

Decoding Instagram Use: The Impact of Content Engagement and Individual Differences on Young Adults' Well-Being

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Abstract

Young adults increasingly rely on social media platforms for connection and engagement with both private circles, including close and distant social ties, and public personas. Instagram, in particular, enables both public and private interactions while allowing users to engage with content from various resources. This three-wave longitudinal study aims to examine how different types of engagement on Instagram influence the psychological and physical well-being of young people. Through a series of interventions, we will explore whether content engagement dynamics—such as following specific quality content or reducing exposure to harmful content— and harm prevention strategies—such as reporting cyberbullying or online hate encounters, affect well-being

over time. Our research enhances understanding of whether and how the proposed interventions can improve the psychological and physical well-being of young adults.

Evaluations

SERVICE	SUMMARY	VERSION	DATE	EVALUATED
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Registration

This Research Plan submission is the registration.

Materials

There are no digital materials available because the study has not yet started.

Data

There are no data available because the study has not yet started.

Code

There is no code available because the study has not yet started.

Paper

Decoding Instagram Use: The Impact of Content Engagement and Individual Differences on Young Adults' Well-Being

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Introduction

Concerns about the impact of social media on youth have been growing in recent years. Social media plays an important role in the lives of young adults, who actively engage with these platforms to shape their identities, navigate offline experiences, acquire knowledge, and foster social connections. Among various platforms, Instagram is one of the most relevant sources of influence. The developmental phase between ages 18 and 25 is marked by increasing independence, transitions to college, changing jobs, and the formation of new social relationships (Bonnie et al., 2015). Relying on Instagram as a source of information, entertainment, and connection became increasingly high among this demographic (Pew Research, 2024) which is going through a critical period for social and personal development (Wood et al., 2018).

Recent research proposes that the content users engage with on social media, rather than the amount of time spent on these platforms, drives well-being outcomes that range from positive aspects such as social support and hedonic well-being to negative effects like social comparison, anxiety, and depression (Hancock et al., 2022). Yet, in a recent in-depth interview study we found that the content adolescents engage with on Instagram primarily reflects their personal interests, ranging from sports and baking to makeup and life hacks. Additionally, our findings have revealed content's fleeting nature. As one adolescent shared with us "I forgot what I see within five minutes of closing the app". Thus, we must ask: in what ways does content matter? Is it the quantity, type, or quality of content that influences well-being outcomes? Our first question is: How does the content young adults engage with affect their psychological well-being?

In addition to examining content, we aim to explore the heterogeneous effects of social media use. A recent report from the National Academy of Sciences in the U.S. concluded that the impact of

social media on well-being varies among adolescents. While some adolescents benefit from social media engagement, experiencing positive effects on their well-being, others face significantly adverse outcomes associated with its use (Beyens et al., 2020). Understanding which individuals are most vulnerable to the negative effects of social media and, more importantly, identifying effective interventions to mitigate these harms is a critical area of research.

Existing research has primarily focused on gender differences and found that girls are more likely than boys to experience upward comparison, body dissatisfaction, and mental health issues (Jung et al., 2022; Maes & Vandenbosch, 2022). However, analyses have shown some dispute pertaining to the actual problems users face on Instagram (Raychoudhury, 2021) with both positive and negative experiences reported. Additionally, research has found that race and ethnicities are associated with users' experience online (Pew Research, 2023), alongside the influence of life events (Saha et al., 2021). Findings suggest that African American and Latino youth frequently encounter online racial discrimination, which correlates with adverse psychological outcomes such as increased depressive symptoms and anxiety (Tynes et al., 2021). Similarly, individuals with lower subjective socioeconomic status (SES) report more negative experiences on social media platforms, even after accounting for variables like age, gender, and amount of social media use (Smith et al., 2022). Moreover, youths from lower SES backgrounds may face a higher number of negative life events due to limited familial and community resources (Evans & English, 2002). Thus, this study seeks to address a critical question: Which users are more at risk based on their characteristics, user behaviors, life events, and socioeconomic status? Identifying at-risk population is important given that many young users encounter various risks and harmful content online. Understanding the predispositions in terms of individual's characteristics as well as online risks associated with social media use is essential for effectively mitigate the risks and harms.

World Economic Forum's Global Coalition for Digital Safety (2023) categorizes six types of harms affecting youth: threats to personal and community safety, harm to health and well-being, hate and discrimination, violation of dignity, invasion of privacy, and deception and manipulation. These categories encompass a range of harms that young people experience online, from exposure to inappropriate content and cyberbullying to privacy breaches and online scams. Identifying the frequency of exposure to these risks enables researchers to tailor interventions that could effectively mitigate potential harms and create safer online environment especially for users that are at higher risk.

Due to an increasing concern about social media and its impact on youth, research on specific platforms and their psychological and health-related effects is urgently needed. The Surgeon General has proposed adding a warning label on social media platforms, stating that social media is associated with mental health harms (Murthy, 2023; Haidt, 2024). Parents across the country are worried about the harms and addictive nature of social media use among adolescents (Douglas et

al., 2020). Schools in some states have begun enforcing phone bans (Assembly Committee on Education, 2024).

Despite these concerns, there is limited evidence regarding the impact of content on the associations between social media use and well-being, as well as identifying the individuals most vulnerable to its negative effects. This gap persists largely because most research relies on cross-sectional designs and self-reported data, which do not test potential solutions or interventions. The lack of intervention studies on social media represents a significant research gap, as most existing studies focus on correlations rather than causation, therefore restricting our ability to evaluate the effectiveness of mitigation strategies.

Addressing this gap is crucial, as interventions provide actionable insights that go beyond mere correlation, offering evidence-based recommendations for policymakers, educators, and platforms. By incorporating experimental and longitudinal intervention study designs using both self-reported and actual behavioral data, the current study can advance the field, bridging the gap between theory and practical application. This contribution is essential for developing targeted, scalable, and effective digital well-being strategies that can be implemented in real-world settings.

Social Media Engagement and Well-being

Well-being is a complex multifaceted concept that has been operationalized in many different ways. Researchers focused on general well-being often operationalize this construct as a self-evaluation of how one generally feels (Diener, 1984; 2015). However, the wide variety of psychological experiences that engaging on social media content can elicit, it is crucial to understand how different type of content relate to more specific facets of well-being, as these effects likely differ (Hancock et al., 2022). While many specific well-being outcomes have been connected to social media use in previous research (see Hancock et al 2022 for a review), some of the most relevant ones in the context of Instagram use are self-esteem (Saiphoo et al., 2020) and quality of social relations (Hall, 2020).

Next to *psychological* aspects of well-being, some *physical* aspects of well-being have also received considerable attention in previous work. Among these, due to the important quantity of health-related content that Instagram offers to its users, health-related aspects such as sleep (Alonzo et al., 2021), as well as physical activity and body image (Gualdi-Russo, 2022) are particularly relevant.

Research addressing the impact that social media has on youth's well-being outcomes is generally divided into two main areas (Weinstein, 2018). The first focuses on the benefits of social media use for well-being (Chan, 2015, 2018), while the second examines its potential risks (Keles et al., 2020).

While previous studies have dealt mainly with objective social indicators (e.g., family life or household income), recent research has increasingly focused on the measurement of subjective well-being indicators, such as life satisfaction or quality of life, positive and negative experiences,

and health (e.g., Chan, 2015; Diener et al., 2015; Vuorre & Przybylski, 2024). Self-perceptions, self-esteem and the perceived quality of the relationships, represent additional relevant subdimensions of well-being in youth's lives. This framework integrates both hedonic and eudaimonic dimensions of well-being. The hedonic perspective emphasizes the presence of positive emotions and the absence of negative affect (Kahneman et al., 1999), while the eudaimonic approach focuses on cognitive appraisals of one's life and personal fulfillment (Ryan & Deci, 2001).

Given that social media platforms like Instagram offer multiple ways of usage, it is important to examine how different patterns of use are associated with varied well-being dimensions. In this research, we focus on two dimensions: 1) psychological well-being, defined as a multifaceted construct encompassing both positive psychological adjustment and the absence of maladaptive functioning (Diener, 1984; Keyes, 2002; Ryff & Singer, 1998). This dimension include positive indicators, such as self-esteem, social well-being, and life satisfaction (Diener et al., 1999), as well as negative indicators such as depression and loneliness (Keyes, 2005; Seligman, 2011); 2) physical well-being, defined as multidimensional concept consisting of health perceptions (Capio et al., 2014) and subjective physical appearance satisfaction (Sherlock & Wagstaff, 2019). Additionally, quality of sleep, which is important for optimal mental health, is considered as a key factor in physical well-being (Alonzo et al, 2021; Koban et al., 2023).

Social media use has been shown to have numerous positive effects on different indicators of well-being, particularly when individuals engage in interactive and targeted activities. One of the key benefits of social media is its role in fostering and maintaining social relationships through instant messaging and other interactive features (Burke et al., 2011; Hall & Baym, 2012). By enhancing both bridging and bonding social capital, social media platforms provide opportunities for individuals to connect with diverse networks, which has been linked to greater well-being (Ellison et al., 2007; Phua et al., 2017; Chan, 2015, 2018). Additionally, research indicates that active social media use, such as direct communication with others and self-expression, is associated with increased well-being (Liu et al., 2019). Engaging in private interpersonal interactions and sharing personal content can lead to feelings of social support and belonging, further strengthening emotional well-being. Furthermore, the affordances of social media platforms, such as targeted communication and one-click interactions, allow users to maintain connections (Burke & Kraut, 2016). Overall, the ability to engage meaningfully with others through social media enhances social connectedness and psychological well-being, underscoring its potential for positive outcomes in young people's daily lives.

In our study, active engagement is operationalized by counts of different types of interactions (e.g., comments, post creation, sending and receiving private messages) based on previous research on targeted Facebook use for social interactions (Burke & Kraut, 2016). The researchers analyzed data from Facebook users, linking self-reported well-being measures to their actual Facebook activity logs. They found that receiving personalized, composed messages from close friends—referred to as “strong ties”—was associated with improvements in well-being. In contrast, passively viewing

broad broadcasts from friends or receiving generic one-click feedback (like “likes”) did not have the same positive effect. This suggests that meaningful, tailored communication from close connections on social media platforms can enhance psychological well-being, while more superficial interactions may not provide the same benefits. Accordingly, we predict:

H1: Active engagement with the social network enhances psychological well-being.

Previous research has emphasized the importance of bidirectional relationships between self-disclosure on social media and well-being (Luo & Hancock, 2020). In the second process of the theoretical framework, researchers explain the effects of psychological well-being on self-disclosure in social media as a reciprocal mechanism that influences interpersonal and intrapersonal motivations for relationship maintenance and self-expression on social media. Indeed, recent studies have identified loneliness as precursor of self-disclosure on social media (Stevic et al., 2025) as well as of passive social media use (Stevic & Matthes, 2021). As different well-being states might affect the way social media is being used to, for example, enhance mood, we are predicting that there will be a bi-directional relationship between well-being and Instagram use. Due to reciprocal nature of relationships between social media use and well-being (Luo & Hancock, 2020) as well as loneliness (Nowland et al., 2018), we further assume:

H2: There is a bi-directional relationship between Instagram use and (a) psychological well-being and (b) physical well-being.

Exposure to harmful content and harmful encounters on Instagram might be detrimental for young users. Harmful online content, including material that promotes self-harm, disordered eating, hate speech, fake news, scams, and unwanted sexual content poses a significant risk to young people’s well-being (Ofcom, 2020). Exposure to harmful content has been linked to lower subjective well-being, potentially exacerbating feelings of distress and vulnerability (Keipi et al., 2017). Given the widespread nature of harmful content online, further research is needed to understand its long-term psychological impact and to develop effective interventions for mitigating its effects.

In terms on contact, studies have shown that online bullying is prevalent in the US especially among marginalized youth (Kreski et al., 2022) resulting in risky offline behaviors. Experiencing online risks has been consistently linked to lower psychological well-being, particularly in terms of self-esteem (Palermi et al., 2017; Patchin & Hinduja, 2010). Many social media users receive cyberbullying messages on Instagram that can harm their well-being (Kim et al., 2014). Longitudinal evidence on this association remains limited, yet findings from a large-scale study of 3,127 children in the United States indicate that cybervictimization can contribute to decreased self-esteem over time (Smokowski et al., 2014). These findings highlight the need for further research into the long-term psychological as well as physical consequences, assuming that

H3: There is a negative association between harmful content exposure and harmful encounters on Instagram and psychological and physical well-being over time.

Interventions (Exploratory)

The body of research on the impact of social media use and interactions on well-being has demonstrated both positive and negative effects, highlighting the potentials to enhance user experience and mental health (Deters & Mehl, 2013; Kross, et al., 2013; Kramer, et al., 2014; Verduyn et al., 2017). Studies such as those by Kross et al. (2013) highlight the potential for social media use, particularly platforms like Facebook, to result in declines in subjective well-being. In contrast, some intervention-based research, like Deters & Mehl (2013), suggests that actively engaging with social media, such as posting status updates, can alleviate feelings of loneliness, indicating possible benefits when used intentionally.

Other scholars, like Verduyn et al. (2017), found social media can have diverse effects on users, suggesting that the relationship between social media and well-being is complex, depending on factors such as usage patterns, content exposure, and individual differences. This is supported by Sagioglou & Greitemeyer (2014), who show social media use is correlated with negative emotional consequences and explain why individuals continue to engage with these platforms despite potential mood decreases. A study of Kramer et al. (2014) on emotional contagion also demonstrates users' emotional states are significantly influenced by the emotions in the content they browse in Facebook news feeds. These studies collectively underscore the need of well-designed social media platforms to better support psychological resilience and improve mental health outcomes. In particular, they suggest design considerations around content curation and personalized context are pivotal for social media to benefit its users' well-being, providing a foundation for our proposed research on Instagram's influence on young adults' well-being.

Due to many factors occurring during Instagram use, we propose to test two different interventions. The first will focus on content-based intervention with an emphasis on following self-selected high-quality influencer content in order to understand whether promotion of positive (e.g. education, reflection, creation) and healthy topics (e.g. nutrition, fitness, sports) enhances well-being in line with previous content interventions on Instagram (e.g., Blackstone & Russie, 2020; Depow et al., 2025). The second intervention will focus on reducing potential risks that young adults might encounter on the platform. With short instructional video and literacy intervention on how to safeguard privacy and report harmful content, we aim to help young adults have more agency over their Instagram use adapting previous intervention study on cyberbullying intervention (e.g., Kutok et al., 2021). Pre- and post-intervention surveys will assess how the intervention affects participants' physical and psychological well-being. We will examine the persistence of treatment effects by administering follow-up surveys one month after the intervention and complement our survey-based measures with behavioral measures of Instagram use. The interventions are separately described in the following sections.

Following Influencers (Exploratory)

Following social media influencers on Instagram is based on several motivations—authenticity, consumerism, creative inspiration, and envy (Lee et al., 2021). While motivations precede the intention to follow different accounts, less is known about the outcomes on physical and psychological well-being. One experimental study found that browsing influencer’s profiles for 10 minutes diminished well-being in relation to browsing their own profile (Burnell et al., 2020), however, the content of the influencer that users engage with has to be taken into account as it could potentially bring about positive experiences and emotions. To ensure ecological validity, we will ask users to self-select profiles they want and would normally follow for one month, to test the outcomes of long-term exposure to self-selected high-quality content. Previous cross-sectional correlational studies on following influencers suggest higher trust and brand purchase, however, there is a lack of research evaluating whether follow high quality influencers can users’ well-being. Thus we ask:

RQ1a: Do users who receive an intervention prompting engagement with high-quality content on Instagram at T1 experience higher psychological and physical well-being at T2 compared to those who do not?

Additionally, we examine the duration of this effect and the potential impact of a booster intervention. We ask:

RQ1b: Does the effect of the high-quality content engagement intervention persist at T3?

RQ1c: What is the impact of a booster intervention for high-quality content engagement on users’ psychological and physical well-being?

Risk Experiences (Exploratory)

It is relevant to take into account perceived risk experiences of users themselves when designing new interventions. After all, young adult users are the ones using the platforms, with distinct levels of exposure to risks. In the seminal study on Instagram use, Razi et al. (2022) found that 14% of users experience high risk in conversations through flagging conversations with risks. Due to risk exposure, we expect users will be more receptive to interventions that aim to mitigate the harms they encounter. Agha et al. (2023) study among teens found they often encountered information breaches and sexual risks with strangers, as well as cyberbullying. The usual strategies were blocking or reporting those profiles, however, they did not find any of the existing ways for responding to these risks to be effective in keeping them safe. Researchers have therefore developed intervention ideas co-designed with users teaching teens user experience prototyping tools so they could sketch app features for online risk prevention. Participants used the tools to outline specific online risk experiences and designed features to manage the content they view

and other users they could safely interact with. Some teens also designed personalized nudges to handle online risks themselves without getting their parents involved fostering their autonomy (Agha et al., 2023). Similarly, in another study young Instagram users reported using backpedaling strategies to regain control over their feed (Landesman et al., 2024).

Research studies looking at risks and harassment on social media suggest negative outcomes after experiencing harassment through a single direct message (Kim et al., 2024). However, the post-harassment effect washes away after two-weeks demonstrating that the time aspect is relevant to study. One of the limitations of previous studies is not looking at cumulative effects of harassments in terms of identifying harms and consequences following them. In this study, we aim to address the lack of time component by testing the effects of risk exposure and risk mitigation over time. This way we can understand the duration of the intervention effects better.

RQ2: What are the risk factors that influence young adults' experience and well-being outcomes associated with Instagram use?

Research further suggests the need for targeted risk prevention strategies for youth online (Alsoubai et al., 2024). To contribute to the research gap, in our study we plan to group users based on their risk experiences on Instagram. For those users who identify exposure to different types of risks on Instagram in the first survey wave, we are interested in understanding how effective the risk mitigation intervention would be for them over time. Previous research has identified five risk profiles emerging among Instagram users (Alsoubai et al., 2024). The majority of 51% fall into the low risk category, 29% fall into medium risks category, and the other users experienced increased sexting (8%), increased self-harm (8%), and high risk perpetration (4%). We expect a similar outcome in our study, with approximately 20% of users selecting risk categories they are exposed to. For that group, we plan to develop a targeted intervention in the form of a short Instagram video that helps users with flagging content, reporting content, setting privacy features etc. After showing them the intervention, we are interested to know if their psychological and physical well-being enhances.

RQ3: Do users who receive an intervention of harm reductions on Instagram at T2 experience higher psychological and physical well-being at T3 compared to their T2 baseline?

Methods

We will conduct a three-wave longitudinal study with one-month interval between each wave among young adults. This research has been approved by the Institutional Review Board at Stanford University (Protocol # IRB-78354). All participants will provide informed consent online through the Qualtrics survey platform. We aim to recruit 1000 young adult Instagram users (ages between 18 and 25 years) via a convenient snowball sampling method through university courses and online recruitment platforms. We expect a 40%–50% drop-out rate based on previous panel studies in young adult populations (Arendt et al. 2019; Geusens & Beullens, 2021; Koban et al.,

2023). We plan to over recruit participants in the first survey aiming for $N = 1000$ in order to reach 400–500 young adults in the third survey wave. All participants recruited from university participants' pools will receive credit for completing all three surveys and tasks. Participants recruited through online recruitment platforms will receive payment for their participations. We expect to recruit $N = 1000$ in wave 1, $N = 700$ in wave 2, and achieve $N = 400$ –500 in wave 3. If a total of $N = 400$ participants achieves $> 80\%$ power, anticipated minimum detectable effect size is Cohen's $d = .042$.

We will conduct panel surveys asking users about their psychological and physical well-being at three time points that will occur in April, May and June, with a one-month interval in between. In parallel, we plan to collect users' actual behavioral Instagram data and combine it with their self-reported experiences for analysis (see Figure 1). We will collect well-being measurements including physical and psychological indicators at all three time points to allow for testing over time changes. All self-reported measures in the surveys will be based on the validated scales used in communication science research. Variables will include established scales from the literature including life events scale (Dohrenwend et al., 1978), Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988), Profile of Mood States (POMS) scale (McNair et al., 1971), sleep quality scale (Koban et al., 2023), life satisfaction scale (Diener et al., 1985), agency mindset scale (Lee & Hancock, 2024), motivations (self-developed), loneliness (UCLA scale by Hughes, Waite, Hawkey, & Cacioppo, 2004), self-esteem (Rosenberg et al., 1979), brief resilience scale (Smith et al., 2008), body image states scale (Cash et al., 2002), health habits scale (Williams et al., 1991). Each study wave will include a self-report questionnaire and one intervention. Key conditions include one intervention that includes a task of following self-selected high-quality prosocial content and a control group that receives no intervention. At the end of each survey, we design an intervention as a task to be completed and plan to test its effectiveness in the follow-up survey.

In the first survey (T1), we will randomly assign participants either to the treatment group with the intervention task asking participants to follow several social media accounts or influencers that broadcast high-quality content or to the control group with no intervention. We will provide options to choose from based on initial exploration with research assistants who are familiar with Instagram content to identify N social influencer profiles that are regarded as high-quality content for young people. These profiles will include several topics relevant to the youth population such as fitness, nutrition, well-being, etc. The success of the intervention will be monitored through manipulation check questions asking about following the chosen account and providing a screenshot of the profile showing that they follow them.

In the second survey (T2), participants in the treatment group at T1 will be divided into two groups based on the results of harmful content exposures and harmful encounters measured in the first survey (T1). For participants who have higher level of high harmful content exposures and encounters (the at-risk group), they will be provided with the harm reduction intervention. The intervention will be designed as a short educational video to report harms and customize privacy

settings. For these participants who do not have high levels of on harmful content exposure and harmful encounters, they will be provided with a booster intervention for high-quality content engagement.

Design and Analytical Approach

We will conduct multilevel regression analyses with lagged measures. As sensitivity tests we will check for multicollinearity and use scales (measures) that result in variance inflation factors less than 4. Additionally, we will analyze data with random intercepts cross-lagged panel models (RI-CLPM; Hamaker et al., 2015), which allow us to investigate how a person's earlier social media use and well-being measure affects their subsequent social media use and well-being at the within-person level while controlling for stable individual differences. RI-CLPM approach provides less biased estimates of cross-lagged effects by accounting for both autoregressive and bidirectional effects (Falkenström et al., 2022). The method has been used in previous three-wave panel studies on social media use and well-being indicators (e.g., Ding et al., 2023; Geusens & Beullens, 2021; Lee et al., 2022). To test the differences between interventions and no intervention groups, we will perform t-tests. Lastly, to exploratively study potential user differences, we will rely on latent class analysis (Foerster & Rösli, 2017).

The analysis aims to explore how different types of engagement and user-generated activities on Instagram are associated with various well-being outcomes. Dependent variables (measured at T1, baseline survey) will include well-being metrics and indicators. Independent variables (measured from T 0 to T 1) will include (1) time spent (session duration) that is the total duration a user spends on Instagram within the month leading up to the first survey; (2) close-tie content view defined as the frequency of views or duration of time users spend viewing content posted by close connections, close-tie content is defined as content from users who follow each other or content designated by the poster to be seen only by close friends; (3) public content view defined as the frequency of views or duration spent viewing content that is publicly accessible including ads; (4) user-generated content including post creation (the number of posts a user creates within the period from T 0 to T 1), comment creation (the number of comments a user makes during the specified one-month period), like activity (the total number of times a user clicks the 'like' button during the same timeframe). (5) harmful content exposure and harmful encounters. Control variables will include age, gender, one session duration, privacy settings, and life events.

Intervention 1: High-quality Social Influencers Content Engagement

Testing the first intervention will include dependent variables that are well-being scores collected at T2 from indicators of mood, emotions, comparison, sleep, body image, esteem, loneliness, depressive symptoms, and life satisfaction as well as behavioral engagement on Instagram in terms of time spent (session duration), interactive behavior (commenting, liking, interacting),

passive browsing behavior (close-tie content views, public content views). Independent variable is the intervention treatment at T1 coded as a binary variable, 1 if the user is assigned to the treatment group 1, otherwise 0. Control Variables: As the users were randomly assigned to the control and treatment groups, we don't need to have control variables in the regression model. Analytical approach will include lagged linear regression analyses and t-test group comparisons (intervention group vs. no intervention group).

In the second survey (T2), we will include intervention booster asking participants to follow influencers and test the duration of the effects on dependent variables at T3.

Intervention 2: Harm Reduction

Dependent variables will include well-being scores collected at T3: mood, emotions, esteem, comparison, body image, sleep, loneliness, depressive symptoms, life satisfaction as well as interactive and browsing engagement on Instagram including variables listed above and use of safety and control features (privacy, blocking, reporting) on Instagram. Independent variable is harm reduction intervention (two groups high vs. low risk group comparison to identify whether the intervention has preventive values for high-risk group). The intervention will be administered only to at risk group that is self-identified in Wave 1. Analytical Approach: Lagged linear regression analysis based on intervention treatment and t-test group comparison.

The overview of study design and detailed approach based on hypotheses and research questions is presented in Table 1.

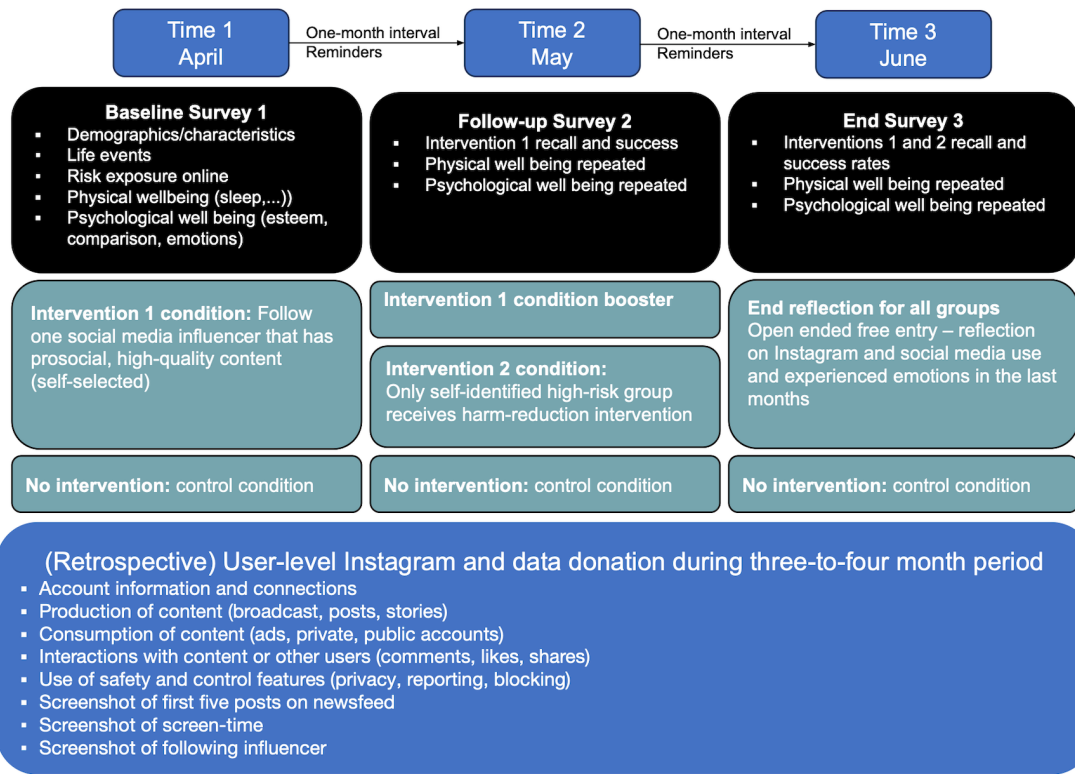


Figure 1. Research Design.

11. Study Design Overview

Question	Hypothesis	Sampling plan	Analysis Plan	Rationale for deciding the sensitivity of the test for confirming or disconfirming the hypothesis	Interpretation given different outcomes	Theory that could be shown wrong by the outcomes
How does Instagram interactive and browsing engagement affect physical and psychological	H1: Active engagement with the social network on Instagram enhances psychological well-being over time.	We expect to recruit N = 1000 in wave 1, N = 700 in wave 2 and achieve N = 400–500 in wave 3 If a total of N = 400 participants				

		achieves > 80% power, anticipated minimum detectable effect size is Cohen's d =.042.	Longitudinal regression analyses; lagged well-being measure (the multilevel regression analysis controls for an individual's previous level of well-being)	Multicollinearity tests and power analysis based on effect sizes from previous research on Instagram use (Burnell et al., 2022) and Facebook use Burke & Kraut (2016)	If we find support for H1 (active Instagram engagement predicts higher well-being at wave 3 controlling for lagged measures from wave 1 and wave 2 at p <.05), we will conclude that the causes of overall increase are due to active social interactions on Instagram. If we find negative evidence for H1, we will conclude the opposite: that the overall active engagement on Instagram decreases well-being. If we find no significant relationship, we will conclude that active Instagram use over time does not influence	
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					well-being and other factors are more relevant in predicting well-being.	Need to belong differs online, active interactions and connection might not be sufficient to satisfy belonging.
Does well-being affect Instagram use?	H2: There is a bi-directional relationship between Instagram use and (a) psychological well-being and (b) physical well-being.	If a total of N = 400 participants achieves > 80% power, anticipated minimum detectable effect size is Cohen's d = .042.	Longitudinal regression analyses; lagged Instagram use measures, the multilevel regression analysis controls for an individual's previous levels of Instagram use.	Multicollinearity tests and power analysis based on effect sizes from previous research	For H2, if we find a positive relationship that higher well-being predicts more engagement over time at $p < .05$, we will conclude that is because users with better psychological and physical well-being may engage more actively, using Instagram for social connection and self-expression intentionally benefitting them. If higher well-being relates to less engagement	

					we will conclude that those users with high well-being might prioritize offline interactions, use Instagram more intentionally, or limit screen time. If we find that lower well-being is related to more engagement we will conclude that users with poor well-being may seek social support, distraction, or emotional relief, possibly leading to excessive use. If we find that lower well-being relates to less engagement we will conclude that psychological distress may reduce motivation to interact	
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					online, leading to withdrawal or passive browsing. If we find no significant relationship, we will conclude that Instagram use may be driven by habits, personality, or external factors rather than well-being, or the relationship may be moderated by other variables.	
How are online risks related to well-being?	<i>H3</i> : There is a negative association between harmful content exposure and harmful encounters on Instagram and psychological and physical well-being over time.	The N size will be determined based on the self-identified exposure to risks on Instagram at T1	Lagged regression analysis including survey measures of self-reported risks online and self-reported well-being measures, controlling for time spent on Instagram and use of control features	Post-hoc sensitivity power analysis according to achieved N at T1	If H3 is confirmed at $p < 0.05$, we will conclude that being exposed to harmful content and harmful encounters decreases well-being after one month. If H3 is rejected at $p > 0.05$, we will conclude that being exposed to harmful content and harmful	

					encounters does not impact well-being after one month.	
<i>RQ1a:</i> Do users who receive an intervention prompting engagement with high-quality content on Instagram at T1 experience higher psychological and physical well-being at T2 compared to those who do not? <i>RQ1b:</i> Does the effect of the high-quality content engagement intervention persist at T3? <i>RQ1c:</i> What is the impact of a booster intervention for high-quality content engagement on users' psychological and physical well-being?		If N = 400 participants achieves >80% power, assuming equal group sizes, anticipated effect size is Cohen's $d = 0.280$	Multilevel regression analysis including lagged well-being measures that controls for an individual's previous levels of well-being and t-tests to account for group differences.		For RQ1a, if higher well-being is shown for the intervention group, we conclude that following high-quality content positively impacts users' well-being, possibly by providing inspiration, positivity, or meaningful engagement. If results show lower well-being in the intervention group, we conclude that exposure to high-quality content might increase social comparison, lower esteem and reduce well-being. If there are no	

					difference between groups, we conclude that the intervention may not be strong enough to influence well-being, or other factors are more important predictors. For RQ1b, if a significant relationship is found over time, we conclude that the intervention has long-term effect. If there is no significant relationship at T3, we conclude that the intervention does not last over time. If RQ1c result shows positive relationship, we would conclude that engaging with high-quality influencer content enhances users' mood, self-	
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					perception, and overall Instagram experience (browsing, interacting) If RQ1c shows a negative relationship, we conclude that exposure to influencer high-quality content may reduce well-being. If RQ1c result shows no significant relationship we conclude that the intervention does not significantly impact users' Instagram experience, suggesting content quality is not enough to impact well-being.	
RQ2: What are the risk factors and protective factors that influence young adults' experience and outcomes						

associated with Instagram use?		If a total of N = 400 participants achieves > 80% power, anticipated minimum detectable effect size is Cohen's $d = .042$.	Multilevel lagged regression analysis		Based on self-identified risks that users are exposed to and report in wave 1 survey, we will group them in low risk, medium risks and high risks groups and test whether there are differences in Instagram use for different groups in terms of privacy settings, blocking, time spent on Instagram, active interactions, browsing behavior.	
RQ3: Do users who receive an intervention of harm reductions on Instagram at T2 experience higher psychological and physical well-being at T3						

compared to their T2 baseline?		Estimated N = 300 participants across three waves	Random intercept crossed-lagged model across three waves	The Monte Carlo power analysis for the RI-CLPM with a sample size of 300 in three waves and 1000 replications showed the fit indices (RMSEA, CFI, TLI, SRMR) suggest good model fit. Several parameters, show power above 0.7, indicating a high likelihood of detecting significant effects. <i>Positive effects:</i> Participants show differences and report higher well-being. <i>Negative effects:</i> Some users may react negatively to interventions, leading to lower well-being. <i>Mixed outcomes for different groups of users:</i> individual differences, with some benefiting while others have no change in well-being. <i>No intervention effects:</i> no significant change in Instagram use or wellbeing.	
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Instagram Data Access Pilot Transparency Statement

For a fuller view of this project's process through the *Instagram Data Access Pilot*, supporting documents are openly available here: <https://osf.io/thuqp/>

Supporting Information

Supporting information files related to this work can be found here: <https://osf.io/5r2yg>

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Declarations

Ethics

The research has received an IRB approval (protocol number 78354) from Stanford University.

Competing Interests

The authors declare that no conflicts of interest exist.

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Author Contributions

AS: Conceptualization, Methodology, Project administration, Resources, Writing – original draft, Writing – review & editing YCW: Conceptualization, Methodology, Resources, Writing – original draft, Writing – review & editing DDSV: Conceptualization, Writing – original draft, Writing – review & editing SXL: Conceptualization, Methodology, Project administration, Resources, Writing – original draft, Writing – review & editing JH: Conceptualization, Methodology, Project administration, Resources, Supervision