condition (tutorial, abstinence, control) as the independent variable and the engagement and helpfulness metrics as the dependent variables. When the omnibus ANOVA was significant, we compared each condition with one another using the least significant difference test.

Comparison to Preregistration

Our preregistration intended that data analyses would use repeated measures ANOVA. An a priori power analysis based on this assumption led us to plan a sample of 300 (split between the human subject pool and community recruitment) to yield a power of .99 to detect a medium effect size. However, ANOVA requires participants to have complete data. Because it became evident during data collection that this was untenable, and we had more difficulty recruiting community participants than expected (perhaps affected by COVID-19), we enrolled for as long as time and funding allowed and expanded the age range slightly to 17–29. This yielded our sample of 393, and we changed our data analytic strategy so as to retain all cases. Initially, we also intended to analyze observational data about participants' interactions on Facebook and Instagram. Although we did collect these data at each timepoint, in the 2 weeks between timepoints, many participants had none, or one, codable interaction on their social media profile. This led to us being unable to run the models, owing to low variability and too much missing data. Therefore, we could not use these data in the current article because we could not measure change in these variables over a 2-week period.

Transparency and Openness

We followed the APA Style Journal Article Reporting Standards in the preparation of this article. Study procedures and the data analytic plan were preregistered on the Open Science Framework at <https://osf.io/gwfex>. The data set is publicly available on the Open Science Framework at <https://osf.io/9sb57/>. Below, we report how we determined our sample size and all data exclusions, manipulations, study measures, data analytic techniques, and software used and any instances where these things differed from our preregistration.

Results

Descriptive Statistics

Table 2 presents descriptive statistics on study measures. All had acceptable skewness (range = -0.45 – 1.24) and kurtosis (range = -1.16 – 1.80) except for the two quantity of use measures (observed and self-reported screen time), where some participants had very high values. We calculated the square root of both measures, which resulted in skewness and kurtosis between -1 and 1 , and used the transformed values in analyses although raw values are in Table 2 for interpretability. Bivariate correlations (Supplemental Table 4) generally show medium to large ($rs = .5$ – $.7$) associations for the same outcome measure across timepoints. Small ($rs = .2$ – $.4$) associations existed between measures of related constructs within the same timepoint.

Table 2 also contains the group means of all outcome variables across timepoints, separated by study condition. Spaghetti plots of these data are shown in Supplemental Figures 5–17. Visual

Table 2
Descriptive Statistics

Variable	Total						Control						Abstinence						Tutorial					
	<i>M (SD)</i>						<i>M (SD)</i>						<i>M (SD)</i>						<i>M (SD)</i>					
	T0	T1	T2	T3	T0	T1	T2	T3	T0	T1	T2	T3	T0	T1	T2	T3	T0	T1	T2	T3	T0	T1	T2	T3
Observed screen time	394.93 (294.24)	348.18 (318.35)	352.16 (307.15)	336.32 (305.88)	408.29 (320.69)	445.66 (338.31)	440.03 (310.43)	450.74 (317.45)	416.19 (282.63)	202.72 (272.72)	213.46 (273.05)	191.86 (251.07)	365.67 (278.81)	368.92 (292.53)	380.49 (294.61)	345.98 (289.68)								
Self-report screen time	129.83 (111.72)	83.58 (89.31)	78.67 (95.18)	74.68 (91.00)	119.03 (104.45)	100.38 (87.11)	90.00 (105.58)	97.28 (95.38)	131.19 (106.28)	47.57 (70.49)	38.96 (51.86)	39.15 (66.88)	138.98 (122.42)	98.71 (97.37)	102.51 (103.45)	85.47 (96.67)								
MFIS	3.37 (0.58)	2.92 (0.80)	2.84 (0.83)	2.78 (0.86)	3.35 (0.58)	3.18 (0.66)	3.08 (0.74)	3.11 (0.73)	3.37 (0.56)	2.43 (0.88)	2.40 (0.89)	2.32 (0.95)	3.38 (0.60)	3.10 (0.66)	3.00 (0.70)	2.87 (0.73)								
PAUM active own page	0.02 (0.70)	0.04 (0.75)	0.02 (0.73)	0.02 (0.76)	-0.01 (0.71)	0.21 (0.68)	0.25 (0.66)	0.29 (0.74)	0.07 (0.69)	-0.42 (0.68)	-0.37 (0.74)	-0.34 (0.70)	0.01 (0.70)	0.28 (0.70)	0.15 (0.71)	0.09 (0.73)								
PAUM active friends	0.01 (0.60)	0.02 (0.69)	0.01 (0.65)	0.01 (0.74)	-0.03 (0.60)	0.22 (0.55)	0.24 (0.51)	0.30 (0.62)	0.04 (0.62)	-0.47 (0.66)	-0.40 (0.66)	-0.43 (0.73)	0.02 (0.58)	0.25 (0.62)	0.15 (0.58)	0.13 (0.67)								
PAUM active other	0.01 (0.58)	0.01 (0.66)	0.01 (0.65)	0.01 (0.66)	0.00 (0.60)	-0.44 (0.66)	-0.35 (0.65)	-0.36 (0.67)	0.00 (0.60)	-0.44 (0.66)	-0.35 (0.65)	-0.36 (0.67)	0.06 (0.55)	0.22 (0.58)	0.14 (0.59)	0.16 (0.60)								
PAUM passive	0.00 (0.67)	-0.01 (0.79)	-0.01 (0.78)	-0.01 (0.81)	-0.07 (0.66)	0.27 (0.57)	0.26 (0.62)	0.34 (0.69)	0.02 (0.70)	-0.64 (0.80)	-0.51 (0.81)	-0.51 (0.80)	0.03 (0.65)	0.28 (0.64)	0.16 (0.67)	0.11 (0.70)								
INCOM	3.80 (0.61)	3.46 (0.80)	3.40 (0.78)	3.38 (0.76)	3.77 (0.63)	3.68 (0.68)	3.60 (0.73)	3.60 (0.71)	3.80 (0.60)	3.06 (0.93)	3.08 (0.85)	3.07 (0.85)	3.84 (0.61)	3.60 (0.63)	3.50 (0.66)	3.47 (0.65)								
SCRS	50.13 (17.06)	52.99 (17.72)	53.30 (16.90)	55.42 (17.65)	49.15 (17.14)	50.33 (17.71)	52.05 (17.81)	53.01 (17.83)	51.48 (17.69)	55.48 (17.76)	56.37 (15.10)	58.02 (17.42)	49.90 (16.48)	53.42 (17.49)	51.81 (17.28)	55.37 (17.53)								
FOMO	29.35 (7.90)	26.81 (8.66)	24.75 (9.34)	23.78 (8.34)	29.60 (7.73)	28.41 (8.53)	26.43 (8.17)	25.08 (8.21)	29.01 (7.68)	25.50 (8.64)	24.39 (7.58)	23.86 (8.36)	29.41 (8.28)	26.43 (8.63)	24.75 (9.33)	22.50 (8.32)								
Loneliness	2.40 (0.61)	2.29 (0.61)	2.26 (0.62)	2.23 (0.62)	2.46 (0.65)	2.43 (0.61)	2.36 (0.62)	2.36 (0.62)	2.37 (0.62)	2.20 (0.62)	2.18 (0.57)	2.20 (0.61)	2.37 (0.57)	2.24 (0.58)	2.24 (0.64)	2.15 (0.63)								
DASS-21	47.07 (24.43)	40.18 (24.26)	39.04 (25.76)	35.77 (26.20)	48.64 (25.14)	45.24 (24.09)	42.90 (23.95)	40.16 (25.15)	44.64 (23.63)	32.43 (22.17)	32.76 (25.51)	30.74 (25.36)	47.63 (24.44)	42.10 (24.69)	40.86 (26.78)	36.15 (27.32)								
EDI-2	53.40 (18.20)	54.98 (17.48)	55.79 (17.68)	56.70 (18.67)	50.68 (18.40)	53.03 (18.49)	53.72 (18.63)	54.39 (19.22)	55.77 (18.45)	57.27 (16.71)	57.82 (17.75)	57.95 (19.29)	53.95 (17.59)	54.83 (17.04)	55.93 (16.63)	57.74 (17.22)								

Note. T = timepoint; observed screen time = phone screenshots of Instagram+Facebook minutes over 1 week; self-report screen time = participant-reported Instagram+Facebook minutes over 2 weeks; MFIS = Multidimensional Facebook Intensity Scale (Orosz et al., 2016); PAUM = Passive and Active Use Measure (Gerson et al., 2017) extracted factor scores; INCOM = Iowa-Netherlands Comparison Orientation Measure-Modified (Gibbons & Buunk, 1999); SCRS = Social Comparison Rating Scale (Allan & Gilbert, 1995); FOMO = Fear of Missing Out (Przybylski et al., 2013); DASS-21 = Depression Anxiety Stress Scale-21 (Lovibond & Lovibond, 1995); EDI-2 = Eating Disorders Inventory-2 (Garner, 1991).

inspection of this information suggests that, for the abstinence group, potentially concerning social media behaviors decreased most sharply from T0 to T1, and this reduction generally maintained across T2 and T3. For the tutorial group, reductions in the outcomes of social media behaviors occurred gradually across T0–T3. Any improvements in well-being seemed to occur steadily across T0–T3 for both the abstinence and the tutorial conditions. To a lesser extent than in the tutorial or abstinence groups, those in the control group

also showed some reductions in social media behaviors and improvements in well-being across T0–T3.

Social Media Behavior Outcomes

These results are presented in Table 3. Participants in the abstinence group showed a statistically significant decrease in quantity of use relative to those in both the control and the tutorial

Table 3
Effects of Condition on Social Media Behaviors and Psychological Well-Being

Variable	95% CI for <i>b</i>			95% CI for <i>d</i>			<i>p</i>
	<i>b</i>	<i>LL_b</i>	<i>UL_b</i>	<i>d</i>	<i>LL_d</i>	<i>UL_d</i>	
Tutorial versus control							
Observed screen time	−0.57	−1.19	0.05	−0.22	−0.46	0.02	.072
Self-report screen time	−0.46	−0.88	−0.04	−0.31	−0.58	−0.03	.030
MFIS	−0.08	−0.13	−0.03	−0.44	−0.70	−0.17	.001
PAUM active own page	−0.06	−0.12	0.00	−0.26	−0.51	0.01	.045
PAUM active friends	−0.07	−0.12	−0.02	−0.34	−0.59	−0.08	.010
PAUM active other	−0.05	−0.10	0.00	−0.27	−0.51	−0.03	.031
PAUM passive	−0.11	−0.17	−0.05	−0.51	−0.80	−0.22	.001
INCOM	−0.06	−0.12	−0.01	−0.31	−0.57	−0.05	.019
SCRS	0.72	−0.71	2.16	0.13	−0.13	0.38	.324
FOMO	−0.87	−1.45	−0.29	−0.33	−0.55	−0.11	.003
Loneliness	−0.04	−0.09	0.00	−0.22	−0.43	0.00	.049
DASS-21	−1.38	−3.23	0.48	−0.17	−0.40	0.06	.145
EDI-2	0.66	−0.33	1.66	0.11	−0.05	0.27	.190
Abstinence versus control							
Observed screen time	−3.04	−3.87	−2.21	−1.18	−1.51	−0.86	<.001
Self-report screen time	−1.58	−2.03	−1.13	−1.05	−1.35	−0.75	<.001
MFIS	−0.26	−0.33	−0.19	−1.34	−1.69	−0.98	<.001
PAUM active own page	−0.21	−0.27	−0.14	−0.89	−1.17	−0.61	<.001
PAUM active friends	−0.24	−0.31	−0.18	−1.21	−1.53	−0.88	<.001
PAUM active other	−0.18	−0.24	−0.13	−0.94	−1.24	−0.65	<.001
PAUM passive	−0.28	−0.36	−0.20	−1.25	−1.59	−0.91	<.001
INCOM	−0.17	−0.23	−0.10	−0.81	−1.12	−0.50	<.001
SCRS	1.00	−0.59	2.59	0.18	−0.10	0.46	.217
FOMO	−0.22	−0.87	0.43	−0.08	−0.33	0.16	.509
Loneliness	−0.03	−0.08	0.02	−0.15	−0.38	0.08	.216
DASS-21	−2.22	−4.20	−0.23	−0.27	−0.52	−0.03	.029
EDI-2	0.37	−0.67	1.41	0.06	−0.11	0.23	.485
Tutorial versus abstinence							
Observed screen time	2.47	1.62	3.31	0.96	0.63	1.29	<.001
Self-report screen time	1.12	0.65	1.59	0.74	0.43	1.05	<.001
MFIS	0.17	0.10	0.24	0.90	0.54	1.27	<.001
PAUM active own page	0.15	0.08	0.21	0.63	0.35	0.91	<.001
PAUM active friends	0.18	0.11	0.24	0.88	0.55	1.20	<.001
PAUM active other	0.13	0.07	0.19	0.67	0.38	0.97	<.001
PAUM passive	0.17	0.09	0.24	0.74	0.39	1.08	<.001
INCOM	0.10	0.04	0.16	0.50	0.19	0.80	.002
SCRS	−0.28	−1.80	1.25	−0.05	−0.32	0.22	.722
FOMO	−0.65	−1.29	−0.01	−0.25	−0.49	0.00	.047
Loneliness	−0.01	−0.06	0.04	−0.07	−0.31	0.17	.568
DASS-21	0.84	−1.05	2.73	0.10	−0.13	0.33	.383
EDI-2	0.29	−0.69	1.28	0.05	−0.11	0.21	.560

Note. To control the false discovery rate in our analysis, we employed the Benjamini–Hochberg procedure (Thissen et al., 2002) with a predetermined threshold of 0.05, for the categories of (a) demographic variables, (b) social media behaviors, and (c) psychological well-being outcomes. *p* values presented in italics are those that remained significant following the Benjamini–Hochberg correction. CI = confidence interval; *LL* = lower limit; *UL* = upper limit; observed screen time = phone screenshots of Instagram+Facebook minutes over 1 week; self-report screen time = participant-reported Instagram+Facebook minutes over 2 weeks; MFIS = Multidimensional Facebook Intensity Scale (Orosz et al., 2016); PAUM = Passive and Active Use Measure (Gerson et al., 2017) extracted factor scores; INCOM = Iowa–Netherlands Comparison Orientation Measure–Modified (Gibbons & Buunk, 1999); SCRS = Social Comparison Rating Scale (Allan & Gilbert, 1995); FOMO = Fear of Missing Out (Przybylski et al., 2013); DASS-21 = Depression Anxiety Stress Scale–21 (Lovibond & Lovibond, 1995); EDI-2 = Eating Disorders Inventory–2 (Garner, 1991).

groups. This appeared in the observed screen time measure ($d = 1.18, p < .001$ and $d = 0.96, p < .001$) and also in the self-reported screen time measure ($d = 1.05, p < .001$ and $d = 0.74, p < .001$). Participants in the tutorial condition showed a significant decrease relative to those in the control condition on the self-reported screen time measure ($d = 0.31, p = .030$); the trend was similar on the observed measure ($d = 0.22, p = .072$). Social media intensity on the MFIS also reduced in the abstinence group relative to both the control and tutorial groups ($d = 1.34, p < .001$ and $d = 0.90, p < .001$, respectively), and the tutorial group showed a significant reduction compared with control ($d = 0.44, p = .001$). Participants' active use on their own page, friends' pages, and other pages, and their passive use, showed statistically significant decreases in the abstinence condition relative to both the control ($d = 0.89\text{--}1.25, p < .001$) and tutorial conditions ($d = 0.63\text{--}0.88, p < .001$). The tutorial group also showed decreases in these same metrics compared with the control condition ($d = 0.26\text{--}0.51, p = .001$ to $.045$).

The first measure of social comparisons made on social media assessed the total amount of comparisons, regardless of the direction (INCOM). On this measure, the abstinence group reduced more than the control ($d = 0.81, p < .001$) and tutorial groups ($d = 0.50, p = .002$), and the tutorial group also reduced in total social comparisons more than the control ($d = 0.31, p = .019$). Regarding the tendency to make social comparisons in an upward versus downward direction with no indication of the amount of comparisons (SCRS), there were no changes in the abstinence ($d = 0.18, p = .217$) or tutorial groups ($d = 0.13, p = .324$), relative to the control. Nor did the abstinence and tutorial groups differ from one another ($d = 0.05, p = .722$).

Psychological Well-Being Outcomes

These results are also presented in Table 3. Participants' FOMO decreased in the tutorial condition relative to the control ($d = 0.33, p = .003$) and abstinence conditions ($b = 0.25, p = .047$), but not in the abstinence condition relative to control ($d = 0.08, p = .509$). Similarly, feelings of loneliness went down uniquely in the tutorial group relative to the control ($d = 0.22, p = .049$). There were no differences in loneliness in the abstinence group relative to control ($d = 0.17, p = .216$) or in the tutorial group relative to abstinence ($d = 0.07, p = .568$). The abstinence condition was uniquely associated with a reduction in internalizing symptoms on the DASS-21 compared with the control ($d = 0.27, p = .029$). There were no differences between tutorial and control groups ($d = 0.17, p = .145$) or between abstinence and tutorial groups ($d = 0.10, p = .383$) in this outcome. Eating pathology showed no differences between abstinence and control ($d = 0.06, p = .485$), tutorial and control ($d = 0.11, p = .190$), or abstinence and tutorial groups ($d = 0.05, p = .560$).

Robustness Check

Findings maintained when controlling for recruitment source (human subject pool vs. community), participation during the COVID-19 pandemic (yes vs. no), gender (ciswoman vs. cisman vs. other), country of origin where social media is blocked (yes vs. no), or age, when these covariates were placed in the model as predicting the slope and the intercept. All previously significant findings remained at $p < .05$ (one finding went to $p = .054$ in the presence of one covariate, but not with other covariates), and those that were nonsignificant

remained so. When the Benjamini–Hochberg procedure was applied to control for the expected proportion of false discoveries, the majority of the previously significant findings for social media behaviors remained, but only one of the previously significant findings for well-being remained (tutorial as superior to control in reducing FOMO; see Table 3).

Mediation Analyses

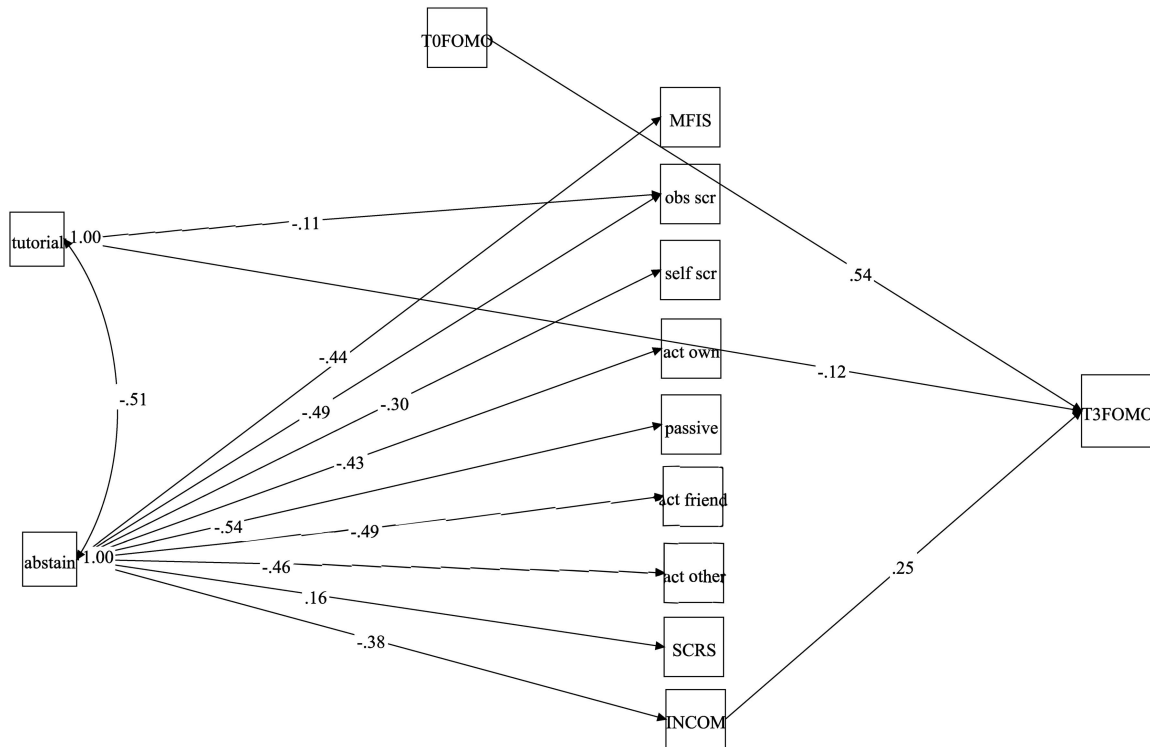
See Figures 2–5. When comparing tutorial versus control, significant total effects were found for the tutorial group demonstrating lower T3 values of FOMO ($\beta = -0.15, 95\% \text{ CI } [-0.26, -0.05]$) and loneliness ($\beta = -0.15, 95\% \text{ CI } [-0.35, -0.08]$). However, none of the included social media behaviors mediated this effect. When comparing abstinence with control, total effects were found for the abstinence group having lower loneliness ($\beta = -0.12, 95\% \text{ CI } [-0.29, -0.02]$) and internalizing symptoms ($\beta = -0.16, 95\% \text{ CI } [-0.26, -0.07]$) at T3. There was a significant indirect effect through social media behaviors for both loneliness ($\beta = -0.11, 95\% \text{ CI } [-0.19, -0.04]$) and internalizing symptoms ($\beta = -0.10, 95\% \text{ CI } [-0.19, -0.03]$). Abstinence did not have a significant total effect on FOMO, but there was a significant indirect effect through social media behaviors ($\beta = -0.16, 95\% \text{ CI } [-0.25, -0.08]$). There were no total or indirect effects for either tutorial or abstinence on eating pathology. The results for the total effects in these models are similar (but not identical) to those obtained in Primary Aim 1, and they consistently suggest the benefits of both tutorial and abstinence conditions relative to control for well-being. The mediation analyses test the main effect of the condition on the T3 outcome measure of well-being, after adjusting for T0 well-being, whereas Primary Aim 1 tested whether the condition was associated with a different linear slope of well-being across T0 through T3.

Regarding indirect effects for specific mediators, abstinence led to less loneliness via (a) lower social media intensity (MFIS; $\beta = -0.08, 95\% \text{ CI } [-0.16, -0.03]$), (b) greater tendency to make social comparisons in a downward direction (SCRS; $\beta = -0.03, 95\% \text{ CI } [-0.06, -0.01]$), and (c) less activity on other pages ($\beta = -0.13, 95\% \text{ CI } [-0.20, -0.06]$). However, abstinence also led to less activity on friends' pages, which led to more loneliness ($\beta = 0.19, 95\% \text{ CI } [0.07, 0.32]$). Abstinence led to lower internalizing symptoms through (a) greater tendency to make social comparisons in a downward direction (SCRS; $\beta = -0.03, 95\% \text{ CI } [-0.06, -0.01]$) and (b) less activity on other pages ($\beta = -0.12, 95\% \text{ CI } [-0.22, -0.04]$). Although the total effect of abstinence on FOMO was not significant, mediation analyses found that abstinence led to less FOMO via a lower total amount of social comparisons made (INCOM; $\beta = -0.10, 95\% \text{ CI } [-0.16, -0.05]$).

Feasibility and Acceptability

Participants showed high engagement overall (85.0%). In the tutorial condition, the average participant engagement rate was 84.3% across all three modules. The corresponding number for the abstinence condition was 83.1%, and it was 87.5% in the control condition. There were no significant differences based on condition, $F(2, 392) = 0.99, p = .372$. Participants also generally perceived the modules to be helpful (78.5%). The average rate of perceived helpfulness was 82.6% in the tutorial condition, 68.7% in the abstinence condition, and 83.0% in the control condition. With the

Figure 2
Mediation Analyses: Fear of Missing Out



Note. All paths are included in the model, but the figure omits T0 values of mediators and all nonsignificant paths between tutorial/abstinence, mediators, and outcomes. Coefficients reflect standardized betas. T = timepoint; MFIS = Multidimensional Facebook Intensity Scale; obs. scr. = observed screen time; self scr. = self-reported screen time; act own, act friend, passive, and act other are the Passive and Active Use Measure subscales; SCRS = Social Comparison Rating Scale; INCOM = Iowa-Netherlands Comparison Orientation Measure-Modified; FOMO = Fear of Missing Out scale.

caveat that the question about perceived helpfulness was asked differently across conditions, there was a significant group difference, $F(2, 343) = 7.33, p < .001$. Post hoc analysis (using the least significant difference test) showed that participants in the abstinence condition had a lower perceived helpfulness rate than those in the tutorial ($p < .001$) and control conditions ($p = .001$). There was no difference between the control and tutorial groups ($p = .928$).

Discussion

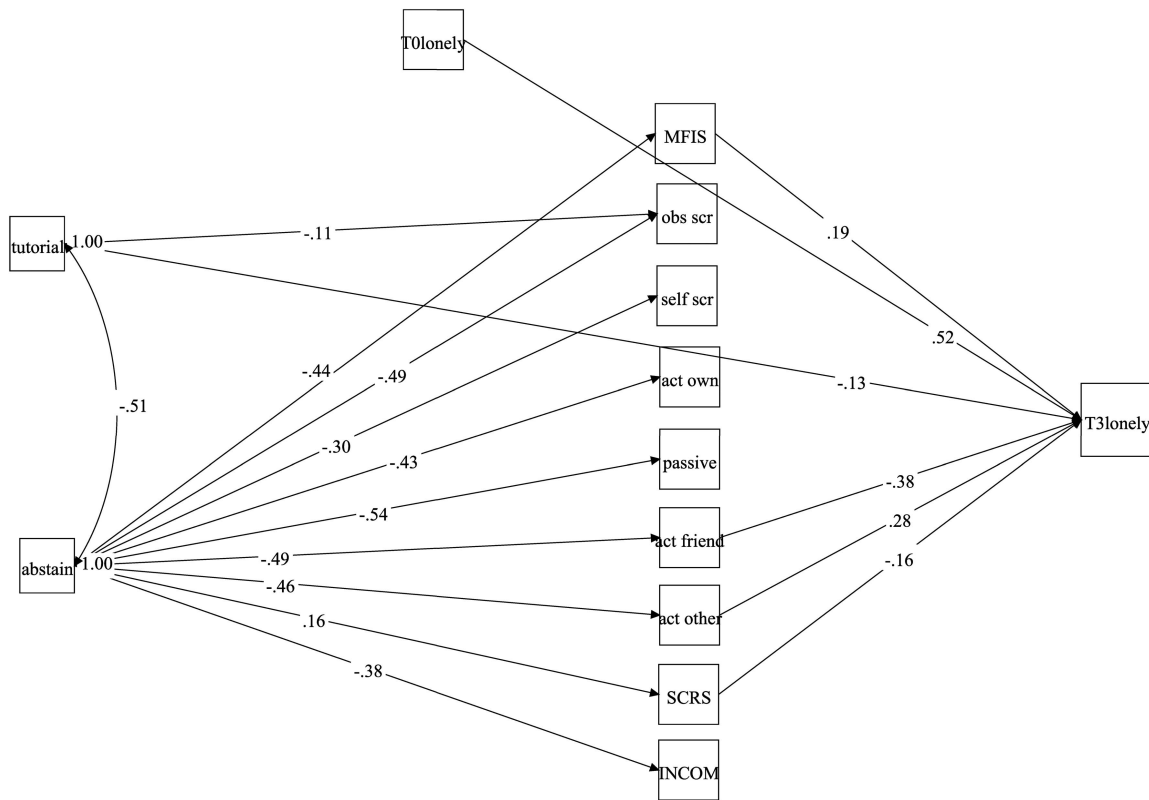
Social media use is endemic among emerging adults, which has led to questions about the implications of this phenomenon for well-being. This 6-week study compared the effects of a tutorial that aimed to change the way users engaged with social media with an abstinence condition where users were encouraged to give up social media and a control group where users were not asked to change their behavior. Both tutorial and abstinence conditions resulted in some beneficial effects relative to the control condition on problematic social media behaviors and on psychological well-being. However, there were some unique outcomes where either the tutorial condition or the abstinence condition appeared superior to the other. Our results put forward the idea that there may be various approaches to combat potential negative effects of social media on well-being and that abstinence is not the only option.

Findings for Study Condition

Consistent with the condition instructions to cut back on all social media, the quantity of social media use and social media intensity reduced most sharply in the abstinence group relative to all other groups. This was evident in measures of both active and passive use. Interestingly, the tutorial group also reduced in these measures relative to control, but not as much as did the abstinence group. This was expected given that the tutorial focused on promoting mindful, intentional use in ways that enhance social connection, and we asked participants to selectively stop the social media use that did not fit these goals. However, our specific hypothesis that tutorial and abstinence would equally cut back on passive use was not supported.

Participants in both the abstinence and tutorial conditions reduced the total amount of social comparisons they were making on social media relative to control, with abstinence being most effective (which was contrary to our hypothesis that it would be equal across abstinence and tutorial). There were no group differences in the tendency to make social comparisons in an upward versus downward direction. Previous work has emphasized upward social comparisons as damaging while neglecting downward comparisons. However, the total amount of social comparisons (regardless of direction) may be at least as important as a tendency to make social

Figure 3
Mediation Analyses: Loneliness



Note. All paths are included in the model, but the figure omits T0 values of mediators and all nonsignificant paths between tutorial/abstinence, mediators, and outcomes. Coefficients reflect standardized betas. T = timepoint; MFIS = Multidimensional Facebook Intensity Scale; obs. scr. = observed screen time; self scr. = self-reported screen time; act own, passive, act friend, and act other are the Passive and Active Use Measure subscales; SCRS = Social Comparison Rating Scale; INCOM = Iowa-Netherlands Comparison Orientation Measure–Modified.

comparisons upward (regardless of amount). Emerging adults often seek reassurance on social media (Parsons & Alden, 2022), but doing so may predict poorer self-esteem (Clerkin et al., 2013). Social comparisons may be a form of reassurance seeking that the user is okay. If the user concludes that they are better than the target (downward comparison), it may engender pressure to maintain that status or to seek further validation of their social position. If they conclude they are worse than the target (upward comparison), this may contribute to poor self-worth.

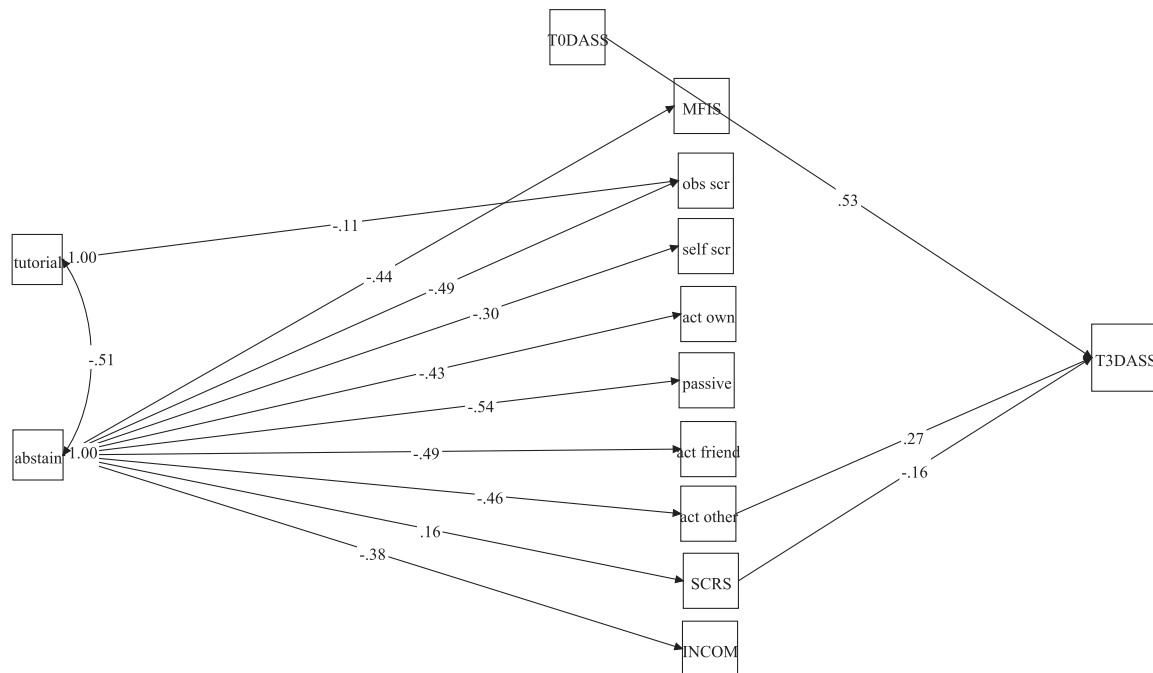
The reduction in social comparisons may happen through a different process in each condition. In the abstinence group, social comparisons might reduce strictly owing to stopping social media. In the tutorial group, we speculate that social comparisons might reduce because users became more intentional about engaging with people who bring them joy. We instructed people in the tutorial condition to unfollow or mute accounts that had the net result of making them feel bad about themselves, and we emphasized them building social connections. The result may be that, when a user sees someone with whom they have a supportive relationship sharing a success, instead of comparing themselves, the user may share in that person's happiness.

Regarding the well-being outcomes, the tutorial condition was unique in reducing both FOMO and loneliness relative to the

control group; this was not the case for abstinence. Most of our study occurred during the COVID-19 pandemic, when restrictions on in-person socializing increased the risk for FOMO and loneliness (Bonfanti et al., 2023), so it is meaningful that people in the tutorial group found ways to connect with others on social media. Based on the theory that this would maximize the benefits of social media use (Kross et al., 2021), the tutorial emphasized making genuine social connections online; in contrast, the abstinence condition cuts off online involvement and that source of potential connection. Even when COVID-19 is not an imminent threat, FOMO and loneliness may discourage people from giving up social media (Vanman et al., 2018). Abstinence was the only condition to lead to lower internalizing symptoms compared with control; this was not the case for the tutorial condition. These results are consistent with the findings that the sheer quantity of social media use (which was most reduced in the abstinence group) may foster internalizing problems (Haidt et al., in press). Whereas interacting on social media may have helped connection (and thus reduced FOMO and loneliness), there may be unique benefits in terms of reducing internalizing symptoms by stopping social media.

There were no condition differences on the outcome of eating pathology. This is despite considerable work finding that using social media, particularly Instagram, may increase thin ideal

Figure 4
Mediation Analyses: Depression Anxiety Stress Scale–21



Note. All paths are included in the model, but the figure omits T0 values of mediators and all nonsignificant paths between tutorial/abstinence, mediators, and outcomes. Coefficients reflect standardized betas. DASS = Depression Anxiety Stress Scale–21; MFIS = Multidimensional Facebook Intensity Scale; obs. scr. = observed screen time; self scr. = self-reported screen time; act own, passive, act friend, and act other are the Passive and Active Use Measure subscales; SCRS = Social Comparison Rating Scale; INCOM = Iowa-Netherlands Comparison Orientation Measure–Modified.

internalization and body dissatisfaction (de Valle et al., 2021). Efforts to disrupt the pathway between social media use and eating pathology have explicitly targeted this outcome (e.g., de Valle & Wade, 2022). Our tutorial condition never discussed body image and instead focused on building social connection, so it is not surprising that the outcomes affected by the tutorial (FOMO, loneliness, social comparisons) are most aligned with its content. Perhaps the abstinence condition did not reduce eating pathology because thin ideal internalization and body dissatisfaction are affected by cultural influences beyond social media.

Mediation analyses suggested that abstinence led to improvements in well-being, relative to control, through changes in social media behaviors. Results for individual mediators were generally as expected: Abstinence predicted less social media intensity, a lower total amount of social comparisons, greater tendency to make social comparisons in a downward direction, and less activity on other social media pages—in turn resulting in better well-being. There was also a finding that abstinence led to less activity on friends' pages, which led to more loneliness specifically. This supports the idea that active engagement on social media friends' pages (such as commenting on friends' content) may be a source of social connection that is taken away by abstinence. By contrast, activity on other pages (such as commenting on celebrities' pages) predicted more loneliness and internalizing symptoms. We also found that the tutorial condition led to well-being improvements (as evidenced by the total effects), but this was not mediated by

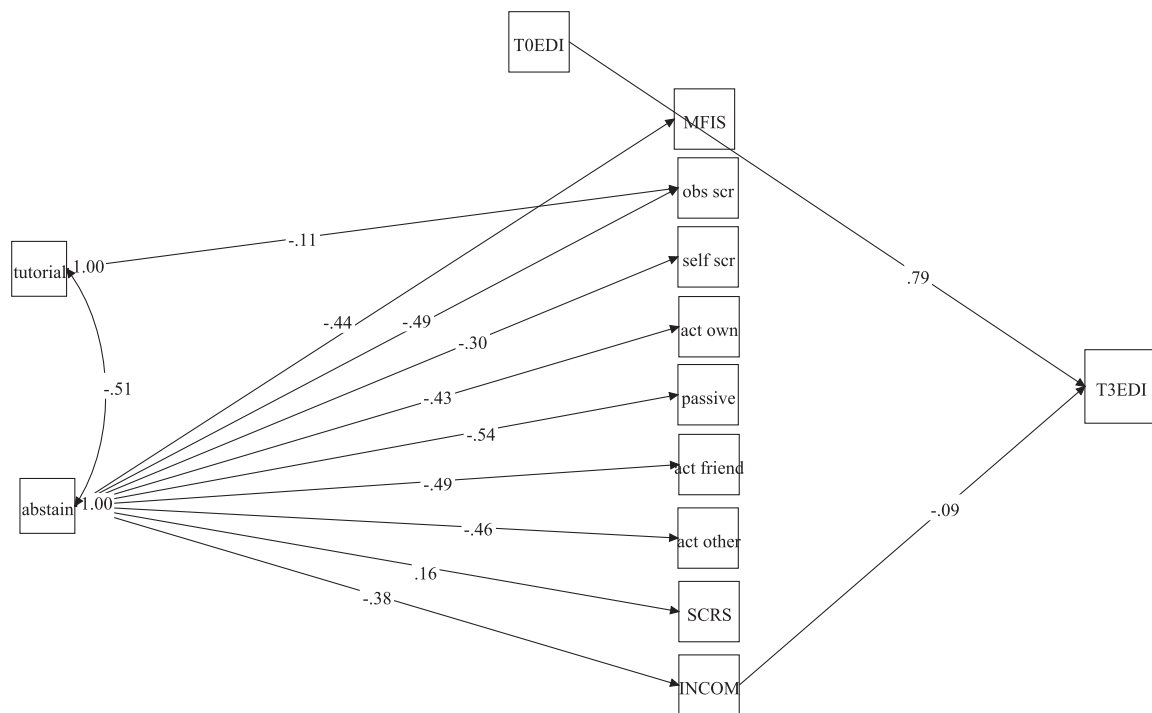
changes in the included social media behaviors. We wish we could have used the observational measure of emotionally supportive, connected interactions with social media friends in this study. Perhaps this construct would mediate the effects of tutorial on better well-being.

Implications

The high practicality of the tutorial and abstinence conditions needs to be considered alongside their potential benefits for well-being. Each condition consists of three, 15-min, online modules that can be done anywhere, at any convenient time. There are few or no monetary costs, or costs in terms of a clinician's time, associated with distributing the modules. All these factors may facilitate reach. Keeping in mind that the present study findings were obtained in emerging adults who self-reported elevated psychopathology and some dissatisfaction with how social media affects their life, the tutorial or abstinence modules could easily be made accessible to people with similar inclusion characteristics who are incoming university students or who live in rural or less developed areas.

Engagement was high in both tutorial (84.3%) and abstinence (83.1%), suggesting that it is feasible for users to do the modules. Participants reported the modules to be helpful overall. However, although the questions about helpfulness were asked differently across conditions, on average, people found the abstinence condition

Figure 5
Mediation Analyses: Eating Disorders Inventory–2



Note. All paths are included in the model, but the figure omits T0 values of mediators and all nonsignificant paths between tutorial/abstinence, mediators, and outcomes. Coefficients reflect standardized betas. T = timepoint; EDI = Eating Disorders Inventory; MFIS = Multidimensional Facebook Intensity Scale; obs. scr. = observed screen time; self scr. = self-reported screen time; act own, passive, act friend, and act other are the Passive and Active Use Measure subscales; SCRS = Social Comparison Rating Scale; INCOM = Iowa-Netherlands Comparison Orientation Measure–Modified.

(68.7%) to be less helpful than the tutorial (82.6%) and even the control condition (83.0%). This is similar to other findings in the literature (Lyngs et al., 2020; Vanman et al., 2018) and may suggest limitations of abstinence-based approaches in the real world. Nonetheless, in our study, those in the abstinence condition were generally able to maintain reductions in the quantity of social media use over 6 weeks. Maintenance may have been aided by the tips and testimonials that we gave them, in 2-week intervals. Clinicians who are trying to support people in reducing their quantity of social media use might consider incorporating some of the techniques in our abstinence condition.

Study Strengths and Limitations

Study strengths include the recruitment of both university students from a human subject pool and community participants, as this may allay some concerns about the human subject pool sample being unrepresentative. Notably, we did not find differences in our results based on recruitment source. We also included an observational measure of screen time and attempted to observe interactions on participants' social media pages (even though there was insufficient variability in the latter to include it). Finally, the study involved four timepoints over 6 weeks. Although 6 weeks is short overall, it is longer than almost all other experimental work that has manipulated social media use and assessed the effects on well-being.

One study limitation is that our outcomes included predominantly negative indicators of well-being, but not positive ones; nor did we measure global life satisfaction. We chose this focus because social media use may be more associated with the negative aspects of well-being than the positive ones (Huang, 2017) and based on the reasoning that social media use is only one small factor impacting global life satisfaction. Second, participants' views on the helpfulness of the modules were measured inconsistently, making it difficult to compare this metric across the three conditions. Third, it was unfortunate that our observed measure of interactions on participants' social media pages was unable to be used. We had intended this to be an indicator of social connectedness, which is an important outcome and mediator for the tutorial condition. Fourth, although attrition analyses generally revealed no group differences on outcomes, there were demographic differences between participants who completed all timepoints versus those who did not. Finally, we did not account for either the time of day that participants completed the questionnaires or the severity of COVID-19-related restrictions that they experienced during the study. These factors would be advantageous to consider in future research.

Constraints on Generality

The sample was screened for reporting elevations in psychopathology and at least some dissatisfaction with how social media

affects their life, so results may not extend to other users. However, surveys show that 59% of adolescents view social media as having both positive and negative effects on their lives, relative to 32% who see it as mainly positive and 9% who see it as mainly negative (Pew Research Center, 2023b). Moreover, fluctuations over time in psychopathology and perceptions of negative impact of social media are to be expected, meaning that more people may meet study inclusion criteria at some point in their emerging adulthood. Another constraint is that most participants were cisgender women, although this demographic group more often uses social media (Pew Research Center, 2024). Finally, extending recruitment to more rural or less developed areas could enrich the generalizability and applicability of the findings.

Future Directions

Longer term follow-up data are needed. One possibility is that all condition effects diminish over time. The washout of effects could be most pronounced for the abstinence group because maintaining the benefits on well-being might require abstaining from social media forever. Vanman et al. (2018) postulated that this is unrealistic because even as internalizing distress decreases during social media abstinence, FOMO and desire for online social connection increase, which drives the person back to social media. A study found that, across three online auctions where the payment and terms were real and not hypothetical, the average Facebook user required more than \$1,000 to deactivate their account for a year (Corrigan et al., 2018). Haidt et al. (in press) emphasize that because social media use is endemic, adolescents and emerging adults who choose to not partake are, in fact, being left out of a community.

Another future direction is to extend the study to the adolescent developmental period, which is the time when social media use often begins (Pew Research Center, 2023b). Early to midadolescence (in addition to age 19) may be a stage where individuals are more sensitive to the negative effects of social media (Orben et al., 2022). Several of our participants remarked that the tutorial would have been helpful when they were in secondary school, which in Canada, begins around age 13. They reported experiencing stronger FOMO then, relative to what they do in emerging adulthood, which they attributed to their classmates being their entire social world. Some also mentioned having more difficulty in secondary school in controlling their social media use, so it did not interfere with other responsibilities, which they attributed to immaturity.

Conclusions

This 6-week experimental study found some benefits of abstaining from social media, as well as engaging with social media in a way that emphasizes social connection, for emerging adults at risk for psychopathology and who perceive some negatives to how social media affects their lives. Benefits were found in terms of reducing problematic social media behaviors and improving psychological well-being. To date, efforts have focused on reducing the quantity of social media use to improve well-being. This study offers an alternative, involving using social media differently, that may potentially be more palatable to some users than abstinence.

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