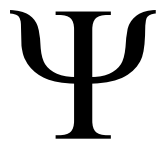




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The Effects of Restricting Social Media Use on Subjective Well-Being – A Systematic Review

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Richard Eriksen

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Supervisor: Associate Professor Eilin Kristine Erevik, Department of Psychosocial Science

Co-supervisor: Professor Ståle Pallesen, Department of Psychosocial Science

Abstract

During the last decade, social media usage has increased dramatically, cultivating a significant change in the way people communicate, socialize, and consume information. In turn, this shift in cultural and behavioral change has given rise to concerns about the potential impact on mental health and well-being. The findings from a range of correlational studies suggest an association between increased social media usage and reduced subjective well-being, although the causality of this relationship is not fully understood. Recent studies have attempted to clarify the causality of this association by employing experimental restrictions on social media or smartphone use. The current review summarizes findings from these experiments, highlighting the effects of abstinence and moderation on subjective well-being and the interaction of proposed mediating and moderating factors such as social connection, withdrawal, gender, and baseline use of social media. The review was conducted in accordance with the PRISMA guidelines; the primary search was performed during October 2020 using the APA PsycInfo, Embase, Medline (Ovid), and Web of Science databases, identifying a total of 19 experimental studies that met the inclusion criteria. Overall, the review found that the majority of studies observed beneficial effects of restricted social media use on measures of subjective well-being—notably, these benefits were most pronounced through an approach of moderated use rather than complete abstinence. Restrictions seem to have stronger effects for heavy social media users than for light or casual users. The results are discussed in terms of limitations and implications for further research.

Sammendrag

I løpet av det siste tiåret har bruken av sosiale medier økt dramatisk, noe som har bidratt til omfattende endringer i måten mennesker kommuniserer, sosialiserer og tilegner seg informasjon. Denne kulturelle og atferdsmessige endringen har gitt grobunn for bekymringer omkring eventuelle negative effekter med hensyn til mental helse og velvære. Funnene fra en rekke korrelasjonsstudier antyder en sammenheng mellom økende bruk av sosiale medier og redusert opplevd velvære, men årsaksvirkningene er ikke tilstrekkelig kjent. Det har vært gjennomført en rekke studier de siste årene der man har forsøkt å avdekke kausale effekter knyttet til nevnte sammenheng ved å anvende eksperimentell restriksjon av sosiale medier og smarttelefonbruk. Denne litteraturgjennomgangen oppsummerer funnene fra disse eksperimentene, med fokus på effektene av avhold og moderasjon av bruk på opplevd velvære, og på mulige medierende og modererende faktorer i dette forholdet, slik som sosial tilhørighet, abstinenser, kjønn og individuelle forskjeller i omfang av bruk av sosiale medier i forkant av studiene. Litteraturgjennomgangen ble gjennomført i henhold til PRISMA-retningslinjene. Litteratursøket, som ble gjennomført i oktober 2020 i følgende databaser: APA PsycInfo, Embase, Medline (Ovid) og Web of Science, identifiserte 19 eksperimentelle studier som tilfredsstilte inklusjonskriteriene. Litteraturgjennomgangen viste at majoriteten av de inkluderte studiene fant fordelaktige effekter av restriksjoner på bruk av sosiale medier på opplevd velvære. Disse fordelene var mest uttalte i studier der deltakerne begrenset bruken, heller enn å avstå fullstendig fra sosiale medier. Deltakere som i utgangspunktet hadde omfattende bruk av sosiale medier opplevde større effekt enn de med moderat og begrenset bruk. Resultatene er diskutert med hensyn til deres begrensninger og implikasjoner for videre forskning.

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Introduction

The last fifteen years has been a period of momentous change regarding the way people relate to communications technology and, subsequently, to each other. With the release of the first generation of iPhones in 2007 and the concurrent rise of Facebook as the first major social networking site, a symbiosis between smartphones and social media platforms naturally evolved, resulting in what might be considered a significant cultural and technological turning point (Frommer, 2011). This shift aptly precipitated a rapid growth in users over the course of the next 15 years. In 2005, when the Pew Research Center began systematically tracking social media usage, 7% of adult Americans were using at least one social networking site (Perrin, 2015). By 2015, the number had risen to 65%. Among young adults the rate of adaptation was even more substantial, from 12% in 2005 to 90% ten years later. By 2020, the use of social media platforms has become nearly ubiquitous, and surveys have shifted their focus to tracking the amount of daily use and the relative popularity of different platforms, rather than their use altogether. Social media and smartphone use are often studied simultaneously as they are used for similar purposes, socializing, information seeking, and leisure, and because social media is frequently accessed through smartphones (Y. Kim, Wang, & Oh, 2016; Stieger & Lewetz, 2018). More than 95% of teens in the U.S. own or have access to a smartphone, and 45% report that they are online "almost constantly" (Anderson & Jiang, 2018). By 2016, the average daily use of digital media (primarily accessed via smartphone) among teens amounted to 6 hours (Twenge, Martin, & Spitzberg, 2019). The major trendlines identified in these surveys of social media and smartphone use are also found in a global context (Kuss, Kristensen, & Lopez-Fernandez, 2021), albeit with some regional variations in the rate of adaptation. According to the recently published "Digital 2020 October Global Statshot Report", the number of social media users worldwide surpassed 4 billion in 2020 (Kemp, 2020).

Social media platforms and related technology are increasingly consuming the time and attention of users of all ages, inciting concerns among researchers, policymakers, and the public about the potential negative impact on human behavior. It has been dubbed a "public health risk" by influential politicians (Shaban, 2019), academics, and former Silicon Valley pioneers in the "time-well-spent" movement; arguing that social media applications may be harmful and addictive (Alter, 2018; Newport, 2019), and implore users to delete their social media accounts altogether (Lanier, 2018). Further, one of this year's most-viewed documentaries on the streaming service, Netflix, cautions against social media use based on its inherent polarizing effect and the resulting potential for catastrophic social disintegration (Leigh, 2020). These concerns are particularly apparent in regard to mental health and other aspects of psychosocial well-being.

With the ensuing rise of social media use, a steep increase in reported mental health issues has also been observed among the cohorts of teens and young adults who are growing up tightly embedded in online social environments (Twenge, Joiner, Rogers, & Martin, 2017). Data from large representative surveys indicate a positive correlation between the amount of screen use (primarily social media and smartphone use) and reported mental health issues, and negative correlations between psychological distress and engaging in non-screen activities (Twenge, 2019; Twenge & Campbell, 2018). Given the amount of time people spend engaging with social media and the subsequent displacement of other daily activities, it is crucial to determine whether this will have significant and lasting negative implications on the health and well-being of the population and to examine how these potential effects might be attenuated.

Definitions of Social Media

Definitions of social media vary widely both within and across different disciplines, constituting a challenge when seeking to create a shared understanding which can guide

theory and research (Carr & Hayes, 2015). Still, most definitions typically converge around the understanding that social media refers to digital technologies where user-generated content or interaction is emphasized. Kietzmann, Hermkens, McCarthy, and Silvestre (2011) offers the following definition: "Social media employ mobile and web-based technologies to create highly interactive platforms via which individuals and communities share, co-create, discuss, and modify user-generated content". As a result of the symbiosis between screen-based technology and the functions it facilitates, social media use may also refer indirectly to the use of hardware such as smartphones and other screen-based technology, when this activity to a large extent is conflated with the social and communication functions provided (Barnes, Pressey, & Scornavacca, 2019). Furthermore, several principal studies (Orben & Przybylski, 2019) does not distinguish between overarching constructs, such as "digital screen-time" and social media use. The fact that inconsistency when delimiting the subject matter makes up part of an unsettled methodological disagreement (Twenge, Blake, Haidt, & Campbell, 2020) when studying the association between social media use and well-being supports an inclusive approach when reviewing the subject. In the following, social media and social media use will be addressed in a broad sense, incorporating alternative descriptions such as "social networking sites" and "online social networks", as well as related functions such as chat and messaging, specific platforms and services such as Facebook, Instagram, WeChat, Twitter, Snapchat and TikTok.

Subjective Well-being

Among the psychosocial correlates of social media use, the construct of subjective well-being seems to be the most studied. Subjective well-being is conceptualized as a multi-faceted construct, typically understood as a reflection of how an individual evaluates his or her life, encompassing factors such as the absence of negative affect, presence of positive affect, optimism, and life satisfaction (Diener & Chan, 2011). The central construct of

subjective well-being considers these different factors as they relate to and influence other indicators of overall well-being. Selected for its broader meaning, subjective well-being thus effectively encompasses other related topics, including mental health and life satisfaction. Further, subjective well-being is described as a multi-dimensional phenomenon existing on a spectrum, as opposed to mental disorders, for example, which are often explained as dichotomous (i.e., something an individual either suffers from or not). Subjective well-being has been found to predict a range of important life outcomes, such as physical health and longevity, which substantiates the importance of investigating the effect social media may have on subjective well-being (Diener & Chan, 2011).

The current review utilizes a broad interpretation of subjective well-being, informed by the established usage in the field of interest (Tromholt, 2016; Twenge, 2019), and in accordance with the OECD approach to measuring subjective well-being (Durand & Smith, 2013). This includes both cognitive and affective components of well-being, such as the experience of life satisfaction, happiness, loneliness, social connection, worry, self-esteem, mood, distress, and subclinical symptoms of affective disorders. The terms subjective, psychological, or mental well-being, or simply well-being are used interchangeably in the relevant literature. This will not be differentiated if the concept is not explicitly defined in a narrower sense in a specific study.

Associations Between Social Media Use and Subjective Well-Being

There is substantial evidence suggesting a trend of declining scores on measures of subjective well-being, especially among adolescents and young adults. Repeated cross-sectional analysis of data from large, nationally representative, screening studies have accordingly found declines in happiness, life satisfaction, flourishing and increases in depressive symptoms (Duffy, Twenge, & Joiner, 2019; Keyes, Gary, O'Malley, Hamilton, & Schulenberg, 2019) and several studies have found associations between these changes and

the amount of social media use among the examined population (Twenge, Martin, & Campbell, 2018). Booker, Skew, Kelly, and Sacker (2015) collected data from a nationally representative youth panel in the U.K. and found that adolescents with heavy screen-based media use were less happy than moderate users and were more likely to report socioemotional difficulties. The amount of direct messaging and social media use, specifically, was also associated with higher odds of socio-emotional problems. Adolescents who interacted via direct messaging on social media platforms between 1 and 3 hours per day were about half as likely to report being happy as those who used these applications less than 1 hour per day. Similar associations were found in nationally representative surveys of U.S. adolescents, where those who spent more time on digital media were more likely to report mental health issues, and adolescents who spent more time on non-screen activities were less likely to report such issues (Twenge et al., 2017). The two surveys also revealed a considerable increase in reported depressive symptoms from 2010 to 2015. In a follow-up study, Twenge and Campbell (2018) examined a national random sample of 2 to 17-year-old children and adolescents with comprehensive measures of screen time and measures of subjective well-being. Daily screen time beyond 1 h/day was associated with lower well-being, including less curiosity, lower self-control, more distractibility, difficulty making friends and less emotional stability. These associations were larger among adolescents than among younger children.

Several researchers have suggested or implied that the observed inverse associations between social media use and subjective well-being may be explained by social media causally affecting well-being (Schønning, Hjetland, Aarø, & Skogen, 2020). This interpretation has, however, been contested by other academics and health professionals, primarily on the basis of the correlational nature of reported findings, advising against interpreting them as evidence of a causal link between social media use and subjective well-

being (Etchells, Fletcher-Watson, Blakemore, Chambers, & Kardefelt-Winther, 2017). Other explanations to the observed associations include that reduced subjective well-being may cause social media use or that both outcomes may be caused by unidentified third/confounding variables. It could be reasoned that social media use could be a coping mechanism for individuals with reduced subjective well-being, enabling escape from unsatisfactory life conditions, and that low subjective well-being as such may cause social media use (Schønning et al., 2020; Whiting & Williams, 2013). Possible third variables that may explain both social media use and subjective well-being include gender, social support, and sleep patterns (Berryman, Ferguson, & Negy, 2018; Kelly, Zilanawala, Booker, & Sacker, 2018).

Further, the decreasing trends in subjective well-being on a societal level has been argued to be related to cultural changes in how subjective well-being issues are reported or other societal changes rather than as a reflection of an actual decrease in subjective well-being due to social media use. It has been suggested that historical changes in how adolescents, young adults, and their parents understand and communicate challenges in life manifest as an apparent rise in mental health issues, representing a cultural shift towards pathologizing or exaggerating everyday levels of distress (Friedman, 2018). Another suggested explanation to the inverse association between social media use and subjective well-being on a societal level is that the decrease in subjective well-being reported by young people might be considered an appropriate or expected reaction to objective historical factors such as economic recession and climate change.

In an effort to counter some of these alternative explanations, Twenge et al. (2017) controlled their reported associations for cyclical economic factors, unemployment, and the Dow Jones Index. They found that they were not associated with depressive symptoms or suicide rates to the same degree as variations of social media use. Regarding the argument

that the aforementioned reduction in well-being is due to changes in response style of adolescents and their parents when responding to surveys, rather than substantial changes in well-being or mental health, Mercado, Holland, Leemis, Stone, and Wang (2017) found that self-inflicted injury resulting in visits to an emergency department were relatively stable until 2008, and increased significantly thereafter, particularly among young girls. There was, for example, an 18.8% annual increase in such visits among girls aged 10 to 14 years from 2009 to 2015. These numbers are consistent with trends in self-reported prevalence of major depressive episodes among adolescents and young adults (Mojtabai, Olfson, & Han, 2016; Twenge, Cooper, Joiner, Duffy, & Binau, 2019). Overall, the available research demonstrates a broad worsening of mental health among, at least, U.S. adolescents and young adults over the past decade (Duffy et al., 2019), indicating that the trends of decreased subjective well-being is not confined to how subjects communicate their difficulties when self-reporting or economical or climate factors. Presuming that social media may cause a decrease in subjective well-being, several mediating and moderating factors have been suggested.

It is not just the causal relationship between social media and subjective well-being that has been debated; the strength of the association has also been discussed. Shakya and Christakis (2017) surveyed U.S. subjects in a nationally representative study and found associations of Facebook use with compromised well-being in the form of lower self-reported mental health and life satisfaction, and that these associations were robust to multivariate and prospective analysis. Kelly et al. (2018) used population data from a U.K. cohort study of adolescents and found that the level of social media use is related to online harassment, poor sleep, low self-esteem, and poor body image, which in turn are positively related to depressive symptoms. Analyzing data from the same cohort study Orben and Przybylski (2019) found a negative but small association between digital technology use and subjective well-being, explaining at most 0.4% of the variation in well-being, and argue that these

effects are too small to warrant policy changes. Another large study (Przybylski & Weinstein, 2017) analyzed data from a large representative sample of U.K. adolescents and found that the relationships between social media use and subjective well-being are nonlinear and concluded that moderate engagement in digital activities is not intrinsically harmful, and that technology use predicted only 0.5% percent of the variability in the well-being of girls (Orben & Przybylski, 2020). The authors contextualize the strength of the association by comparing it to the stronger negative correlation between subjective well-being and wearing glasses as an adolescent. They further argue that post hoc groupings of social media use featured in past research may oversimplify the nature of the relations between use and subjective well-being. These results and conclusions have been contested by Twenge (2020) on the basis of both the included variables and the analysis performed. When analyzing the same data set as Przybylski and Weinstein (2017), Twenge and Campbell (2019) found that heavy smartphone-users were twice as likely as light users to experience low subjective well-being. They further argue that the effects found are substantial, reporting that social media use among girls is more strongly associated with depressive symptoms than heroin use, exercise or obesity and that the association was similar to the correlation between lead exposure during childhood and IQ. They attribute these different results to variables included and the curvilinear pattern of the associations in question.

In sum, the reported effects of social media use on subjective well-being, and the subsequent inferences made from survey-based studies diverge substantially (Orben & Przybylski, 2020) and reveal challenges of using cross-sectional study designs to examine complex behavioral phenomenon where group and individual level changes are intertwined. The divergence may in part be explained by the relationship being dependent on both moderating and mediating factors.

Possible Mediating and Moderating Factors in the Relationship

The relationship between social media use and subjective well-being appears to be complex. Several possible mediating and moderating factors have been suggested, including social connection, types of social media use and users, and gender. These factors are further not independent from each other, and the causal relationship between them and social media use is not fully understood. Social connection may, for instance, both be a consequence and antecedent of social media use. In the following sections, the factors of social connection, types of social media use and users, and gender will be discussed as possible mediating and moderating factors in the relationship between social media use and subjective well-being, although other relationships between these factors and social media use could also be present.

Social Connection

Studies have consistently shown that people generally feel happier when they interact with others and that happier people spend more time with others (Sun, Harris, & Vazire, 2019). The amount of social interaction one experiences is associated with greater well-being, and the need to belong is a powerful, fundamental, and extremely pervasive motivation (Baumeister & Leary, 1995). Furthermore, lack of attachments is associated with a variety of adverse effects on physical and mental health, adjustment, and well-being (Holt-Lunstad, Smith, Baker, Harris, & Stephenson, 2015), and the strength of an individuals' social relationships is found to be a strong predictor of mortality (Holt-Lunstad, Smith, & Layton, 2010). Social connection can be viewed as a component of subjective well-being. However, social connection and related constructs are also often conceptualized as potential mediators in the relationship between social media use and subjective well-being (Brown & Kuss, 2020). The relationship is, however, complex, where one could speculate that social media use could both increase and decrease social connection, thus indirectly increase or decrease subjective well-being. Several studies report that the population in general, and adolescents

and young adults in particular, spend less time on non-digital social interaction today than they did before the advent of social media (Twenge & Spitzberg, 2020). Adolescents and young adults spend less time on in-person social interaction with peers, including getting together, going to parties, going out, dating, going to the movies, and going for car-rides without a specific purpose (Twenge, Spitzberg, & Campbell, 2019). Twenge et al. (2019) also found a sharp increase in reported loneliness among adolescents after 2011. These changes are found at the cohort level and are not transferable to a direct linear association at the individual level, where in-person social interaction and social media use are found to be positively correlated, although the combination of being a heavy user of social media and having little in-person social contact is associated with the highest levels of reported loneliness. There is, however, no consensus as to whether social media use actually decreases or disturbs social interactions, and the nature of this relationship has been heavily debated, where some findings suggest that social media use may improve social relationships and thus also indirectly improve subjective well-being. Diener and Chan (2011) found that communication via social media had a reinforcing effect and increased subsequent face-to-face and messaging online, which were found to increase life satisfaction. Ellison, Steinfield, and Lampe (2007) report a positive association between social media use and measures of well-being, and attribute this to the increased opportunity to maintain social ties with friends and family across space and time and a lower threshold to establish new relationships online. These findings suggest that online relationships might contribute to subjective well-being and the development of social capital, although the causality is not clearly established (Hooghe & Oser, 2015).

The inconsistencies in the findings regarding social media use and social interaction might be explained by the number of online/offline interactions and the settings where social media is used. Prior research and theory within the field of social psychology suggest that

there may be fundamental cognitive restraints on the number of relationships people can maintain successfully (Dunbar, 1992) and that only relatively weak relationships can be maintained without face-to-face-interaction (Dunbar, 2012). This might in turn result in a curvilinear relationship between the amount of online social interaction and well-being where excessive interaction is associated with feelings of social overload as proposed by Maier, Laumer, Eckhardt, and Weitzel (2015). Social media use might also affect the experienced quality of offline social interactions by the mere presence of smartphones. Several studies have demonstrated that such presence lessens enjoyment of the activity one is engaging in and decreases the quality of face-to-face interactions (Dwyer, Kushlev, & Dunn, 2018), both with friends and strangers. Kushlev, Hunter, Proulx, Pressman, and Dunn (2019) report that the use of smartphones significantly reduces smiles among strangers. Others argue that people mainly spend time on social media when they would otherwise be alone and that people have become less socially isolated when using public spaces (Fischer, 2015; Hampton, Goulet, & Albanesius, 2014).

Distinguishing Between Different Use and Users

The relationship between social media and subjective well-being has been suggested to be moderated by how social media is used and by whom. Confronted with the multitude of claims about the harmful effects of using their product, research scientists employed by Facebook refer to studies that indicate that the critical factor is how you use the technology (Ginsberg & Burke, 2017). They argue that, just like in person, interacting with other people can be beneficial, while watching from the sidelines may make you feel worse. Verduyn et al. (2015) support this claim by applying experimental and experience sampling methods. They find that passive Facebook use undermines affective well-being by increasing envy, while Shakya and Christakis (2017) find that overall Facebook use is negatively correlated with well-being and that activity such as "liking" the posts of others or posting status updates is

associated with decreased self-reported mental health and life satisfaction. Tobin, Vanman, Verreynne, and Saeri (2014), on the other hand, find that being experimentally restricted from sharing information on Facebook resulted in lower levels of belongingness and meaningful existence. Further studies find that the relationship between use and subjective well-being depends on whether or not the communication originated from individuals the user cares about, and whether it was personally tailored to the user (Burke & Kraut, 2016) and that the effects of posting on social media are moderated by the feedback received by others (Burke & Kraut, 2016; Frison & Eggermont, 2020). Perhaps not surprisingly, positive feedback enhances well-being and decreases feelings of loneliness. Frison and Eggermont (2020) also find that private communication on Facebook was positively associated with perceived social support.

Sagioglou and Greitemeyer (2014) report that the more time people spend on Facebook, the more negative their mood is afterward, and that this effect is mediated by a feeling of not having done anything meaningful. Further, findings suggest that non-users of social media are slightly worse off than light users (e.g., 1 hour/day) and that well-being declines with progressively higher levels of social media use in a dose-response pattern (Twenge, 2020). This might suggest that heavy use, and not social media itself, is the central issue. Heavy use may displace time that might otherwise have been spent in in-person interaction and other activities that are found to promote subjective well-being (Twenge, 2019; Twenge & Farley, 2020). Finally, research indicates that baseline variables related to cognitive limitations and clinical conditions ranging from ADHD to depression and personality disorders, and related sub-clinical tendencies might increase the adverse impact of social media use on subjective well-being (Gazzaley & Rosen, 2016), and that personality traits such as conscientiousness and extroversion moderate addictive tendencies among users (Wilson, Fornasier, & White, 2010). These findings indicate the importance of distinguishing

between different types of users and interactions in future studies on the causal relationship between social media use and subjective well-being.

Gender

Gender has been suggested as an important moderator in the relationship between social media use and subjective well-being. Adding to the complexity of the association between social media use and social connection is the fact that there are substantial gender differences both in terms of preferred forms of social interaction (Rose & Rudolph, 2006) and reactivity to interpersonal stress (Flook, 2011), and that these differences might account for higher rates of depression and lower scores on measures related to subjective well-being among girls (Shih, Eberhart, Hammen, & Brennan, 2006).

Across all the referenced surveys, the magnitude of the association between social media use and measures related to lower subjective well-being (and more serious psychological distress) is found to be larger for girls and young women than for boys and young men (Kelly et al., 2018; Keyes et al., 2019). The existence of gender differences in peer relationship processes, social-cognitive style, and related stress and coping responses, with resulting costs and benefit for social adjustment (Rose & Rudolph, 2006) suggest that gender should be a salient variable when examining the relationship between social media use and subjective well-being, as more time spent on social media will increase the opportunity to experience episodes evoking interpersonal stress. Twenge and Farley (2020) report that the association between heavy internet use and depressive symptoms, to a large extent, is moderated by gender. Girls who report heavy social media use are 166% more likely to reveal clinically relevant levels of depressive symptoms than low users, compared to a 75% difference among boys. These differences might reflect general gender differences in how users interact with social media. Several explanations have been suggested as to why girls/women may be more adversely affected by social media use. Among these, one finds

explanations pertaining to gender differences in social comparison, relation aggression, and social media involvement. Studies suggest that girls are more likely to engage in social comparison and feedback-seeking online, which are associated with depressive symptoms (Nesi & Prinstein, 2015). Popularity moderated these effects of gender, as the associations were particularly prominent among girls low in popularity. Girls are also more concerned with appearing interesting, well-liked, and attractive on social media, and some invest a great deal of effort in crafting their online image (Yau & Reich, 2019). They are also more likely to compare themselves to online images on dimensions of physical attractiveness, and in turn, more affected by such comparisons (Haferkamp & Kramer, 2011).

Experimental findings suggest that women who engage with attractive peers on social media subsequently experience an increase in negative body image and that upward appearance comparisons may promote increased body image concerns (Hogue & Mills, 2019). The association of upward social comparisons with subjective well-being is also mediated by the experience of envy, which in turn is moderated by traits such as self-efficacy, which explains why such comparisons do not affect individuals equally (Li, 2019). The variation in the tendency for social comparison also affects the interaction between the affective valence of the content (e.g., a picture of someone smiling) and the resulting affective reaction of the viewer. Individuals with a strong tendency to compare themselves with others might experience lower levels of positive affect from viewing positive content posted by others. In contrast, individuals who engage in social comparison to a lesser degree might experience more positive affect when viewing positive content (de Vries, Möller, Wieringa, Eigenraam, & Hamelink, 2017), which lend support to the emotional contagion perspective (Ferrara & Yang, 2015). Even when engaging in social comparisons online results in negative feelings, the users might not attribute this to the medium they are using, but instead to the relative social status, they are deducing from it. Perceived social rank may

act as a psychosocial mechanism that mediates the relationship between such social cognitions and depressed mood (Wetherall, Robb, & O'Connor, 2019). Such an effect might be further amplified by a tendency reported in a study by J. Kim, Kim, and Yang (2019) that suggests that loneliness is positively related to frequency of visits to the social media accounts of celebrities, which one might surmise are both more attractive and have higher social status than most social media users. The research literature also shows gender differences in relational aggression (Card, Stucky, Sawalani, & Little, 2008), and that girls experience a higher degree of cognitive absorption when using social media (Barnes et al., 2019), that might further account for the differences observed between genders. Finally, girls are on average more active on social media in general, both in terms of amount and frequency (Anderson & Jiang, 2018; Clement, 2018), increasing the exposure to potential negative effects and to being disproportionately represented in the moderate and heavy groups of users (Su, Han, Yu, Wu, & Potenza, 2020).

Methodological Issues in Research on Social Media Use and Well-Being

The ubiquitous presence of social media in contemporary society represents a substantial methodological issue when investigating the relationship between social media use and subjective well-being as there is arguably no representative naïve population that is not tightly integrated with the complex online environment. The rapid technological and cultural changes in question might also outdate the findings from research at a faster rate than within most similar fields of research (Twenge, 2019). This is especially relevant to the factors of amount and frequency of use and the subsequent substantial displacement of other daily activities. It might even affect younger users' psychosocial development at a cohort level (Lukianoff & Haidt, 2018; Twenge et al., 2017), complicating the possibility of establishing causality with regards to potential harmful effects. Adolescents and young adults might feel worse because of social media on a group level, without a direct correlation

existing at the level of the individual. Another factor that might obscure the strength of association between social media use and well-being, especially within survey-based research, is the reliance on retrospective self-reported estimates of amount of use or proxy measures of usage related to addiction constructs (e.g., C. S. Andreassen, Torsheim, Brunborg, & Pallesen, 2012; Laks et al., 2013). Ellis (2019) argues that the correlation between self-reported use and objective measures are often unreliable and that research within the field tends to fail in differentiating between distinct behaviors and experiences of interest. Hunt, Marx, Lipson, and Young (2018) find that self-reported estimates do not match actual use and argue that retrospective bias appears to explain at least some of the associations previously reported. Others find that underestimation of self-perceived use is actually positively correlated with amount of use (Lin et al., 2015). One study (Burke, Marlow, & Lento, 2010) found a moderate correlation ($r = .45$) between self-reported estimates of use and empirical data on use provided by Facebook, but this might not be valid for contemporary usage, which has increased substantially in frequency and amount, and where smartphones have replaced desktop and laptop computers as the primary technology used to access social media, arguably complicating users' ability to estimate their own use.

Recent monitoring applications and additions to smartphones such as Screen Time on iPhones might provide more ecologically valid data on individual use in the form of widely available objective measures (Ryding & Kuss, 2020), which might improve the precision of assessment of social media use. Lastly, the cross-sectional design in most studies on social media use and subjective well-being is, as previously described, an important limitation. As a result of the aforementioned methodological challenges, the strength and relevance of effects found and the difficulties in establishing how the variables in question interact underscores the need for study designs that facilitates causal inference.

Restriction of Social Media Use

Restricting social media use experimentally is one approach that facilitates causal inferences. As concerns about the effects of social media use, and the subjective experience of negative effects, have become more prevalent, the public interest in abstinence, or moderation of use, sometimes referred to as "digital detoxing" or "digital dieting", has emerged as a trend (Cherry, 2020; Lilleslatten, 2020). In a survey of U.S. adults, Raine, Smith, and Duggan (2013) found that 61% of current Facebook users have taken a "Facebook vacation", where they voluntarily abstained from using the platform for several weeks, and 20% reported that they had quit the platform permanently. Another indication of widespread interest in abstinence from social media is the popularity, prevalence, and names of applications that claim to assist the users in moderation, such as Moment, Freedom, BreakFree, and AppDetox (Wojtowicz, 2019).

The motivation for reducing social media use ranges from wanting more presence in real-life social interactions to increasing concentration and privacy concerns. Some arguments for abstinence rest on a presumption of balance that might resemble motivation to engage in activities such as mindfulness, where abstinence is seen as facilitating heightened consciousness, presence, and self-regulation (Syvertsen & Enli, 2019). The concept of social media abstinence has also gained traction as an experimental route to examine the effects of social media use by subtraction, and as a way of attenuating possible negative effects of social media use. Given that social media use is associated with both positive and negative effects on subjective well-being, it is likely that abstinence may involve some negative consequences as well. While some may experience relief and reduction of stress, others may experience negative feelings, such as disconnection, anxiety, and boredom (Hoffner, Lee, & Park, 2016; Sheldon, Abad, & Hinsch, 2011).

A concept that specifically addresses the social ambivalence associated with being temporarily disconnected from social media is the concept of Fear of Missing Out, popularly

abbreviated as FoMO. It has been defined as "a pervasive apprehension that others might be having rewarding experiences from which one is absent" (Przybylski, Murayama, DeHaan, & Gladwell, 2013). It is proposed as a perspective that might link factors such as life satisfaction and mood to social media engagement and as a possible explanation for experiences of withdrawal when being unable to access social media (Eide, Aarestad, Andreassen, Bilder, & Pallesen, 2018). FoMO is reported to be a strong motivation for social media use (Scott & Woods, 2018) and have been proposed as a possible explanation for findings of adverse psychological and physiological effects of short-term iPhone separation (Clayton, Leshner, & Almond, 2015), and associated with addiction-like behavior and heavy use of smartphones and social media (Fuster, Chamarro, & Oberst, 2017). To what degree people may experience FoMO when abstaining from social media use might depend on how long the abstinence lasts (Brown & Kuss, 2020) and whether they abstain from direct peer-to-peer communication, as well as the public spheres available on social media platforms.

Study Objectives

A growing body of research has identified an association between the use of social media and subjective well-being. The strength and direction of these associations have been contested and are still subject to disagreements among researchers. To support causal inferences about the association between social media use and subjective well-being, and to examine the correlation on a more granular level with regards to mediating and moderating variables, multiple recent studies have employed experimental designs investigating the effect of restriction of use, ranging from moderation to full abstinence from social media. These studies inform not only about the effects of social media use itself but also about the potential of moderation or abstinence as a way of attenuating the potential negative effects of use, with possible implications for both policies, public health recommendations, and possibly even mental health interventions.

To the best of the current author's knowledge, there has so far not been registered or published a systematic review effects of experimental restriction of social media use on subjective well-being. Hence, the aim of the current review is to summarize the relevant findings from previously published studies, to provide an overview of relevant measures utilized, and to help inform the design of future experiments and interventions. Mediating and moderating factors, such as degree of social connection, baseline usage pattern, experiences of withdrawal, fear of missing out, and gender will be examined in particular, as they might interact with the participants overall feeling of subjective well-being. One could assume that the experience of complete abstinence from a major social interface would result in perceived isolation (at least in some users), and that this again might be moderated by the baseline usage pattern of the individual users. However, it is also conceivable that abstinence might increase and improve real-world social interactions. Lastly, the duration of the abstinence/moderation will be assessed, as the length of the intervention may moderate the relationship between the intervention and subjective well-being, as the effect on perceived social connection (as reflected in constructs such as fear of missing out and loneliness) may depend on how long and to what degree the user restricts social media use.

Participants

This review will focus on the relationship between social media use and well-being in presumably healthy participants and does not seek to directly assess the relationship between social media use and the development, maintenance, or recovery from various forms of mental disorders (e.g. Brusilovskiy, Townley, Snethen, & Salzer, 2016). It is acknowledged that most studies examining the matter are primarily concerned about the effects on adolescents and young adults, for several reasons; they are the most active users and apparently most affected, childhood and young adulthood are arguably more formative than later stages in

life, and for reasons of convenience students are the primary group represented in experimental studies.

Research question

The aim of the present study is to conduct a systematic review of studies where the participants' use of social media applications, or mediating technology, has been the subject of experimental restriction (moderation of-, or abstinence from use) in order to answer the following research questions: *1) How does experimental restriction of social media use affect measures of subjective well-being, and 2) and which factors might mediate or moderate the relationship between restriction and well-being?*

Methods

Protocol and Registration

This review was performed in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines for the design and implementation of systematic reviews (Liberati et al., 2009). The protocol for this review was pre-registered with the International Prospective Register of Systematic Reviews (PROSPERO) on October 24th, 2020, (record ID: CRD42020215455). As this was a systematic review, the study was exempted from approval by an ethics committee.

Eligibility Criteria

To specify the study characteristics deemed necessary for inclusion in the current review, the research question and subsequent search strategy were addressed and developed according to the PICOS framework (Liberati et al., 2009) for formulating research questions.

Population

Inclusion Criteria. (a) Subjects from an adolescent (over the age of 10) and adult population engaged in habitual (or unspecified, or normally distributed) use of social media stemming from all genders and nationalities. (b) Studies on abstinence from smartphone use

are included if social media use and psychosocially relevant factors are explicitly addressed and measured or if smartphone use is otherwise conflated with social media use.

Exclusion Criteria. (a) Studies with subjects from pre-selected clinical or proposed clinical groups (e.g., "internet addiction", "social media addiction"), (b) Subjects selected on the basis of being involved in gaming or reporting gaming addiction.

Interventions

Inclusion Criteria. (a) Restriction on use (pre-planned and specified short- or long-term abstinence from- or restriction of use).

Exclusion Criteria. (a) Studies involving a specified alternate activity or therapeutic intervention (e.g., breathing exercise, mindfulness meditation etc.). (b) Studies where the restriction of use is effectuated by use of an application that employs secondary incentives to motivate reduction of use (e.g., specified rewards). (c) Studies where the participants are not in charge of adhering to the behavioral prescription inherent in the experimental condition (e.g., adolescent subjects where restriction is enforced by the school or by parents).

Comparison

Inclusion Criteria. Studies where the design includes randomized allocation to a control condition with no induced change of social media use, or a within-subject design.

Outcome

Inclusion Criteria. Self-reported measures of mental (or subjective) well-being, and related measures (including stress, anxiety, happiness, loneliness, social connectedness, mood, depressive symptoms, quality of life and self-esteem).

Exclusion Criteria. Studies utilizing restriction of use with the intention of exploring specific task performance (e.g., driving safety or academic performance).

Study Design

Inclusion Criteria. Experimental design with randomized allocation to a control group, or a within-subject (pre-post or multi-stage) design.

Additional criteria

The review further only included studies with the following characteristics: Published in a peer-reviewed journal with full text available in English or a Scandinavian language. Published or pre-published between 2007 (the year the first-generation iPhone was introduced) and October 24th, 2020.

Information Sources

The following databases were systematically searched on October 25th, 2020; APA PsycInfo, Embase, Medline (Ovid) and Web of Science. Subsequently the author performed an additional manual search for any missed studies with relevance to the research question, by reviewing the references of recently published articles identified by the computerized search procedure.

Search

The eligibility criteria were structured around four categories to increase the precision and specificity of the computerized search strategy. These categories were represented with associated keywords and phrases, see appendix B, and combined using the Boolean operator “AND”. The search strategy was adapted to each database, in terms of fields searched (e.g., appendix C). Due to the near ubiquitous use of words and phrases that relate to social media and smartphone use across many fields of research, some of the search items were restricted to the title and abstract fields, while other search items were applied to topic or related fields.

Study Selection

Articles were initially identified and organized by the author and the screening was independently verified by a research assistant (L.G.) employed by the research group. In case

of disagreement between the two aforementioned raters, a third rater (E.E.) decided the outcome. The organization, removal of duplicates, and screening process were performed with the use of the Covidence systematic review software (Veritas Health Innovation, Melbourne, Australia; available at www.covidence.org). As a result of a conservative automatic de-duplication in Covidence, the number of duplicates were also identified with the use of Endnote (version X9.3.3), which is the number referred in the following PRISMA diagram. To determine the level of inter-rater reliability in the screening procedure, Cohen's Kappa statistic was calculated using the XLSTAT add-in (version 2020. 5.1.) for Microsoft Excel.

Data Extraction

Information about the included studies, such as bibliography, study setting, participant characteristics, methodology, measurement scales, main results and factors mediating or moderating the results were collated in an extraction sheet created with Microsoft Excel. Weighted pooled means of central characteristics were summarized when possible. See appendix D for a complete list of the data extraction items.

Quality Assessment

Two reviewers (R.E. and L.G.) independently assessed the quality of the included studies using the Cochrane risk-of-bias tool in randomized trials (RoB; Higgins et al., 2011) as provided by Covidence systematic review software (Veritas Health Innovation, Melbourne, Australia; available at www.covidence.org). In cases of disagreement between the primary reviewers' consensus was sought through discussion. A third reviewer (E.E.) would determine the outcome in the case of lack of consensus. To determine the level of inter-rater reliability in the quality assessment, Fleiss' Kappa statistic was calculated using GraphPad QuickCalcs (available at <https://graphpad.com>). The RoB tool covers six domains of bias: selection bias, performance bias, detection bias, attrition bias, reporting bias and

other bias. The domain of selection bias is further defined by two subdomains: "random sequence generation" and "allocation concealment". The use of the tool involves assigning a judgement of high, low or unclear risk of material bias within the domains. Material bias is defined by Higgins et al. (2011) as "bias of sufficient magnitude to have a notable effect on the results or conclusions of the trial". In the current review the author adapted the domain "other bias" to specifically address the risk of bias due to deviation from intended interventions in accordance with the recommendations made by Munder and Barth (2018). A table illustrating the domains and the instructions implemented can be found in appendix E.

Results

The computerized search resulted in 3575 articles, supplemented by 7 articles identified manually. After removing the identified duplicates ($n = 1,561$), the remaining ($n = 2,021$) studies were independently screened by title and abstract resulting in 35 studies eligible for further full-text screening (see PRISMA flow diagram Figure 1). After the full-text review 16 studies were excluded as they ($n = 12$) did not match the intervention-criteria, or ($n = 4$) did not match the outcome-criteria. As a result, a total of 19 studies met the eligibility criteria and were included in the current review. As there has been issued a correction for one of the included studies (Wilcockson, Osborne, & Ellis, 2019), the published corrigendum (Wilcockson, Osborne, & Ellis, 2020) was integrated as part of the same study, and is hereby collectively referred to by the original citation. After conducting the initial screening of title and abstract, the Cohen's κ was found to be $.691, p < .0001$, indicating substantial agreement between the two primary raters (Landis & Koch, 1977). For the full-text screening the result was found to be $\kappa = .942, p < .0001$, indicating almost perfect agreement.

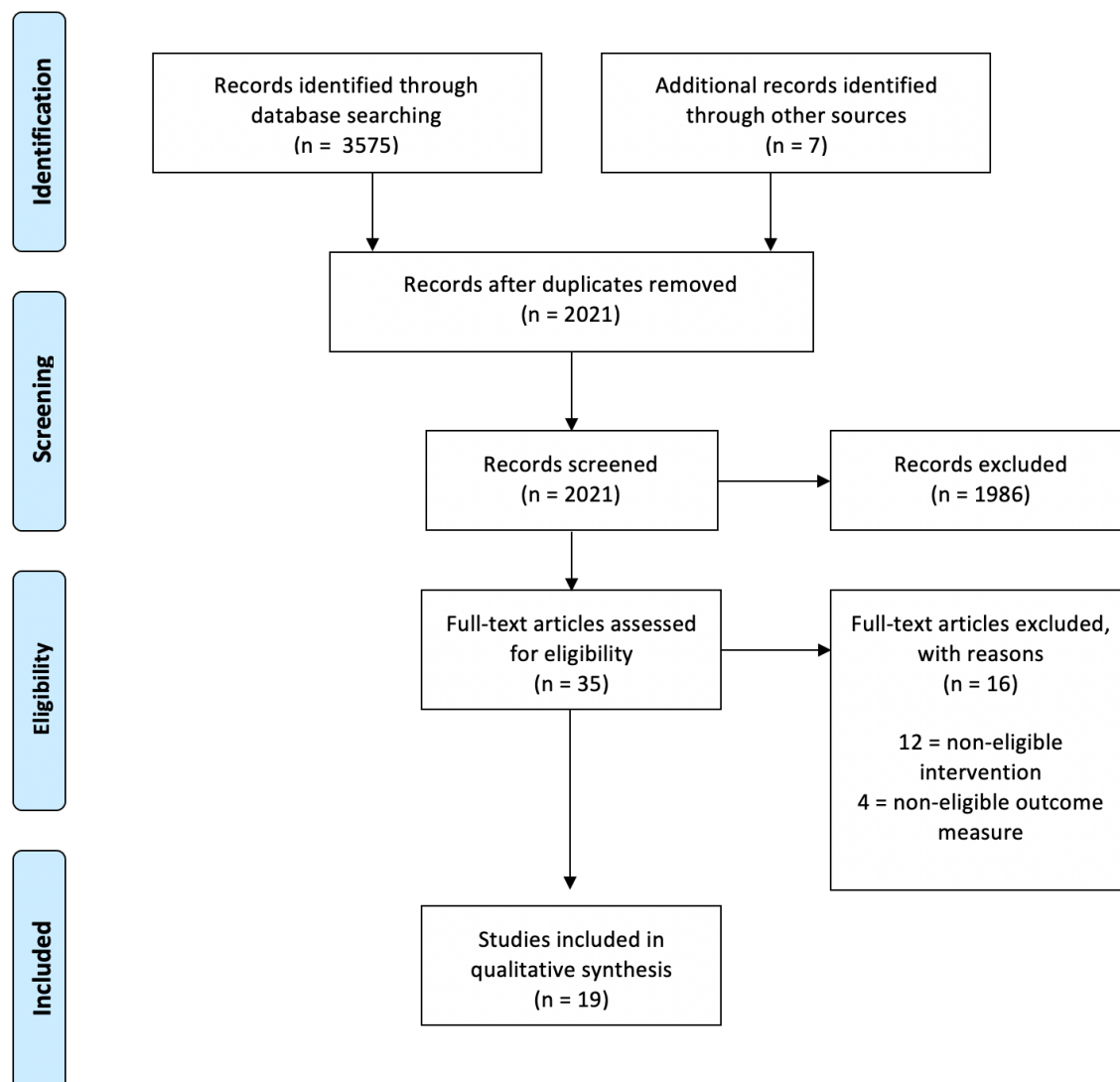


Figure 1. PRISMA Flow diagram of the study screening and selection process.

Source: Moher, Liberati, Tetzlaff, Altman, and Group (2009).

Study Characteristics

Table 1 presents a summary of central characteristics of the included studies. The included studies were published in peer-reviewed journals between 2016 and 2020. Five of the studies were conducted in the U.S. (Allcott, Braghieri, Eichmeyer, & Gentzkow, 2020; Hall, Xing, Ross, & Johnson, 2019; Hunt et al., 2018; Mosquera, Odunowo, McNamara, Guo, & Petrie, 2019; Turel, Cavagnaro, & Meshi, 2018), four in the U.K. (Brown & Kuss, 2020; N. Hughes & Burke, 2018; Wilcockson et al., 2019; Wolf, 2016), two in China (He,

Tu, Xiao, Su, & Tang, 2020; Zhou, Rau, Yang, & Zhou, 2020) and two in Germany (Brailovskaia, Ströse, Schillack, & Margraf, 2020; Stieger & Lewetz, 2018). The remaining six studies (Agadullina, Lovakov, & Kiselnikova, 2020; Eide et al., 2018; Fioravanti, Probst, & Casale, 2020; Tromholt, 2016; Vally & D'Souza, 2019; Vanman, Baker, & Tobin, 2018) were conducted in Russia, Norway, Italy, Denmark, United Arab Emirates and Australia, respectively.

Participant Characteristics

See Table 1 for a summary of participant characteristics in the included studies. The included studies yielded a total of 5,101 participants who were assigned to an experimental or control condition. The mean age of the participants in the individual studies ranges from 19.9 (Agadullina et al., 2020) to 34 years (Tromholt, 2016). Several studies did not report mean age, while some did not report the standard deviation of their age variable. The study with the largest sample ($n = 1,661$; Allcott et al., 2020) lacked details about both the participants' age and gender distribution. The following summarized characteristics are weighted according to sample size, but they should not be interpreted as representing all included studies. The pooled mean age of the participants was 27.44, with a standard deviation of 6.64. The gender distribution ranged from 86% female participants in Tromholt (2016) to 32% female participants in He et al. (2020). The clear majority of the included studies had a skewed gender distribution in favor of female participants, with a pooled average of 70% (not including Allcott et al., 2020). Most studies recruited all or most of their participants from a student population, while some recruited from the general population. Six of the studies rewarded the participants in the form of course credits (Agadullina et al.; Brailovskaia et al.; Hunt et al.; Stieger & Lewetz; Turel et al., 2018; Vanman et al., 2018) while seven provided monetary compensation (Allcott et al., 2020; Eide et al., 2018; Mosquera et al., 2019; Tobin et al., 2014; Vanman et al., 2018; Wilcockson et al., 2019; Zhou et al., 2020).

Table 1

Study characteristics and selected results

Authors (year)	Intervention / study design	Participants / country	Measures of SWB	Main results SWB	Effect of EC	Factors related to the effect
Agadullina, Lovakov, Kiselnikova (2020)	4 weeks abstinence from social media / Between-groups, randomized, mixed-methods	Psychology students. In return for course credits. (N = 77, M _{age} = 19.9, SD _{age} = 0.13, 70.1% female) / Russia	Multidimensional Inventory of Loneliness Experience (MILE)	No significant effect of quitting social media. Comparison of EG and CG showed no difference in social and emotional loneliness. No significant interactions between group and time.	-	The level of emotional loneliness did not depend on positive or negative attitudes toward aloneness and it changed in a synchronous manner over time in both groups.
Allcott, Braghieri, Eichmeyer, Gentzow (2020)	4 weeks deactivation of Facebook, not including messenger / Between-groups, randomized, multistage design	Recruited through Facebook display ads. Reimbursed according to condition and stage completion. N = 1,661 in impact evaluation sample. See study for further details / U.S.	Items from: Subjective Happiness Scale (SHS), Satisfaction with Life Scale (SWLS), Three-Item Loneliness Scale (TIL), Experience sampling via SMS.	Deactivation caused small but significant improvements in SWB. Self-reported happiness and life satisfaction increased. Self-reported symptoms related to anxiety and depression decreased. The overall index of subjective well-being improved by 0.09 standard deviations.	↑	No effects of active vs. passive use or heavy vs. light use. No systematic patterns related to age. Deactivation had less positive effect on SWB for people who had more offline social interactions and were already happier at baseline.
Brailovskaia, Ströse, Schillack, Margraf (2020)	2 weeks of decreased Facebook use. 20 min. daily reduction / Between-groups, randomized	Recruited via public display ads and via several universities. Students compensated with course credits (N = 286, M _{age} = 24.78, SD _{age} = 5.89, 77.63% female) / Germany	SWLS, The Depression and Anxiety Stress Scale 21 (DASS-21)	Life satisfaction increased significantly in the EG with a medium to large effect size ($\eta^2_p = .012$). Depressive symptoms decreased significantly in the EG, with a similar effect size ($\eta^2_p = .011$).	↑	Frequency of physical activity such as jogging or cycling significantly increased among the participants in the EG. The authors speculate that this might have mediated some of the effects between reduced Facebook-use and SWB.
Brown, Kuss (2020)	1 week of normal social media use followed by 1 week of abstinence (not including messaging apps) / Within-subjects, mixed methods	An opportunity-sample recruited via SM, no compensation (N = 61, M _{age} = 24.4, SD _{age} = 4.95, 67.21% female) / U.K.	Warwick- Edinburgh Mental Well-Being Scale (WEMWBS), Social Connectedness Scale - Revised (SCS-R)	There was a significant increase in participants' MWB scores before and after abstinence, with a difference corresponding to a medium-sized effect ($d = 0.47$). There was also a significant increase in participants' social connectedness (SC) scores before and after abstinence, corresponding to a small-sized effect ($d = 0.28$). Further, there was a significant large-sized positive correlation ($r = 0.550$), between scores of SC change and MWB change.	↑	There was a significant decrease in participants' perceived FoMO scores between before and after abstinence with a medium-sized effect ($d = 0.55$). No significant differences in males and females in Fear of Missing Out (FoMO), MWB, and SC change scores were found. Social media use predicts FoMO more than FoMO predicts social media use.

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Authors (year)	Intervention / study design	Participants / country	Measures of SWB	Main results SWB	Effect of EC	Factors related to the effect
Eide, Aarestad, Andreassen, Bilder, Pallesen (2018)	3 days of smartphone restriction (hand-in) / Between-groups, randomized	Students recruited through advertisement and personal appeal. Compensated with 500 NOK undisclosed in advance (N = 127, M _{age} = 25, SD _{age} = 4.5, 72.4% female / Norway	Positive and Negative Affect Schedule (PANAS)	There was no statistically significant main effect for condition on Positive Affects (PA) or Negative Affect (NA). The interaction effect between condition and time was not significant for neither PA nor NA.	-	No significant interaction effect for the outcome variables; Smartphone Withdrawal Scale (SWS), Fear of Missing Out Scale (FoMOS) with scores on PANAS.
Fioravanti, Probst, Casale (2019)	1 week of abstinence from Instagram / Between-groups, randomized	Participants recruited through an advertisement on SM (N = 80, M _{age} = 25.05, SD _{age} = 4.16, 50% female) / Italy	Italian version of SWLS, Italian version of PANAS	A significant effect of Time X Group on satisfaction with life and positive affect were found among the female participants. Women in the EG reported significantly higher post-test satisfaction with life levels ($\eta^2_p = 0.21$), and significantly higher post-test positive affect scores ($\eta^2_p = 0.24$). No interaction between Time X Group was detected among men.	↑	Variations among women in PANAS positive affect scores were mainly a product of social comparison tendencies. Quitting Instagram had a positive effect only among women who reported a tendency toward social comparison. Life satisfaction scores were not related to tendencies of social comparison.
Hall, Xing, Ross, Johnson (2019)	Five conditions: No change or 1/2/3/4 weeks of abstinence from social media / Between-groups, randomized	Community and student participants recruited in seven cities through ads on SM, and through a student research pool (N _{total} = 232, N _{sample} = 160, M _{age} = 26.8, SD _{age} = 11.4, 78.5% female) / U.S.	Loneliness: TIL and one additional item. Affective Well-being: four items from Medical Outcomes Study Short Form 36 (MOS-SF-36). Quality of day: four items adapted from SWLS	No statistical evidence suggesting that abstaining from social media led to a main effect difference in measures of SWB. Participants did not differ within-subjects between periods of abstaining and using social media.	-	The study conducted Monte Carlo simulations to determine post hoc power. The study was considered to have low power to detect relevant effects.
He, Tu, Xiao, Su, Tang (2020)	4 weeks of restricting smartphone use 30min before bedtime / Between-groups, randomized	University students recruited via SM (N = 38, M _{age} = 21.16, SD _{age} = 2.34, 31.55% female) / China	PANAS	Significant interaction between groups and time for PANAS increased positive affect. The study also found a significant decrease of PANAS negative affect in the intervention group in the course of the intervention, but this was not significant as a function of Time X Group.	↑	Change in positive affect associated with pre-sleep somatic and cognitive hyperarousal, sleep amount and quality. Authors speculate that goal attainment when abstaining from use might have contributed to observed effect.

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Authors (year)	Intervention / study design	Participants / country	Measures of SWB	Main results SWB	Effect of EC	Factors related to the effect
Hughes, Burke (2018)	Abstaining from smartphone use in the bedroom for 1 week / Between-groups, randomized	Participants recruited using snowball sampling via SM (N = 95, M _{age} = N/A, SD _{age} = N/A, 67% female) / U.K.	SHS, Quality of Life Scale (QOLS), Intensity and Time Affect Survey (ITAS)	Significant difference in SHS subjective happiness in the experimental group, with an effect size of $\eta^2 = 0.17$, which the authors interpret as a small effect size. They also found a significant difference in the QOLS quality of life scores for the experimental group, with a small to moderate effect size ($\eta^2 = 0.25$).	↑	Result of thematic analysis of open-ended questions regarding experience of abstinence: Better sleep quality, reduced anxiety, improved personal relationships, less time-wasting.
Hunt, Marx, Lipson, Young (2018)	3 weeks of limiting use of SM (Facebook, Instagram, Snapchat) to 10 minutes per day / Between-groups, randomized	Participants recruited from psychology undergraduate research pool. Compensated with course credits. (N = 143, M _{age} = N/A, SD _{age} = N/A, 75,52% female) / U.S.	Interpersonal Support and Evaluations List (ISEL), UCLA Loneliness Scale, Spielberger State-Trait Anxiety Inventory - Six item version (STAI-S), Beck Depression Inventory II (BDI-II), Rosenberg Self-Esteem Scale (RSES), Ryff Psychological Well-Being Scale (PWB)	The EG showed significant reductions in loneliness and depression compared to the control group. This beneficial effect was particularly apparent in individuals that were considered high in depressive symptoms at baseline, who reported clinically significant declines in BDI-II scores from a mean of 23.0 at baseline, to a mean of 14.5 at Week 4. Individuals considered low in baseline depressive symptoms reported a statistically, but not clinically significant, decline of single point in mean BDI, from 5.1. to 4.1.	↑	Distressed individuals did not use social media more prospectively. Baseline FoMO predicted more social media use. During baseline monitoring amount of use and SWB was not related. Both groups showed statistically significant decreases in anxiety and fear of missing out during the study.
Mosquera, Odunowo, MnNamara, Guo, Petrie (2019)	1 week abstaining from Facebook / Between-groups, randomized	Participants recruited via email. Compensated with on average \$16.79. (N = 167, M _{age} = 20.59, SD _{age} = 1.99, 64% female) / U.S.	Five items related to subjective well-being from the OECD Better Life Initiative	Effects on overall life satisfaction, "life is worthwhile", happiness and worry are small and statistically insignificant. Being abstinent from Facebook significantly reduces self-reported depressive feelings.	↑	Splitting the sample by gender the study finds that the significant effect on depressive feelings is accounted for by men, with no significant effect for female participants.
Stieger, Lewetz (2018)	4 days baseline, 7 days abstinence from SM, 4 days post-intervention / Within-subjects, not randomized	Community participants recruited via posting on Facebook and in newspapers. Renumerated via course credits (N = 152, M _{age} = 27.4, SD _{age} = 11.9, 70% female) / Germany	6 items from the international, short form PANAS (I-PANAS-SF)	Abstinence led to lower levels of positive affect in the intervention phase and higher levels in the post-intervention phase, constituting a possible rebound effect, but this effect was not significant. No substantial effect on negative affect.	-	Participants in the intervention phase felt significantly more social pressure from their social network to be on social media compared to baseline. Being abstinent led to significantly elevated boredom and craving.

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Authors (year)	Intervention / study design	Participants / country	Measures of SWB	Main results SWB	Effect of EC	Factors related to the effect
Tromholt (2016)	1 week of abstinence from Facebook / Between-groups, randomized	Participants residing throughout the country recruited via Facebook (N = 1095, M _{age} = 34, SD _{age} = 8.74, 86% female / Denmark	One question about Life Satisfaction. Five items from Center for Epidemiologic Studies Depression Scale (CES-D). Four items from PANAS	The EG reported a significantly higher level of life satisfaction compared to the CG after the intervention, with an intention to treat (ITT) effect of 0.37. The EG also report significantly higher (or more beneficial) levels on items (PANAS and CES-D) measuring affective well-being compared to the CG (ITT = 1.22). As the noncompliers were kept in the sample, the results should be considered as conservative estimates of the true treatment effects.	↑	The effects were significantly greater for heavy Facebook users, passive Facebook users, and users who tend to envy others on Facebook. Light Facebook users had no effect of quitting Facebook, medium users had some effect.
Turel, Cavagnaro, Meshi (2018)	Typical SNS vs. Excessive SNS vs. 1 week of abstinence vs. no change / Between-groups, randomized 2x2 factor design	Participants recruited from an introductory course. Compensated with course credits (N = 555, M _{age} = 24.01, SD _{age} = 4.57, 42,8% female / U.S.	Four questions concerning psychological stress	The EG reported significantly larger absolute decrease in stress (95%CI = [0.62;0.82]) compared to the CG (95%CI = [0.33;0.68]), although the difference in relative stress reduction was not significant.	↑	The effects were particularly pronounced in excessive SNS users, and among females. People with excessive SNS use and higher stress during abstinence were less successful at maintaining abstinence.
Vally, D'Souza (2019)	Abstaining from all social media for 1 week / Between-groups, randomized	Students recruited on campus (N = 78, M _{age} = 22.13, SD _{age} = 2.02, 52.6% female / U.A.E.	SWLS, PANAS, Social and Emotional Loneliness Scale for Adults – Short form (SELSA-S), Perceived Stress Scale (PSS)	The EG reported a considerable and statistically significant reduction in their satisfaction with life, compared with the CG ($\eta_p^2 = .05$). Further, the experimental group reported a higher degree of PANAS negative affect than the control group ($\eta_p^2 = .07$). Participants in the experimental group also reported more experiences of SELSA loneliness than the control group which was statistically significant with a large effect size ($\eta_p^2 = .10$).	↓	Scores on SWLS were not significantly moderated by the type of typical use of social media (ie, active or passive engagement), the number of people followed, frequency and amount of baseline use. None of the potential moderator variables demonstrated statistically significant interactions.

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Authors (year)	Intervention / study design	Participants / country	Measures of SWB	Main results SWB	Effect of EC	Factors related to the effect
Vanman, Baker, Tobin (2018)	5 days of abstinence from Facebook / Between-groups, randomized	Recruited from research pool or via Facebook. Course credits or AU\$20 N = 138 Mage = 22.43 63% female / Australia	SWLS, PSS, PANAS, SELSA-S	Both groups reported a decline in perceived stress but this difference was not affected by condition. Participants who abstained from Facebook reported significantly lower scores on measures of cognitive well-being (SWLS) compared to the control group, which on the contrary experienced an increase in cognitive well-being during the study. This difference was of a moderate effect size ($d = 0.54$).	↓	No differences were found related to gender. Additional analyses found no Facebook usage variables moderated the effects of experimental condition on the PANAS and SELSA measures.
Wilcockson, Osborne, Ellis (2019)	Four lab-sessions, 24h abstinence from smartphone use before session 3 / Within-subjects	Participants recruited from psychology subject pool and campus advertising. Reimbursed £15. (N = 45, Mage = 22.4, 77% female). U.K.	STAI-6, Brief Mood Introspection Scale (BMIS)	No significant main effect of session on mood were found.	-	Mood and anxiety scores were not associated with the SPAI (Smartphone Addiction Inventory) at any time point
Wolf (2016)	Two weeks of minimised Facebook use, two weeks of normal use. Within-subjects, randomized cross.	Students recruited through mailing lists and adverts. No compensation. (N = 78, median age = 21, 67% female) / U.K.	WEMWBS	The study found a significant increase in mental well-being after the moderation period, with a small to medium effect size ($d = 0.33$), when compared to the control period	↑	No significant interactions were found with regards to gender or relationship status
Zhou, Rau, Yang, Zhou (2020)	8 breaks (2.5 hours) from social media over 2 weeks / Between-groups, randomized	Recruited via social media. Compensated with between 100 and 160 Chinese Yuan (approx. 25 USD). N = 65 Mage = 28.79 SDage = 4.88 59% female / China	SWLS, Minnesota Satisfaction Questionnaire (MSQ), daily evaluation of life and work	Participants in the EG reported significantly higher life satisfaction after 2 weeks of intervention, while not in the CG. The findings suggest effects from abstinence besides effects of self-monitoring. No significant effect on work satisfaction.	↑	Scores on Social Media Addiction (SMA) interacted significantly with life satisfaction, implying that users with higher SMA might respond quicker to the intervention. The most common negative feeling related to abstinence was FoMO. This was substantially alleviated during the abstinence period.

Note. CG = control group. EG = experimental group. M_{age} = mean age. SD_{age} = standard deviation age. SWB = Subjective Well-Being. ↓ = significant decrease in some or all measures of SWB after EC. ↑ = significant increase in some or all measures of SWB after EC.

Study Design and Interventions

See Table 1 for a summary of study design and interventions in the included studies. The majority ($n = 12$) of the included studies applied a basic between-groups, randomized design with an experimental group assigned to a condition of complete abstinence from use (Agadullina et al., 2020; Eide et al., 2018; Fioravanti et al., 2020; Mosquera et al., 2019; Tromholt, 2016; Vally & D'Souza, 2019; Vanman et al., 2018) or a specified moderation of use (Brailovskaia et al., 2020; He et al., 2020; N. Hughes & Burke, 2018; Hunt et al., 2018; Zhou et al., 2020), and a control group assigned to a condition of no change of use. Allcott et al. (2020) utilized a randomized between-groups, multistage design; Hall et al. (2019) examined varying lengths of abstinence across five groups, including a control group, and four groups assigned to 1-4 weeks of abstinence respectively; Turel et al. (2018) employed a randomized, 2 x 2 factor design to examine the relative effects of abstinence on typical vs. excessive users. The four remaining studies employed a within-subjects design, where Wolf (2016) examined the effects of minimized use with a randomized crossover-design; Brown and Kuss (2020), Stieger and Lewetz (2018) and Wilcockson et al. (2019) examined the effects of a period of abstinence without a crossover-design. The period of abstinence varied from 24 hours to 4 weeks, and the moderation of use varied from reducing daily use by 20 minutes, to adhering to an upper limit of 10 minutes of use per day. The studies varied in terms of which social media applications that were restricted in the experimental condition, and to what degree. Four studies restricted smartphone use entirely (Eide et al., 2018; He et al., 2020; N. Hughes & Burke, 2018; Wilcockson et al., 2019), six restricted only one specified application or platform, such as Facebook (Brailovskaia et al., 2020; Mosquera et al., 2019; Tromholt, 2016; Vanman et al., 2018; Wolf, 2016) or Instagram (Fioravanti et al., 2020), and Allcott et al. (2020) restricted general use of the Facebook platform, but not the associated messaging application. The remaining eight studies restricted all or most types of

social media use, although Brown and Kuss (2020) also excluded messaging applications from their experimental condition. In sum the included studies vary substantially in their study design, type and amount of intervention, and in how they define and operationalize social media use.

Measures of Social Media Use

See Table 1 for a summary of the social media measures used in the included studies. The majority ($n = 15$) of the included studies employed self-reported measures when estimating social media use (in minutes, hours or according to pre-determined intervals or categories) before, during or after implementing the experimental conditions. The remaining four studies employed various types of monitoring software to acquire objective measures of the participants' usage. Allcott et al. (2020) asked the participants that were using iPhones to report usage of the Facebook application provided by their phone's settings at the end of the treatment condition, while non-iPhone users were asked to report an estimate. Brown and Kuss (2020) measured social media use by employing the Screen Time application (for iPhone users) and the ActionDash or Tracky application (for Android users), which provide detailed, and application-specific, reports of daily and weekly use. Usage time was reported by the participants via manual entry. The amount of time spent accessing social media platforms on other digital devices, such as desktop or tablets, was estimated subjectively by the participants. Hunt et al. (2018) had their participants email screenshots of their iPhone battery usage screen at specified increments of time, which provided information about application-usage during the past 24 hours and 7 days. Zhou et al. (2020) in a similar fashion, required their participants to provide daily screenshots of the time management function embedded in the operating system, or by the use of the application Moment for iOS or QualityTime for Android.

Measures of Fear of Missing Out, Withdrawal and Addiction

Several studies examined how usage patterns interacted with effects of abstinence or moderation, primarily according to a withdrawal or addiction-perspective, measured by various scales, such as the Bergen Facebook Addiction Scale (BFAS; original version: Andreassen et al., 2012; German version: Brailovskaia & Margraf, 2017); Smartphone Addiction Scale – Short Version (SAS-SV; Kwon, Kim, Cho, & Yang, 2013); Smartphone Addiction Inventory (SPAI; Lin et al., 2015), or by the Fear of Missing Out scale (FoMOS) developed by Przybylski et al. (2013). Several studies also adapted and developed their own scales, e.g. the Smartphone Withdrawal Scale (SWS; Eide et al., 2018) based on the Cigarette Withdrawal Scale by Etter (2005) and a smartphone addiction questionnaire adapted from Young (1999) by Zhou et al. (2020) or a measure of craving adapted by Wilcockson et al. (2019), initially designed as a measure of alcohol-craving (Love, James, & Willner, 1998).

Measures of Subjective Well-Being

The studies examined the participants' subjective well-being using a multitude of measures. See Table 1 for a tabular overview. The most prevalent measure of affective well-being was the Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988), the related and internationally validated short form version (I-PANAS-SF; E. R. Thompson, 2007) or the Italian version (Terracciano, McCrae, & Costa, 2003). A variant of this scale was applied in seven studies, although the number of items administered varied across the studies. The following other measures of affective well-being (or related constructs, including measurement of anxiety and stress) were administered in full, or partially with selected items deemed relevant: The Depression and Anxiety Stress Scale 21 (DASS-21; Lovibond & Lovibond, 1995), Medical Outcomes Study Short Form 36 (MOS-SF-36; Ware & Sherbourne, 1992), Intensity and Time Affect Survey (ITAS; Diener, Smith, & Fujita, 1995), Spielberger State-Trait Anxiety Inventory (STAI; Spielberger, Gorsuch, &

Lushene, 1970) and the six item version (STAI-6; Marteau & Bekker, 1992), Beck Depression Inventory II (BDI-II; Beck, Steer, & Brown, 1996), Center for Epidemiologic Studies Depression Scale (CES-D; De Vaus, 2001), Perceived Stress Scale (PSS; S. Cohen & Mermelstein, 1983) and the Brief Mood Introspection Scale (BMIS; Mayer & Gaschke, 1988). Allcott et al. (2020) inquired about the participants' experience of positive emotions by experience sampling via SMS, and Mosquera et al. (2019) adapted a single item concerning depressive symptoms from the OECD Better Life Initiative (OECD, 2013).

The most prevalent measure of cognitive well-being, applied in six studies, was the Satisfaction With Life Scale (SWLS) in its original form (Diener, Emmons, Larsen, & Griffin, 1985) or Italian version (Di Fabio & Gori, 2015), followed by the Warwick-Edinburgh Mental Well-Being Scale (WEMWBS; Tennant et al., 2007), applied in two studies. The following other measures of cognitive well-being were used: Ryff Psychological Well-Being Scale (PWB; Ryff, 1989), Subjective Happiness Scale (SHS; Lyubomirsky & Lepper, 1999), Quality of Life Scale (QOLS; Flanagan, 1982) and the Minnesota Satisfaction Questionnaire (MSQ; Weiss, Dawis, & England, 1967). Allcott et al. (2020) inquired about happiness using experience sampling via SMS.

Social connectedness was primarily measured in terms of perceived loneliness. The Three-Item Loneliness Scale (TIL; M. E. Hughes, Waite, Hawkey, & Cacioppo, 2004), and the Social and Emotional Loneliness Scale for Adults – Short form (SELSA-S; DiTommaso, Brannen, & Best, 2016) were applied in two studies respectively. The following other measures of loneliness were used: Multidimensional Inventory of Loneliness Experience (MILE; Leontiev & Osin, 2013) and the UCLA Loneliness Scale (Russell, Peplau, & Cutrona, 1980). Social connectedness was also measured using the Social Connectedness Scale - Revised Version (SCS-R; Lee & Robbins, 1995), and the Interpersonal Support and

Evaluations List (ISEL; S. Cohen & Hoberman, 1983). Allcott et al. (2020) inquired about loneliness using experience sampling via SMS.

Self-esteem was only measured explicitly in a single study (Hunt et al., 2018) with the use of the Rosenberg Self-Esteem Scale (RSES; Rosenberg, 1979). In brief, there was substantial variation among measures utilized to examine the participants' subjective well-being despite the relatively prevalent use of PANAS and SWLS as measures of affective and cognitive well-being, respectively.

Effects of Restriction of Social Media Use on Subjective Well-Being

See Table 1 for a full overview of the results of the individual, included studies. The majority ($n = 12$) of the included studies found a positive effect of restricting social media use on measures of subjective well-being (Allcott et al., 2020; Brailovskaia et al., 2020; Brown & Kuss, 2020; Fioravanti et al., 2020; He et al., 2020; N. Hughes & Burke, 2018; Hunt et al., 2018; Mosquera et al., 2019; Tromholt, 2016; Turel et al., 2018; Wolf, 2016; Zhou et al., 2020), some studies ($n = 5$) did not identify any significant effects (Agadullina et al., 2020; Eide et al., 2018; Hall et al., 2019; Stieger & Lewetz, 2018; Wilcockson et al., 2019), while a minority of studies ($n = 2$) found a negative effect (Vally & D'Souza, 2019; Vanman et al., 2018). As the included studies vary with regards to essential characteristics such as experimental design, number of participants, measures and statistical analysis applied, the reported results will not provide specific statistics, but rather a verbal summary of the reported findings, with the exception of magnitude of effects (Cohen's d , eta squared or partial eta squared) or Intention to Treat estimates (ITT), if provided in the originating article. The given interpretation of effect size refers to the commonly used benchmarks introduced by Cohen (1988), although it is acknowledged that this should not be considered an absolute indication of whether or not the intervention in question could have substantial effects or meaningful consequences in a broader context (Thompson, 2007). If the interpretation of

effect size given by the respective authors does not coincide with common benchmarks, their reported interpretation will be reproduced. It should be noted that due to variations in study design, the effect sizes are not necessarily fully comparable across studies (Lakens, 2013). Finally, differences in absolute scores on well known clinical instruments (e.g., Beck Depression Inventory II) will be provided if they are deemed to clarify the nature of the results without further statistical context.

Main Results Categorized According to Type and Duration of Intervention

In the following sections, the main results from the included studies will be categorized and described according to the type and duration of the experimental/assigned interventions. Short-term abstinence will hereby be defined as a full and continuous restriction of use lasting less than a week, medium-term abstinence is defined as 1-2 weeks of abstinence, and long-term abstinence is defined as more than two weeks of abstinence. One of the studies (Hall et al., 2019) is included in two of the categories mentioned above, as it contained four experimental conditions with varying lengths of abstinence. The category of "moderation of use" will include all of the studies that did not assign their participants to continuous abstinence, but rather to a condition of restriction where use was limited but not altogether ceased, or where abstinence was limited to a specified context (e.g., before bedtime).

Short-Term Abstinence. A total of three studies falls within this category, assigning their participants to a condition of abstinence lasting less than a week. Two studies (Eide et al., 2018; Wilcockson et al., 2019), lasting three days and 24 hours respectively, did not report any statistically significant main effects for condition on measures of subjective well-being, while the third study (Vanman et al., 2018), with abstinence lasting five days, found that taking a break from Facebook resulted in reduced subjective well-being.

Medium-Term Abstinence. A total of eight studies examined the effect of full abstinence from various social media platforms for one week, revealing conflicting results of closely related interventions on measures of subjective well-being. Five of these studies (Brown & Kuss, 2020; Fioravanti et al., 2020; Mosquera et al., 2019; Tromholt, 2016; Turel et al., 2018) found significant beneficial effects of abstinence on measures of stress and affective and cognitive components of well-being. Two studies (Hall et al., 2019; Stieger & Lewetz, 2018) did not identify any significant effects. Finally, Vally and D'Souza (2019) found significant adverse effects of abstinence on both cognitive and affective components of well-being and with regards to social connection.

Long-Term Abstinence. Three of the included studies assigned their experimental group to two or more weeks of continuous abstinence from social media. Two of the studies, Agadullina et al. (2020) and Hall et al. (2019), lasting four weeks and between one and four weeks, respectively, did not find any significant effects of abstinence on measures of subjective well-being. On the other hand, Allcott et al. (2020), exploring the effects of 4 weeks of abstinence, found that deactivation of Facebook significantly increased reported subjective well-being across several measures.

Moderation of Use. Six studies (Brailovskaia et al., 2020; He et al., 2020; N. Hughes & Burke, 2018; Hunt et al., 2018; Wolf, 2016; Zhou et al., 2020) examined the effect of moderating the use of smartphones or social media, in the form of limitations on daily time spent on social media, daily breaks or situationally specific restrictions. All six found significant beneficial effects of their experimental condition on various measures of subjective well-being.

Mediating and Moderating Factors Identified

The included studies considered and examined various factors that might have influenced the experimental conditions' effects on subjective well-being. According to the

second research question, the findings related to social connection, heavy baseline use, withdrawal, and gender will be summarized.

Social Connection

Five studies examined the effect of restricting social media use on perceived social connection and experience of loneliness explicitly. Two of these studies (Agadullina et al., 2020; Hall et al., 2019) set out to examine how quitting social media might influence perceived loneliness. Neither found statistically significant associations between four weeks of abstinence and social or emotional loneliness. Two studies found beneficial effects of restriction on social connection: Brown and Kuss (2020) report significant increases in participants' perceived social connection after a week of abstinence from social media, and that scores on social connection correlated with other measures of subjective well-being. Here it is worth noting that the study did not restrict messaging applications during the abstinence condition. Hunt et al. (2018) found that limiting social media use over three weeks resulted in significant reductions in loneliness. However, they did not entirely restrict participants' social interactions on social media, as they were allowed 10 minutes of daily use. Finally, the study by Vally and D'Souza (2019) found that abstinence resulted in experiences of profound loneliness and that this effect was statistically significant with a large effect size.

In addition, two studies (N. Hughes & Burke, 2018; Zhou et al., 2020) examined the effects of restriction on social connection qualitatively and found that restricting smartphone use was associated with reports of improved off-line relationships. The participants attributed this improvement to an increased opportunity to focus on close relationships and better communication with their partners. Regarding the influence of baseline characteristics of participants' social connection on the effects on subjective well-being, Allcott et al. (2020)

found that deactivation of Facebook for four weeks had less beneficial effects on well-being for participants who had more social interactions and were happier at baseline.

Baseline Use and Addiction Constructs

A majority (n = 11) of the included studies examined the effects of restriction in relation to individual differences in baseline use or scores related to an addiction construct. Six studies examined the interaction between the amount of use at baseline and the effects of restrictions on subjective well-being, without referring to addiction-constructs. A majority (Allcott et al., 2020; Hunt et al., 2018; Vally & D'Souza, 2019; Vanman et al., 2018) did not find any significant moderating effects of whether users were categorized as light or heavy on subjective well-being. Tromholt (2016), on the contrary, found that the beneficial effects of abstinence from Facebook were significantly larger for heavy users, that moderate users experienced some positive effects, and that light users did not show any increase in subjective well-being by quitting Facebook. A further five studies found associations between addiction-constructs and their respective experimental conditions. Four of them found that participants with heavy or excessive use of social media at baseline experienced more beneficial effects of abstaining or moderating use during their assigned intervention. Brailovskaia et al. (2020) applied the Bergen Facebook Addiction Scale (BFAS) and found that abstinence led to a slight increase of symptoms during the first week, followed by a significant decrease. Turel et al. (2018) also applied BFAS and found that participants exhibiting excessive use at baseline experienced greater reductions in stress when abstaining from social media, than typical users, although they were relatively less successful at maintaining abstinence. N. Hughes and Burke (2018) measured addiction with the Smartphone Addiction Scale (SAS-SV) and found a small but significant decrease in addiction-related scores due to restricting smartphone use in the bedroom. In a similar fashion Zhou et al. (2020) evaluated their participants within a social media addiction (SMA) framework. They found that participants rated with high scores

on SMA experienced increased life satisfaction sooner than users with low scores on SMA, indicating a quicker beneficial response to social media restrictions in the former group. On the other hand, Wilcockson et al. (2019) examined the relationship between measures of craving, smartphone addiction (SPAI), and mood and anxiety when assigning participants to 24h smartphone abstinence. The study found that heavy use and craving correlated and that craving increased after abstinence, but without significant changes to mood or anxiety.

Fear of Missing Out and Withdrawal

Five studies also investigated how restriction affected scores on withdrawal-related constructs such as Fear of Missing Out (FoMO) and craving, and how they interacted with measures of subjective well-being. Brown and Kuss (2020) found that abstinence from social media led to a significant decrease in FoMO and smartphone use following the intervention. They also report a significant negative relationship between social connection and FoMO change scores. Hunt et al. (2018) also examined FoMO and found a significant but small decrease in scores from baseline to the end of the intervention in both the experimental and the control group, suggesting that this might be mediated by self-monitoring of social media use. Furthermore, the study found that baseline FoMO predicted more social media use prospectively. Zhou et al. (2020) found that the most common negative feeling related to abstinence was FoMO. This was substantially alleviated in the course of the intervention. Stieger and Lewetz (2018) found that participants abstaining from social media experienced withdrawal symptoms, such as craving and boredom. A substantial number of participants (59%) relapsed at least once during the intended abstinence period. The participants also reported that they felt significant social pressure from their friends to be active on social media during the intervention. Eide et al. (2018) explicitly set out to examine the effects of smartphone abstinence on withdrawal and FoMO. They found that participants assigned to abstinence for three days experienced significant increases in withdrawal and FoMO

compared to the control group, further supporting the notion that abstinence could lead to withdrawal-symptoms.

Gender

Three of the included studies (Brown & Kuss, 2020; Vanman et al., 2018; Wolf, 2016) did not find any significant differences between men and women on their respective measures of subjective well-being, while two other studies revealed conflicting interactions between gender and effects. Fioravanti et al. (2020) found that quitting Instagram only significantly improved scores on positive affect for women who reported a tendency toward social comparison, while scores on life satisfaction increased significantly among all women independent of comparison-tendencies. No such interactions were detected among the male participants. Mosquera et al. (2019), on the other hand, found the opposite effect of gender, where significant reductions in depressive feelings were found exclusively for male participants.

Risk of Bias Within Studies

See appendix E for a full overview of the results from the Risk of Bias evaluation. The Fleiss' Kappa for the degree of agreement between the two reviewers was calculated to be .905. Adjusted for the fact that three of the seven domains evaluated were judged to be of equal risk of bias across all studies included and might not be considered as domains where judgements could have varied, the Kappa was found to be .847. Both results indicate almost perfect agreement (Landis & Koch, 1977). Due to the complex nature of behavioral interventions that are self-administered by the participants, the risk of bias is inherently high. The number of domains rated as with a high or unclear risk of bias ranges from two to five within the included studies. As a result, all studies were identified as with an overall high risk of bias. While most studies describe the use of random sequence generation, all remain with a high risk of bias resulting from the lack of availability of allocation concealment.

Performance is also considered to be a risk factor across all studies. As this might be considered a result of the nature of the interventions themselves, it is not necessarily an indication of low quality of the respective study designs. Regarding detection bias, all of the included studies are rated as having a low risk of bias, according to a conventional interpretation of self-report measures as blinded (Munder & Barth, 2018). Incomplete outcome data were judged to be present in 6 of 19 studies, most often due to high rates of attrition and lack of compliance (without reported statistical procedures to facilitate attenuated interpretation of effects). The greatest variance in risk of bias resulting from study design was found in the domain "Other sources of bias", with the applied focus on verification of intervention integrity. While some studies went to great lengths to provide manipulation checks, others left the task of ensuring adherence to the experimental condition to the participants.

Manipulation Control

The included studies applied various strategies to ensure the integrity of their intended interventions. Five studies (Brailovskaia et al., 2020; N. Hughes & Burke, 2018; Turel et al., 2018; Vanman et al., 2018; Wolf, 2016) did not report any technical interventions or strategies to facilitate compliance with the treatment condition. Two studies (Tromholt, 2016; Vally & D'Souza, 2019) asked their participants to delete their Facebook and social media applications at the beginning of the abstinence period. Three studies monitored activity through time management software (Brown & Kuss, 2020; Hunt et al., 2018; Zhou et al., 2020). Five studies monitored the participants' engagement with relevant social media accounts by periodically checking the availability of (presumptively) deactivated URLs (Allcott et al., 2020; Fioravanti et al., 2020) or by befriending the participants' social media accounts (Agadullina et al., 2020; Hall et al., 2019; Mosquera et al., 2019), thereby gaining access to activity status (e.g., the "last active" feature on Facebook) and other indications of

use such as posting, liking, etc. Stieger and Lewetz (2018) utilized a software solution (The Personal Analytic Companion) for Android smartphones to implement their experience sampling design, which provided information about the users activity and produced reminders to facilitate compliance with the treatment condition. He et al. (2020) utilized the "manage screen time" function on Huawei and iPhone smartphones (if available), activating the mode "this is my child's phone" to restrict use at "bedtime" by setting a password. For participants utilizing other brands of smartphones, reminders via SMS and daily follow-up were initiated by the researchers. At the most restrictive end of the spectrum, two studies limited physical access to participants' smartphones during the abstinence period, for example, requiring that participants' smartphones were turned off and confiscated over the weekend (Eide et al., 2018). Similarly, Wilcockson et al. (2019) secured the smartphones in plastic evidence bags and instructed participants to open them only in the case of an emergency. Despite these physical constraints, the studies did not control whether participants accessed social media through other means.

Attrition and Compliance

The included studies exhibit considerable variation, both in terms of the degree of attrition and compliance observed, and how (and if) they subsequently controlled for this in their statistical analysis. In effect, several studies conflate attrition and compliance, as non-compliers were removed from their final analysis. Four studies do not report any attrition or compliance issues (Eide et al., 2018; He et al., 2020; N. Hughes & Burke, 2018; Vally & D'Souza, 2019). Three studies (Agadullina et al., 2020; Brown & Kuss, 2020; Zhou et al., 2020) experienced limited attrition or removal on the grounds of non-compliance of less than 5%. Brailovskaia et al. (2020) and Fioravanti et al. (2020) report non-compliance rates of 5.7% and 5%, respectively, but kept the non-compliers in the statistical analysis. Tromholt (2016) also kept the non-compliers in the final analysis but experienced a more substantial

19% attrition from pre to post-treatment, with another 13% of the participants having admitted to using Facebook at least once while assigned to the experimental group. The study also reported that the mean daily use of Facebook decreased by 15 minutes in the control group during the intervention. When comparing pre-test data, the study did not find any significant differences between dropouts and the remaining participants. Mosquera et al. (2019) report a high degree of compliance and an attrition rate of 10% but without finding significant differences between dropouts and the rest of the participants in terms of demographic- and social media use characteristics at baseline. Vanman et al. (2018) report that 10.9% of the participants did not complete the study. However, a substantial degree of compliance according to the assigned experimental condition was observed. Wilcockson et al. (2019) reports 20% attrition from their study, and that the participants who quit during the experimental condition scored higher on measures of social media addiction at baseline. Wolf (2016) reports 27% attrition equally distributed among the crossover groups and 7% non-compliance. In the study by Wolf (2016), 44% of the participants were removed on the grounds of not complying or failure to provide sufficient data. An attrition analysis was performed, revealing that the remaining participants were older and had achieved a higher educational level than the removed participants. Stieger and Lewetz (2018) report an attrition rate of 29%, with 59% of the participants having used social media at least once during the abstinence condition. Allcott et al. (2020) report an attrition rate of 44% from the point where their participants were randomly assigned to the time of their impact evaluation. Turel et al. (2018) describe varying degrees of compliance, with 61.8% of the participants abstaining from Facebook for a full week, while 15.2% abstained for less than four days. Finally, Hunt et al. (2018) report the highest amount of attrition during their study, with an attrition rate of 79% at their follow-up data collection point (but with no attrition prior to follow-up). They

also report compliance issues concerning the participants' adherence to the experimental condition and not providing sufficient screenshots during the study.

Discussion

The objective of the present review was to collate and summarize the results from studies that have employed an experimental design to examine the effects of restricting social media use on measures of subjective well-being. The studies were categorized according to the type and duration of their respective interventions. In the following summary, the most salient findings will be emphasized and contrasted. Subsequently, the results will be discussed regarding the mediating and moderating factors identified in the included studies and in light of prior research presented in the introduction. Finally, the respective limitations and strengths of the individual studies and the current review will be discussed, as well as practical and scientific implications.

Summary of Findings

The number of studies employing an experimental design to examine the subject matter has increased substantially in the last couple of years. Based on the applied inclusion criteria, the first two eligible studies were published in 2016, and all of the remaining 17 studies were published within the last three years. A clear majority ($n = 12$) of the included studies found that restrictions resulted in a significant increase of subjective well-being, in contrast to five studies without significant results and two studies that found adverse effects. There is evidence to suggest that there are beneficial effects of taking a break or moderating one's use of social media platforms on subjective well-being. Some of these studies reported results with moderate or large effect sizes. However, a clear majority found relatively small but significant effects, in agreement with the overall sum of results from prior cross-sectional research. One might also speculate that longer durations of moderation or abstinence could have consolidated or enhanced the observed effects. Although these effects may be of limited

size in the study sample as such, they might have more substantial effects in the population as a whole, according to the arguments put forward by Twenge and Campbell (2019), arguing that limited effects may have importance when considered on a large scale. That a minority of studies did not find significant effects might be a result of the relative limited strength of the respective manipulations, as one would expect that small effects will not always turn out significant, as a result of limited statistical power, lack of compliance, and inherent limitations (e.g., reliability and sensitivity) of self-report measures. It could also reflect substantial heterogeneity among the participants. Further, there was a high degree of variation with regards to study designs, choice of outcome measures, and how the interventions were administered and controlled, which resulted in a limited degree of comparability between each individual study. These somewhat conflicting findings might arguably reflect the ambiguous nature of social media use and its interaction with characteristics of the individual users. The complexity of social media use, which may involve both positive and adverse effect, may also explain why two of the included studies found a significant inverse relationship between abstinence from social media use and well-being.

When categorized according to degree and duration of the restriction, the studies revealed the following trends: First, there was not a clear agreement among studies that had assigned their participants to continuous abstinence of any duration. However, the majority reported a positive effect on measures of subjective well-being. Second, among the continuous abstinence-durations, there was found most support for a beneficial effect from abstinence lasting one week (categorized as medium-term abstinence), although the category included the most salient counterparts within the study (Tromholt, 2016; Vally & D'Souza, 2019), that reported opposing results. Finally, the most consistent evidence is found among studies that have sought to moderate social media use in terms of reduction of daily use or by situationally specific restrictions. Here all the included studies found beneficial effects. This

can be interpreted in support of prior research that have found that light users report higher well-being than non-users, and that the adverse effects associated with social media use are primarily found among heavy users (Twenge & Campbell, 2019). Furthermore, that complete abstinence from social media can result in negative feelings related to perceived disconnection from one's social environment (Hoffner et al., 2016). One could also speculate that it might be unattainable for many users to experience complete abstinence from social media due to its universal nature in social groups and how it manifests in a myriad of ways outside the confines of the social media applications themselves. This could result in that abstinence, for some users, might be experienced more like passive use, which is found to be inversely correlated with subjective well-being (Verduyn et al., 2015). Among young users, it might not be feasible to replace online social interaction with the same level of offline social interaction, at least not in the course of a couple of weeks (Twenge, Martin, et al., 2019),

Mediating and Moderating Factors

The included studies primarily indicate that spending less time on social media improves participants' perceived social connection, both in terms of quality and quantity. Some of these studies also find that the perceived degree of social connection correlates with other well-being measures, supporting a notion that social connection might mediate some of the effects of restriction on subjective well-being. Such an association is further supported by the included study (Vally & D'Souza, 2019) that reported the most aversive effects of abstaining from social media. It highlights perceived loneliness as a primary adverse effect experienced by the experimental group. Another finding that supports the notion of social connection as an important mediating variable with regards to well-being, is that among the studies that limited their restriction to a single social media application, such as Facebook or Instagram, or that excluded direct messaging from their restriction, all but one study (Vanman et al., 2018) found beneficial effects on well-being. This may suggest that people

experience the most benefit from moderating their social media use when they are still able to have regular contact with friends and family online, which is in agreement with prior research that has highlighted the function of social media in maintaining existing relationships (Ellison et al., 2007), and how direct communication catered to the individual user is associated with positive psychological states (Burke & Kraut, 2016). Further, that being able to keep in touch with friends while reducing exposure to impersonal posts (such as pictures and videos) and limiting interaction with one's peripheral social sphere may account for at least some of the subsequent increase in subjective well-being. Such a differentiation of the ambiguous nature of social media use is supported by prior research that emphasizes the negative effects of upward social comparison and envy (Hogue & Mills, 2019). It can also be interpreted as in agreement with a curvilinear perspective on social interaction where heavy use, or exposure, can lead to feelings of social overload (Maier et al., 2015). The relative influence of such dynamics might depend on characteristics of the individual users. For example, Fioravanti et al. (2020) found that women with a tendency to engage in social comparisons online experienced the most benefits from taking a break from Instagram. Further, Tromholt (2016) found greater effects for users that felt considerable envy when using Facebook at baseline. In brief, the evidence suggests that the relationship between restrictions of social media use and perceived social connection is influenced both by degree of restriction, by baseline characteristics of the individual user and that the degree of social connection probably explains variance in the wider construct of subjective well-being.

Regarding the effect of individual variation in baseline use, the findings varied, primarily according to how baseline use was measured and conceptualized. Within the studies that temporally measured baseline use (primarily via self-reported estimates), there was limited evidence to suggest individual differences in usage as a meaningful moderating variable, with the exception of Tromholt (2016) that identified significantly greater effects for

heavy Facebook users. Among the studies that applied a measure related to an addiction-construct to categorize the relative differences in usage at baseline, the majority identified this as a variable with explanatory power. A majority of these studies found that participants with heavy or excessive social media use at baseline experienced more beneficial effects of abstaining or moderating use during their assigned intervention. Several studies also found that these participants found it harder to comply with an abstinence-condition and that some experienced withdrawal symptoms in support of an addiction perspective on heavy social media use. However, Wilcockson et al. (2019) argue that the lack of corresponding increase in negative mood and anxiety undermines the comparison of heavy social media use with other forms of addiction, such as substance abuse. A majority ($n = 15$) of the included studies relied on self-report measures of social media use, which has been criticized on the basis of limited reliability (Ellis, 2019; Ryding & Kuss, 2020), which again may suggest caution when interpreting the viability of baseline use as a significant moderator on the basis of the present review. In brief, the included studies indicate that heavy users may benefit from abstinence more than typical or light users. However, they also might experience more negative effects of abstinence initially, and that they are more likely to relapse or be non-compliant with such an intervention.

The experience of Fear of Missing Out, which is related to social connection, heavy use, withdrawal, and addiction, was found to be a common negative experience of abstaining from social media use. Further, short-term abstinence led to significant increase of reported FoMO, although some studies suggest that this feeling decreased when participants were abstaining for more extended periods. It was also suggested that social pressure from friends might contribute to the feeling of FoMO. The direction of the relationship between FoMO and social media use is somewhat unclear on the basis of the included studies, as Brown and Kuss (2020) found that baseline differences in social media use predicted FoMO more than

FoMO predicted usage, while Hunt et al. (2018) found that baseline FoMO predicted more social media use. Further, although measures of FoMO are associated with other mediating variables, it is unclear to what degree FoMO mediates overall subjective well-being when abstaining or moderating social media use. The findings lend some support to a withdrawal perspective on restricted use by the fact there was some evidence for a curvilinear effect, with slight negative effects of short abstinence that reversed when participants abstained for more than a week.

Based on the research field as a whole, gender/sex may be the single moderating variable with the most explanatory effect on the relationship between social media use and subjective well-being, as multiple studies suggest that women may be more vulnerable with regards to developing addiction-like social media use, and to be negatively affected by use (Cecilie Schou Andreassen, Pallesen, & Griffiths, 2017; Su et al., 2020). One could assume that such effects related to gender would manifest when restricting social media use. The included studies did not support a clear trend with regards to gender as a moderating factor. Several studies did not find significant interaction effects of gender, while the two studies (Fioravanti et al., 2020; Mosquera et al., 2019) that found such effects reported contradicting results. It is worth noting that these two studies addressed abstinence from two different social media platforms, Facebook and Instagram, that might affect their users differently. Gender might have a more pronounced influence when considered in relation to specific subcategories of social media platforms and activity patterns. Furthermore, the skewed gender distribution, in a majority of the included studies, arguably limits the generalizability of these results.

Finally, the sum of findings within the review may indirectly suggest a role for a displacement perspective in explaining the association between social media use and subjective well-being. Perhaps the positive effects found are partially mediated by the

alternative activities some users engage in when they are spending less time on social media, that in turn are positively associated with well-being, such as physical activity (Brailovskaia et al., 2020), more offline social interaction (N. Hughes & Burke, 2018) or generally healthier living and less procrastination (Mosquera et al., 2019). These potentially beneficial effects would necessarily depend on characteristics of the user, as one could assume that individuals who were already enjoying a certain level of well-being, social integration and physical health would have easier access to such effects.

Limitations of the Included Studies

There are a number of limitations that may affect the validity of the findings from the included studies. A primary concern is related to the recruitment of volunteers to participate in abstinence and moderation experiments. One could assume that various forms of selection bias are present. The participants might exhibit bias with regards to psychological motivation to participate or have non-representative characteristics of usage patterns or in other way differ from the rest of the population. This could manifest in ways that could both weaken or enhance the measured effects in ways that could obscure or misrepresent the true effects of social media restriction. This could be equally true of mediating and moderating factors examined. For instance, one could imagine that individuals who exhibit heavy use of social media or addiction-like usage patterns might be both more or less likely to participate. Perhaps heavy users are especially motivated to seek a break from social media in an effort to alleviate unwanted experiences. Alternatively, perhaps the opposite is true. Heavy users might shy away from such experiments, foreseeing an aversive experience. Heavy baseline use might also be associated with selective attrition or lack of compliance. This is supported by several of the included studies that found higher attrition rates and less compliance among participants rated as excessive users at baseline (e.g., Turel et al., 2018; Wilcockson et al., 2019). Another general limitation is the expectancies the participants may have towards the

intervention, as one might assume that many would be influenced by demand characteristics inherent in the experiment. With regard to the social desirability associated with limiting social media use, participants could be led to conclude that partaking in such an experiment should have beneficial effects, and report outcomes in line with these expectancies (Tromholt, 2016), or report less, or more desirable amounts of use when assigned to an abstinence condition (Wolf, 2016). Variations in motivation and expectancies could also explain the divergence between results from studies with similar designs, which might be attributed to differences in psychological preparedness and receptiveness to the experience of abstinence (Vally & D'Souza, 2019). Another limitation is the possibility that self-monitoring, and perceived self-efficacy when successfully complying with the assigned experimental condition, might mediate some of the subsequent effects on measures of subjective well-being. This, in turn, can obscure or enhance the effects of restriction in ways that might not generalize to abstinence or moderation outside of the experiment. Further, many of the included studies relied primarily on recruitment from student courses or university research pools, which by itself reduces the degree to which the participants can be seen as representative of the population in general. By exposing many individuals from the same social environment to simultaneous abstinence from social media, one might also create meta-individual social changes in the environment that might have a separate effect on the individual experience of abstinence.

The included studies varied with regards to what steps they took to ensure the integrity of their intended intervention. Many reported issues with compliance, both in terms of being unable to ensure compliance or that participants admit to a limited degree of compliance to their assigned condition. Related to this issue is the substantial amount of attrition reported. When analyzing the participants who dropped out, Wilcockson et al. (2019) found that they had higher scores on measures related to smartphone addiction, which may

indicate that the heavy users were unable or unwilling to follow through with the intervention, which may have affected the reported findings. Further, many of the included studies do not differentiate between different social media platforms, which might obscure the true effects of abstaining from specific forms of social media. Fioravanti et al. (2020) argue that the literature concerning Facebook use and subjective well-being should not be generalized to other social networking sites because of their distinct features which might influence associations with subjective well-being. One could further argue that Facebook is disproportionately represented among these studies, at least if one considers that Facebook is probably not the primary social media platform among women in their twenties today (Anderson & Jiang, 2018), which make up most of the participants in the studies included in this review.

Limitations of the Current Study

The current study has several important limitations. A primary limitation pertains to how the outer perimeter of the review was defined. First, the review could have applied broader inclusion criteria, for instance including grey literature or non-randomized natural experiments. It could also have included studies employing other measures than those subsumed by the construct of subjective well-being directly, (e.g., studies on cognitive effects of smartphone deprivation, physical activity, sleep measures, academic performance or psychopathological outcomes) as they all arguably influence or interact with subjective well-being. As several of the included studies were published within months of writing up the present thesis, there is a high probability that a repeated search in the near future would yield more studies, which limits the comprehensiveness of the current review if consulted in the future. Further, the variation in measures applied to examine how the restriction of social media use affects subjective well-being may result in low comparability across studies and limit the contributing value of individual studies when seeking to examine overall trends of

the relationship between restriction and subjective well-being. When summarizing and reporting the results of the included studies, the current review assumes that a significant finding within one of the applied scales or instruments related to one of the overarching constructs of subjective well-being equals a beneficial effect on overall subjective well-being (in line with several of the included studies), which might be a somewhat unfounded inference. Suppose a study measures subjective well-being with five different scales and finds significant effects within one of these scales. In that case, one could argue that it would not be fair to imply that the intervention had a significant effect on overall subjective well-being. The variation in measures and heterogeneity of designs also limited the opportunity to perform a meta-analysis or communicate the relevant results in a more graphic manner. It is feasible that applying more narrowly defined inclusion criteria (such as only including studies utilizing the most prevalent measures, e.g., PANAS and SWLS) could have resulted in more comparable studies, that in turn would enable a more structured synthesis, to clarify and communicate the relative and absolute differences in effects. Finally, there are several methodological limitations. Data extraction was performed by the author without a second independent rater, increasing the risk of errors in reporting the results. Secondly, the Cochrane Risk of Bias Tool might not have been optimal to evaluate bias, as the included studies had a high degree of homogeneity within several evaluative domains.

Practical and Scientific Implications

The present review has highlighted some limitations within studies that have sought to examine the effects of abstinence or moderation of use on measures of subjective well-being. These limitations imply some suggestions for future research. First, the development and utilization of objective measures to determine individual differences in overall usage of social media, and perhaps more importantly, to determine the use of specific social media applications, offers an opportunity to examine effects on a more precise level. This may, in

turn, help to elucidate the complex interactions involved. Future research could benefit from more detailed data regarding the users' characteristics and their use of various applications. This could facilitate a better understanding of the mechanisms underlying the effect of restricting social media use. One could see this as increasingly important with the advent of new applications such as TikTok, which differ substantially in their function, and perhaps in how they affect their users. Objective measures could also make it easier to ensure manipulation control. Second, it seems apparent that the field could benefit from a consensus on what measurement scales to utilize to evaluate subjective well-being. A more standardized approach would make studies more comparable. Third, as one finds the most consistent beneficial results among studies that explore the effects of moderation of use, future studies that seek to investigate such benefits may focus on interventions that do not involve complete and continuous abstinence.

The findings within the review suggest that heavy users may benefit from moderation of use, and that there seem to be limited downsides in reducing exposure to the public content found in most social media platforms. This could conceivably translate into a recommendation for individual users to moderate use, especially if they experience subjectively adverse effects from excessive social media usage and are motivated to attenuate these effects. However, one should acknowledge that the potential benefits related to spending less time on social media is related to opportunities provided and created in the real world. Furthermore, as prior research has found an association between heavy use and mental health issues, it appears relevant to investigate if, and how, moderation of use could benefit clinical groups.

Conclusion

In conclusion, the review found that the majority of studies observed beneficial effects of restricted social media use on measures of subjective well-being. Notably, these

benefits were most pronounced through an approach of moderated use rather than complete abstinence. Restrictions seem to have more substantial effects for heavy social media users than for light or casual users. It also found that although most social media users, and especially younger users, are tightly embedded in their online environment, temporary abstinence did generally not result in substantial negative changes in subjective well-being. Further, the review underscores the importance of distinguishing between different users and their respective usage. This could have implications both for effects identified in future research and policy recommendations or interventions on an individual level.

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APPENDIX

Appendix A. Search Items Sorted by Criteria

Social Media	Intervention	Study Design	Well-Being
social media	restrict*	experiment*	well-being
social platform*	limit*	randomized	wellbeing
screen-based media	abstain*	randomised	"well being"
mobile device*	abstin*	RCT	mood
online social network*	minim*	"randomly assigned"	happiness
social networking site*	intervention*	"treatment group*"	loneliness
smartphone*	moderat*	"control group*"	stress
iphone*	quit*	"controlled design"	distress
facebook	"a break"	"matched controls"	connectedness
instagram	separation	within-subject*	relatedness
tiktok	reduc*	"within subject*"	"self esteem"
wechat	detox*	"between subject*"	self-esteem
twitter	withdraw*	between-subject*	anxiety
whatsapp	disconnect*		depress*
snapchat	eliminat*		"life satisfaction"
	deprivation		quality of life
	refrain*		PANAS
			POMS
			SWLS
			MSQ
			SELSA
			PSS

Note. Abbreviated items (e.g., PANAS) searched in expanded form. See appendix C for an example of the applied search strategy.

Appendix B. Example of Search Strategy

Database: Web of Science, October 26th, 2020

TS = ("social platform*" OR "screen-based media" OR "mobile device*" OR "online social network*" OR "social networking site*" OR smartphone* OR iphone* OR "social media" OR facebook OR instagram OR tiktok OR wechat OR twitter OR whatsapp OR snapchat)

TS = (restrict* OR limit* OR abstain* OR minim* OR abstin* OR intervention* OR moderat* OR quit* OR "a break" OR separation OR reduc* OR detox* OR withdraw* OR disconnect* OR eliminat* OR deprivation OR refrain*)

TS = (experiment* OR randomized OR RCT OR randomised OR "randomly assigned" OR "treatment group*" OR "control group*" OR "controlled design" OR "matched controls" OR within-subject* OR "within subject*" OR "between subject*" OR between-subject*)

TS = (stress OR distress OR mood OR happiness OR lonely OR loneliness OR wellbeing OR "well being" OR well-being OR connectedness OR "self esteem" OR self-esteem OR anxiety OR depress* OR relatedness OR "positive and negative affect schedule" OR "profile of mood states" OR "life satisfaction" OR "quality of life" OR "satisfaction with life scale" OR "minnesota satisfaction questionnaire" OR "social and emotional loneliness scale" OR "perceived stress scale")

Note. Fields combined with the Boolean operator: AND. TS = Topic

Appendix C. Data Extraction Items

- a. Bibliography
 - a. Author(s)
 - b. Title
 - c. Year of publication
 - d. Journal
- b. Study setting
 - a. Study design
 - b. Country
 - c. Conflict of interest stated
 - d. Pre-registered protocol reported?
 - e. How social media is defined/assessed
- c. Participants
 - a. Total N
 - b. Mean age (S.D)
 - c. Total age range
 - d. Gender (%)
 - e. Recruitment/selection
 - f. Attrition rate
- d. Intervention
 - a. Type
 - b. Length
 - c. Amount of daily use
 - d. Manipulation control
- e. Outcome
 - a. Relevant measures of use
 - b. Relevant measures of subjective well-being
 - c. Relevant result(s)/effect size
 - i. Main effects
 - ii. Gender difference
 - iii. Social connection (if applicable)
 - iv. Time/effect
 - v. Confidence interval
 - vi. P-value
 - d. Main conclusions
 - e. Factors mediating effect
 - f. Reported methodological issues

Appendix D. Cochrane Risk of Bias Tool

Domain	Instruction	Support for judgement	Judgement
Selection Bias: <i>Random sequence generation</i>	Describe the method used to generate the allocation sequence in sufficient detail to allow an assessment of whether it should produce comparable groups.		
Selection bias: <i>Allocation concealment</i>	Describe the method used to conceal the allocation sequence in sufficient detail to determine whether intervention allocations could have been foreseen in advance of, or during, enrolment.		
Performance bias: <i>Blinding of participants and personnel</i>	Describe all measures used, if any, to blind study participants and personnel from knowledge of which intervention a participant received. Provide any information relating to whether the intended blinding was effective		
Detection bias: <i>Blinding of outcome assessment</i>	Describe all measures used, if any, to blind outcome assessors from knowledge of which intervention a participant received. Provide any information relating to whether the intended blinding was effective.		
Attrition bias: <i>Incomplete outcome data</i>	Describe the completeness of outcome data for each main outcome, including attrition and exclusions from the analysis. State whether attrition and exclusions were reported, the numbers in each intervention group (compared with total randomized participants), reasons for attrition/exclusions where reported, and any re-inclusions in analyses performed by the review authors.		
Reporting bias: <i>Selective reporting</i>	State how the possibility of selective outcome reporting was examined by the review authors, and what was found.		
Other bias: <i>Other sources of bias</i>	State any important concerns about bias not addressed in the other domains in the tool. If particular questions/entries were pre-specified in the review's protocol, responses should be provided for each question/entry.		

Note. Instructions derived from Covidence systematic review software (Veritas Health Innovation, Melbourne, Australia; available at www.covidence.org). Judgement based on further instructions in Higgins et al. (2011). Instructions related to Cochrane risk of bias tool 2.0. (Sterne et al., 2019) also consulted in case of uncertainty.

Appendix E. Results from the Cochrane Risk of Bias Tool

First author, year	Selection bias ^a	Selection bias ^b	Perform. bias ^c	Detection bias ^d	Attrition bias ^e	Reporting bias ^f	Other bias ^g
Agadullina, 2019	Unclear	High	High	Low	Low	Unclear	Low
Allcott, 2020	Low	High	High	Low	Low	Low	Low
Brailovskaia, 2020	Unclear	High	High	Low	Low	Unclear	High
Brown, 2020	Low	High	High	Low	High	Unclear	Low
Eide, 2018	Low	High	High	Low	Low	Unclear	Low
Fioravanti, 2020	Unclear	High	High	Low	Low	Unclear	Low
Hall, 2019	Unclear	High	High	Low	High	Low	Low
He, 2020	Unclear	High	High	Low	Low	Unclear	Low
Hughes, 2018	Unclear	High	High	Low	Low	Unclear	High
Hunt, 2018	Unclear	High	High	Low	High	Unclear	Low
Mosquera, 2020	Low	High	High	Low	Low	Unclear	Low
Zhou, 2020	Unclear	High	High	Low	Low	Unclear	Low
Stieger, 2018	Low	High	High	Low	High	Unclear	Low
Tromholt, 2016	Unclear	High	High	Low	Low	Unclear	High
Turel, 2018	Unclear	High	High	Low	Low	Unclear	High
Vally, 2019	Low	High	High	Low	Low	Unclear	Low
Vanman, 2018	Low	High	High	Low	Low	Unclear	High
Wilcockson, 2020	Low	High	High	Low	High	Unclear	Low
Wolf, 2016	Low	High	High	Low	High	Low	High

Note. ^aSelection bias: Random sequence generation. ^bSelection bias: Allocation concealment. ^cPerformance bias: Blinding of participants and personnel. ^dDetection bias: Blinding of outcome assessment. ^eAttrition bias: Incomplete outcome data. ^fReporting bias: Selective reporting. ^gOther bias: Other sources of bias.