An Overview of Social Media Experiments on Anxiety, Depression, and Well-Being

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Introduction

At the heart of the academic debate about social media is the question of causality. There is little dispute that social media use is *correlated* with depression and anxiety, especially for girls and especially for heavy users (see section 1 of our Review document, and see propositions 3 and 4 in this post to understand the remaining debate over the size of the correlations). What is disputed is the degree to which heavy social media use *causes* declines in mental health or is simply *correlated* with such declines due to other factors or reverse causality. Experiments using random assignment of participants to conditions are usually taken to be the most reliable form of evidence when addressing the question of causation.

There are now dozens of published experiments that have used random assignment to address a variety of questions related to social media's psychological effects. The largest subset of these studies are "Social Media Reduction Studies." These studies assign an experimental group to reduce or eliminate social media use for a period of time and compare the results in that group to the results in a control group that was told not to make any changes. There are many possible ways of structuring such studies, some of which would provide a strong test of our hypothesis (that heavy use of social media *causes* mental health problems). At the strong end, a study would last for a long enough time for participants to overcome addiction and withdrawal effects (which are thought to affect at least 10% of adolescent users). A month or longer would be adequate for giving the dopamine/reward circuits in the brain time to reset to a healthy

baseline.[1] Conversely, a study that deprives those with a dependency of their chosen substance for a day, or a few days, can be expected to produce negative effects in heavy users (we cannot make a prediction for light and moderate users).

Another important design question: Are participants asked to reduce their social media use *by themselves*, such that they'll be partially cut off from their friends, who all stay on social media for the duration of the experiment? Being alone would surely attenuate the benefits of reducing social media. Conversely, in a better design, groups of friends, or an entire school or school grade, would be randomly assigned to reduce or quit social media together. Because social media is socially addictive and puts teens into a collective action trap (where there are social costs to anyone who quits), this design would capture emergent group-level effects, which are rarely discussed in the experimental research literature but may have substantial real-world importance.

Unfortunately, no social media reduction study that we know of has done that: asked a group or school to go off social media for at least a month. We can find studies that test group-level effects when we look at schools that go phone-free. Does mental health improve when there is a severe reduction in social media and phone use during the school day, even if nothing is done to curb such use outside of school? Unfortunately, most of these studies focus on educational outcomes and only a few studies have looked at the mental health impact of schools going phone-free. Also, most studies of phone-free schools use very broad definitions of "phone bans," including the most common and ineffective policy: students are merely prohibited from taking their phones out during class, but are free to use them between classes (or during class if they can hide them well). You can view these studies in Section 5 of our open-source Google Doc, "The Effects of Phone-Free Schools." While many schools are now going phone-free, it has never happened (despite Jon's call for such a study in our SMMH Review and in Ch. 11 of The Anxious Generation) that a state or school district randomly assigned some schools to go phone-free while others continued on with business as usual. We can certainly use a within-subjects design to look at how mental health and other variables changed from before the intervention until after, but none of these studies offer us a control group of schools that were randomly assigned to be the control group.

Our point here is that there are many ways that experiments can be done to test for causality, and some of them (using short durations or asking individuals to act on their

[1] See Anxious Generation, p. 134. "If dopamine release is pleasurable, dopamine deficit is unpleasant. Ordinary life becomes boring and even painful without the drug. Nothing feels good anymore, except the drug. The addicted person is in a state of withdrawal, which will go away only if she can stay off the drug long enough for her brain to return to its default state (usually a few weeks)."

own) may weaken, hide, or even reverse the long-term benefits of reducing or quitting social media. We therefore divide up the studies below into sub-groups, especially with regard to duration, so that we can see how the apparent causal effects vary by kind of study.

A few additional notes to consider (beyond withdrawal and collective action effects):

1. Many studies do not break results down by sex. There is growing evidence that girls are at higher risk of harm from social media use compared to boys.
2. Many studies do not study the key age demographic of interest: Adolescents (aged 10-19). There is growing evidence that social media use is most harmful among young adolescents.
3. Some studies use poor measures of social media use. For example, some look at "access to the internet," "If you have used the internet in the last 7 days", whether you use social media every day, or "screen time." All of these measures miss the key question: what happens when teens move from spending almost no time on social media platforms (e.g., Instagram and TikTok) to spending an average of five hours a day on these platforms?
4. There is a wide variety of dependent variables that often get conflated. Some measure temporary mood (e.g., did you feel sad yesterday?), some measure life satisfaction, and some measure internalizing disorders (e.g., anxiety, depression). We are most interested in changes to internalizing disorders, not temporary mood. If anything, social media may—in the short term—improve temporary mood, as cocaine does for drug users.[2]
5. Most studies are reduction studies, not reduction *and* replacement studies. Our theory claims benefits will be most impactful when smartphones and social media are reduced and real-world play, independence, and responsibility increase.
6. Even the best reduction studies cannot capture the variety of harms that may emerge on these platforms. For example, although you may have reduced your personal use of social media by 80%, teens may still be publicly shamed or bullied online, they may still be sent a flood of sexual solicitations, they may be exposed to self-harm or suicide content, etc.

[2] From p. 25 of Anxious Generation: "We found important clues to this mystery by digging into more data on adolescent mental health.[5] The first clue is that the rise is concentrated in disorders related to anxiety and depression, which are classed together in the psychiatric category known as internalizing disorders. These are disorders in which a person feels strong distress and experiences the symptoms inwardly. The person with an internalizing disorder feels emotions such as anxiety, fear, sadness, and hopelessness. They ruminate. They often withdraw from social engagement."

In what follows, we organize, categorize, and comment on all the experiments we can find that bear on the question of causality. We organize the document by the three major kinds of experiments: 1) Reduction studies, 2) Lab studies, and 3) Quasi-experiments. As you look through the studies, keep these introductory notes in mind.

Before we get to the long list of studies, abstracts, and comments—which will be included in a separate document—we begin with a top-level summary of our findings for the studies in each of the 3 categories.

One last point: The primary goal of this document has been to simply provide an Overview of the evidence in Section 3 of **social media and mental health open source Google Doc.** This is not a systematic review of the experimental evidence, nor a formal meta-analysis. This is a broad overview of all the relevant studies that we have been able to find (we will continuously update this document). We hope it can serve as an independent, brief preview of the current state of experimental evidence.

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Overview (Brief Summaries)

In this section, we examine experimental studies relevant to the impact of social media use on youth's mental health.

- First, we look at studies that directly measure the **impact of reducing SM use on symptoms of depression** or **anxiety.**
- Next, we look at impacts of SM reduction on **momentary mood** such as positive and negative affect – these findings may help us understand psychological dependence on social media and possible withdrawal symptoms.
- Finally, we look at lab studies that **expose participants to some aspect of SM use** for a short time.

Results from experimental outcomes with only a few studies available – such as sleep – will be discussed in the upcoming Full Summaries document. We may also discuss topics of additional interest – such as smartphone abstinence or academic performance outcomes – in Full Summaries.

Social Media Reduction Impacts on Depression and Anxiety

Experiments that reduce or eliminate social media use (the independent variable) while measuring depression or anxiety risk (the dependent variables) are the most common way that researchers have addressed causality questions regarding the influence of SM on the mental health of adolescents and young adults.

We currently (as of August 12, 2024) have found 17 such published studies, 16 of which measured depression and 10 of which measured anxiety (some measure both).[3]

Statistically Significant Results

Let us first see if studies reported finding **statistically significant evidence** that SM use reduction is either beneficial or detrimental to depression or anxiety risk.

It is important to keep in mind that many of the experiments had **small or very small sample sizes** (number of participants), so lack of statistically significant evidence does **not** mean there were no substantial effects. We report statistically insignificant evidence as inconclusive.

[3] Some of the information within this chapter is tentative or incomplete because texts of the published studies are not always crystal clear and because they do not always include all the relevant data; we are working toward obtaining clarifications and missing data from the authors. Please note also that this is a 'living' document – subject to change as we obtain more information.

Table 1: Social Media Reduction Evidence[4]

Duration	Citation	Method	Sample	T_n	C_n	Depression	Anxiety
1w	Lambert 2022	SM abstinence	young adults	74	66	**Beneficial**	**Beneficial**
1w	Mahalingham 2022	SM abstinence	college students	44	49	-	inconclusive
1w	Mosquera 2019	FB abstinence	college students	*69*	*81*	**Beneficial**	-
1w	Tromholt 2016	FB abstinence	mature adults	516	372	**Beneficial**	-
1w	Schwarz 2022	IG abstinence	young adults	79	106	inconclusive	-
2w	Brailovskaia 2020	FB limit 20 min	young adults	140	146	**Beneficial**	-
2w	Brailovskaia 2022	SM limit 30 min	young adults	162	160	**Beneficial**	-
2w	Faulhaber 2023	SM limit 30 min	students	99	131	**Beneficial**	**Beneficial**
2w	Hesselle 2024	SM abstinence	young adults	51	35	inconclusive	-
3w	Wolgast 2023	SM limit 30 min	students	59	58	**Beneficial**	inconclusive
3w	Hunt 2018	SM limit 30 min	students	*66*	*47*	**Beneficial**	inconclusive
3w	Hunt 2021	SM limit 30 min	students	*30*	*30*	inconclusive	inconclusive
3w	Hunt 2023	SM limit 60 min	students	36	58	inconclusive	-
3w	Davis 2024	SM limit 60 min	distressed 17-25 yo	117	103	**Beneficial**	**Beneficial**
3w	Thai 2021	SM limit 60 min	distressed students	16	22	inconclusive	**Beneficial**
4w	Allcott 2020	FB deactivation	mature adults	573	1064	**Beneficial**	**Beneficial**
12w	Reed 2023	SM minus 15 min	students	17	16	**Beneficial**	inconclusive

Notation: *students* means college students, *young adults* means median age < 30, and *mature adults* means median age = 30+. Columns $\mathbf{T_n}$ and $\mathbf{C_n}$ show the number of participants who completed treatment and control conditions (numbers in italics are *estimates*).

As we can see, out of 26 reported findings, the great majority (62%) reveal **statistically significant evidence** of beneficial impact on depression or anxiety (MH) while 10 (38%) reveal insufficient evidence and **none (0%)** reveal statistically significant evidence of detrimental impacts.

[4] In Schwartz 2022 there was a statistically significant benefit of abstinence compared to control based on the Instagram non-users group but not when based on the Instagram users group. In Hesselle 2024, the outcome was PHQ-4, which is actually a combined indicator of depression *and* anxiety.

If SM use reductions have no impact on MH, one would expect statistically significant results to be *rare* in unbiased experiments – instead, nearly **two thirds** of the results are significant. More importantly, one would expect roughly equal numbers of beneficial and detrimental results – and yet we have a ratio of 16 to 0 in favor of beneficial results.

The odds of obtaining such a string of statistically significant results – 16 : 0 within 26 studies – purely by chance are minuscule.

Tests of statistical significance (as well as determination of effect size) vary across studies and depend on the '*power*' of experiments (essentially the sample size) to detect effects. We plan to eventually obtain consistent effect sizes across all studies, but in the meantime we'll report some types of results for which we already have sufficient data in most studies.

Treatment Group Results

Even in experiments that produced statistically insignificant evidence, we can still ask:

Did depression (anxiety) increase or decrease after SM use reduction?[5]

We were able to determine the answers to this question in nearly all outcomes[6] and the answer was YES each time.

Combining this with the statistically significant results, we can reasonably[7] conclude:

Out of the 23 outcomes with sufficient information, the MH outcome declined each and every time after SM use reduction.

[5] Note that this question does not consider changes in the control group – it's simply asking about developments in the SM reduction group.

[6] In Hunt 2021 & 2023, *tentative* depression results (deduced from info on the distressed and non-distressed split of the participants within each group) also suggest beneficial results – we will update when we obtain sufficient data. In Hesselle 2024, the result is based on data provided by lead author Lea de Hesselle (and it is for PHQ-4, which is a combined depression/anxiety indicator).

[7] Not all authors state explicitly that depression/anxiety actually declined when they report a statistically significant result in favor of SM use reduction; we *presume* this implies actual decline within Treatment as it would be highly irregular for authors to fail to mention the remarkable situation where depression risk increased in Treatment but increased so much more in Control as to produce a statistically significant result.

Comparative Results

Even in experiments that produced statistically insignificant evidence, we can also ask:

Does the comparison of changes in Treatment and Control indicate beneficial or detrimental impacts of SM use reduction?

We were able to determine the answer in nearly all cases by either considering test results supplied by the authors or by directly comparing the absolute pre-post changes within Treatment and Control groups (when MH group means were supplied) – and with one exception (Hunt 2018) the answer was beneficial.[8]

Out of the 23 outcomes with sufficient information, Treatment (SM use reduction) was more beneficial than Control in all but one result.

Hypothesis Support

The results from 17 experiments measuring 26 MH outcomes are **overwhelmingly in support** of the hypothesis that **SM reductions improve mental health**, at least among **young adults**.[9]

SM Reduction MH Hypothesis: Substantial sustained reduction of SM use reduces depression and anxiety risks in young people.

Note that if we presume that there are no SM impacts on MH and that the experimental results are the product of pure chance, we would expect to have a roughly similar number of positive and negative results. The actual results are therefore **extremely unlikely to be the product of pure chance:** for example, had one flipped a fair coin 23 times, the chances of getting at least 22 heads would be **1 in 364,722** while the chances of obtaining the same side 23 times in a row would be **1 in over 8 million**.

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[8] In Hesselle 2024, the result is based on info provided by author Lea de Hesselle. In Mahalingham 2022, anxiety declined in both Treatment and Control – the absolute (but not the relative) decline was greater in Treatment.

[9] Only two of the studies (Tromholt 2016 and Allcott 2020) targeted mature adults, and none of the experiments focused on adolescents below college age.

The *level of persuasion* provided by the evidence from these experiments depends on how their methodologies[10] are evaluated while the *practical significance* of these results depends on how the effect sizes in these experiments are evaluated (see the upcoming **Full Summary** for discussions of these issues). There seems no doubt, however, that when considered on their own, the overall results provide overwhelming support for SM use reductions having beneficial impacts on MH. The results also indicate that current levels of SM use[11] among young people are probably **harmful** to their mental health.

It is especially remarkable that all the 17 SM reduction experiments resulted in declines of depression or anxiety risks after SM use reduction *despite* a wide variety of SM time limits, scope of SM included, methods to implement and monitor SM use reductions, types of sample population, and tools to measure depression and anxiety. It is also remarkable how many studies produced results – such as the 11 out of 16 results for depression – that were statistically significant, despite the mostly small – and sometimes extremely small – sample sizes.

Distressed Youth

Some of the studies also reported results specifically for distressed young adults within a larger sample, as determined by baseline scores, while other studies recruited distressed young adults as the sample population. We present the results for distressed young adults in Table 2 below.

Table 2: SM Reduction Impacts on MH of Distressed Youth[12]

Duration	Study	Method	T_n	C_n	Depression	Anxiety
3w	Thai 2021	SM limit 60 min	16	22	beneficial	**Beneficial**
3w	Hunt 2018D	SM limit 30 min	16	15	**Beneficial**	**?**
3w	Hunt 2021D	SM limit 30 min	8	9	**Beneficial**	-
3w	Hunt 2023D	SM limit 60 min	16	19	**Beneficial**	-

[10] Concerns such as demand characteristics and placebo effects are beyond the scope of this brief Overview and will be discussed in the Full Summary.

[11] The experimental results are not sufficient to answer the question what *degree* of SM use is harmful to MH; they do, however, suggest that *current* levels are harmful, at least within North America and much of Europe.

[12] Statistically significant results are in **bold**.

3w	**Davis 2024**	SM limit 60 min	117	103	**Beneficial**	**Beneficial**

Note: Hunt 2018D is Hunt 2018 restricted to distressed young adults, similarly for Hunt 2021D & 2023D.

Note: In the Hunt studies, some of the data was provided by author Melissa Hunt. Distressed in all the Hunt studies are defined as those with BDI = 14 or above.

As can be seen**,** most of the studies have very small, even extremely small sample sizes (although the results of the three Hunt studies could be reasonably combined, given the similarity of experimental interventions and methodologies), which greatly limits their relevance, despite the fact that **all but one of the depression and anxiety impacts were statistically significant**.

We can therefore only note that while the results do **suggest that SM reduction may be especially beneficial for distressed young adults,** much more evidence is needed.

Indeed one of our projects is to examine impacts on 'distressed' in all the studies for which we will obtain full data.

Social Media Reduction Impacts on Mood

Measures of mood and similar outcomes like momentary happiness or day satisfaction can help us detect *withdrawal symptoms* and their likely duration in SM reduction experiments.

As of June 7, 2024, there are 3 SM reduction studies (with a total of 6 experiments) that lasted less than a week and so are relevant to the **Psychological Dependency Hypothesis** discussed below.

Two of these studies involve **one-day** SM reduction (Mitev 2021) or abstinence (**Przybylski 2021**) among students while one study imposed FB abstinence for **5 days** (**Vanman 2018**) on young adults..

Psychological Dependency Hypothesis

Psychological Dependency Hypothesis: Many young people--particularly heavy users--have become psychologically dependent on social media use. For these dependent users, a sudden and short period of deprivation may cause *temporary* withdrawal symptoms. We expect that withdrawal symptoms would abate within a week or two, if the experiment had gone on for longer.

Withdrawal symptoms would be indicated mainly by declines in *mood* and *momentary satisfaction or happiness*, so let us first examine the impacts on these aspects of well-being in the three studies where SM reduction lasted less than a week. Statistically significant changes are in **bold**.

We plan to obtain consistent effect sizes across all studies for mood results, but in the meantime we report descriptive results.

List of Results by Duration

Table 3: Mood impacts, brief duration:

Duration	Study	Result
1d	Przybylski 2021 **UK**	**substantially impaired day satisfaction**
1d	Przybylski 2021 **US**	**substantially impaired mood and day satisfaction**
1d	Przybylski 2021 **HK**	**substantially impaired mood and day satisfaction**
1d	Mitev 2021 **UK&Bul**	a slight decline in mood+self-esteem+day satisfaction
5d	Vanman 2018	no mood impact

> **Note**: Mitev does not report results per country nor per each well-being component. The effects in the Przybylski experiments ceased to be statistically significant in "*ANOVA models holding variability in participant age and gender constant*". Vanman 2018 also reported a s.s. decline in Life Satisfaction.

Vanman 2018 states that when participants were asked about how they felt about their assignment, the participants assigned to the FB Abstinence group used significantly more negative words ($p = .002$, $d = 0.58$), indicating a substantial number of them were unhappy.

Do impacts on mood remain negative in longer interventions?

Table 4: Mood Impacts: One week or longer

Duration	Study	Result
1w	Vally 2019	**impaired mood**

1w	**Wezel 2021** *	no substantial impacts on mood
1w	**Hanley 2019**	no substantial impacts on mood
1w	**Mosquera 2019**	no substantial change in happiness
1w	**Fioravanti 2019**	**improved mood in women**, no change in men
1w	**Brown 2020**	**improved mood**
1w	**Tromholt 2016**	**improved mood and day satisfaction**
1w	**Lambert 2022**	**improved mood**
1w	**Graham 2021**	**improved mood**
2w	**Brailovskaia 2022**	**improved happiness**
2w	**Faulhaber 2023**	**improved mood**
1-4w	**Hall 2019**	no impacts on mood
4w	**Allcott 2020**	**improved happiness**
7w	**Collis 2022** *	no impact/slight improvement of mood *

Note: In Faulhaber 2023, Graham 2021, Brown 2020, and Collis 2022 the outcomes are per WEMWBS. In Tromholt 2016, the outcome is per 4 PANAS items.

Note: In Collis the time spent on smartphones actually **increased** as students substituted WhatsApp (not counted as SM by Collis) for Snapchat (SM per Collis) and so on. Only Android users had SW installed to verify SM time limits, and in these users mood improvement was close to s.s.

Note: In Wezel 2021, the control group substantially decreased SM time (38% vs 59% experimental group) and decreased their overall digital screen time slightly more than the experimental group.

In Hanley 2019 (1 week abstinence from SM), the more **active** users reported substantial decline in positive affect; the authors speculate this may have been due to "*propensity to **SNS addiction** among **highly active** users*".

In Turel 2018 and Mitev 2021, 1 week (5 days) SM (FB) abstinence reduced stress, while in Wolgast 2023, 3 week SM reduction reduced stress.

[ToDo: add note on divergent 'satisfaction' measures]

Hypothesis Support

The results indicate that SM reductions lasting *less than a week* tend to impair mood and satisfaction while reductions lasting *at least a week* tend to either improve these outcomes or have no effect on them.

The overall evidence therefore **supports** the **Psychological Dependency Hypothesis** but the number of studies is currently very small at the shorter duration. [Furthermore, not all the longer-lasting experiments measuring mood have been included yet in the list.]

Note: evidence of withdrawal effects is also provided by Vaghefi 2021, a quasi-experimental study where over 500 college students tried to abstain from Facebook for up to a week; the results showed that higher SM use correlated with higher mood impairment during abstinence.

See the upcoming Full Summary for details as well as discussion.

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Lab Experiments

Lab studies are experiments without *natural* control conditions – there is no 'behave as usual' in these artificial circumstances. Social media lab experiments often expose participants to some type of SM use for a short time and detect momentary impacts on aspects of cognition or emotion related to well-being, such as mood or body image. Other lab experiments expose participants to a specific type of imagery found on SM; and yet another type of a lab experiment requires participants to perform a particular activity related to SM, such as posting a selfie or editing their own FB page.

Note: Yellow highlight indicates ambiguous or mixed or neutral results.

Lab Experiments: Social Media Use Exposure

Table 5: SM use impact on WB:

Duration	Study	Intervention	Effect
5 min	Ozimek 2019 S1	FB comparative use	**impaired self-esteem** (young adults)
7 min	Engeln 2020	Instagram use	**impaired mood and body image** (young women)

		FB use	slightly impaired body image
20 min	Sagioglou 2014 S2	Active FB use	**impaired mood** (middle-aged adults)
20 min	Tartaglia 2022	Passive FB use	impaired mood (young adults)
20 min	Yuen 2019	Passive + active FB use	**impaired mood** (young adults)
30 min	Lepp 2022	SM use	**impaired mood** (young adults)

Note: significant results are in **bold**.

Lab Experiments: Instagram Imagery Exposure

Table 6: Instagram imagery impacts on well being:

Study	Intervention	Effect	Pop.
Kleemans 2018	Manipulated Instagram photos	**impaired body image**	Teen girls
Lowe-Calverley 2021	Idealized Instagram photos	**impaired mood and body image**	Adult women
Sherlock 2019	Instagram beauty+fitness images	**impaired body image**	Young women
Pritchard 2024	Idealized Instagram photos	**impaired body image in women,** less so in men	Young adults

Note: significant results are in **bold**.

Hypotheses Support

Each of the above studies is relevant to one or both of the following hypotheses about **adolescents and young adults**:

1. **SM Mood Hypothesis:** Typical SM use impairs mood.
2. **Instagram Image Hypothesis:** Instagram imagery can impair body image.

All 10 experiments support one or both of the above hypotheses: 7 support the **SM Mood Hypothesis** while 5 support the **Instagram Image Hypothesis. No lab results directly contradicted either of the above hypotheses**.

> Note: The Sagioglou 2014 S2 experiment targeted middle-aged adults.
>
> Note: One study (Engeln 2020), however, was *inconclusive* regarding FB's effect on mood after only 7 min exposure.

The *degree* of evidence provided by these studies depends on the evaluation of their methodologies. [See the upcoming **Full Summary** for discussions of evidence.]

Social Media Activity Lab Experiments

A few experimental studies focused on a specific social media *activity* rather than general use of SM.

Key Results

Study	Intervention	Effect	Pop.
Gentile 2012 S1	Editing own Myspace page	**Increased narcissism**	College students
Gentile 2012 S2	Editing own Facebook page	**Increased self-esteem,** increased narcissism	College students
Hogue 2018	Engaging with attractive peer on SM	**Impaired body image**	Female students
Mills 2018	Posting selfies	**Impaired mood and body image**	Female students

Note: significant results are in **bold**.

These experiments indicate potential harm (body image dissatisfaction) or paths to psychological dependency (narcissism and self-esteem) of certain SM activities – or perhaps a genuine benefit (in the case of self-esteem).