



Focusing the Attention on What Truly Matters. Preventive Approaches for Problematic Instagram use in Youth

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Abstract

Purpose of review This paper addresses the extensive use of Instagram by youth and explores the potential negative consequences of such use, with a view to provide recommendations for prevention purposes.

Recent findings Based on an attention economy model, Instagram strategically incorporates design elements rooted in behavioral psychology to maximize user engagement, fostering habit loops and self-presentation. The paper outlines and discusses Instagram's unique features for aesthetic manipulation of content, provides an overview of reported negative consequences of Instagram use, and identifies factors influencing vulnerability to problematic use, such as social comparison orientation and fear of missing out. Based on these analyses, recommendations for prevention are formulated.

Summary To develop prevention strategies for problematic Instagram use and implement tailored interventions for individuals at high risk, it is crucial to emphasize identity development, critical thinking, and emotion regulation. Promoting ethical social network design and responsible Instagram use are critical. Users should be made aware of these risks and processes, automatic usage patterns need to be addressed, and self-regulation and life skills enhanced. More applied research on these topics is required and encouraged.

Keywords Instagram use · Patterns of use · Motives · Social comparison orientation · Fear of missing out · Prevention

Introduction

Young people's extensive use of digital devices and social networks like Facebook, Instagram, or TikTok has sparked debates and concerns about their potential negative consequences. While social networks can be beneficial [1], their intensive use has been shown to also lead to negative outcomes for individuals and society [2, 3]. As both positive and negative outcomes have been reported, it is difficult to draw conclusions from the existing evidence on social network use without cherry-picking results that fit either narrative [4].

Within the literature on social network use, Instagram raises specific concerns as an image-based platform [5••], since it fuels constant comparison and fear of missing out among its users.¹ This paper aims to provide an overview

of Instagram's characteristics, individual factors associated with problematic use, and reported consequences of extensive use. Based on these, recommendations will be offered for promoting healthier Instagram use.

Why is Instagram engaging yet pervasive?

Understanding social media user behavior requires considering the design and interface of the different applications (apps). Although *theoretically*, users can decide how they engage with a given app, the design elements of the apps reveal how their creators *want* users to behave [6]. SNs like Instagram operate on an *attention economy* model [7], where user attention generates revenue through advertisements (ads) and consumption [8•, 9]. Prolonged user engagement enhances the likelihood of ad exposure, thus bolstering company profit [6, 8•].

For that reason, Instagram incorporates insights from behavioral psychology in its design to increase user screen time [10–12]. Examples of such features include infinite scrolling, video autoplay, push notifications, and variable rewards such as likes and shares [11, 13–15]. To stay competitive, Instagram constantly introduces novel

¹ Part of the arguments of this paper derive from the first author's PhD thesis. The full document can be accessed here: <http://hdl.handle.net/2078.1/269794>

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functionalities such as the recently added "like" button for stories. These features perpetuate *habit loops* [12], whereby users engage in *auto-pilot* due to triggers (e.g., notifications) and rewards (e.g. likes). Given the value of attention in this context [16], users garner followers' attention by fostering self-disclosure and constant surveillance, thus reinforcing the attention economy [6]. These design elements play a pivotal role in user engagement, which can lead to problematic use [17, 18].

Furthermore, Instagram has distinctive features for aesthetic manipulation of content. Users can employ filters to enhance image quality, imbuing everyday objects with sophistication and refinement to symbolize aspiration and status [6]. While these tools can boost creativity among individuals and content creators, they also create a curated and highly edited version of reality that diverges from most people's experiences. By providing greater control over self-disclosure [19] and encouraging enhanced self-presentation and impression management [20, 21], they facilitate users' popularity [22], but this has consequences for both content creators and users who consume content. The former may experience heightened pressure to conform to elevated aesthetic standards in order to get attention and recognition, potentially leading to perfectionism in areas like physical appearance, status, and lifestyle [23, 24]. Such perfectionistic self-promotion on social networks correlates with heightened stress and anxiety [25]. The users, on the other hand, are induced to make upward comparisons, which can result in frustration and envy. They may also experience fatigue from continuous content exposure and the pursuit of others' idealized presentations [26–28]. Overall, it appears that contrary to its claims, Instagram prioritizes self-presentation and social recognition over social connection [20, 21].

What are the negative consequences of Instagram use?

A growing body of literature shows that there is a relationship between Internet use, social networks, and Instagram use in particular, and decreased mental and physical health and well-being [5••, 29–31, 32••, 33]. Nonetheless, not all Instagram users experience adverse effects. The occurrence of such consequences depends on various factors, including the design of the app, individual characteristics, and genetic, environmental, and cultural factors [33–35], as well as on specific usage patterns [21]. Some reported consequences associated with Instagram use include:

- Mental health issues like anxiety, stress, depression, loneliness, envy, lower self-esteem, and poor sleep quality [36–39].
- Difficulties resisting the urge to enter the platform, controlling the time spent there, or stopping use [40].

- Procrastination, time waste, lower productivity, and interference with daily important activities [41, 42].
- Excessive or reckless selfie-taking [43–46].
- Deceptive like-seeking behaviors to enhance influence metrics (e.g., purchasing likes) [47, 48].
- In specific cases, cyberbullying, harassment, stalking, exposure to inappropriate content, and grooming [49–52].
- Exposure to misinformation, polarization, curated views of reality, unrealistic beauty standards, lifestyle enclaves, echo chambers, etc. [53–55].

These findings need to be qualified, however. Many negative consequences associated with Instagram use have been identified through cross-sectional studies, which implies that the causality and directionality of the effects remain unclear [4, 32••, 56••]. Furthermore, research on the negative consequences of social network use has significant methodological weaknesses, including problems with the conceptualization of "social network use", the use of inaccurate measures, excessive reliance on the addiction framework, misinterpretation of small or non-existent statistical effects, and the use of convenience samples that limit generalizability to the broader population [40, 57••, 58••, 59–61]. These limitations hinder the ability to draw definitive conclusions that could inform prevention and intervention programs.

Who is most vulnerable to developing problematic Instagram use?

If social media use is not inherently problematic but leads to adverse consequences under specific conditions, these conditions need to be identified. In that regard, a useful distinction can be made between conditions that are *predisposing*, *reinforcing*, or *enabling* [62]. With regard to *predisposing factors*, various psychosocial characteristics have been identified as factors that increase vulnerability to problematic Instagram use, including interpersonal sensitivity, social anxiety, shyness, loneliness, perceived social support, the need for belonging, narcissism, social comparison orientation, and fear of missing out [40, 63–71]. About the latter, i.e., *social comparison orientation* (SCO) and *fear of missing out* (FoMO), direct and mediated relationships with Instagram usage patterns and motives have been found, highlighting their significance and indicating that individuals who exhibit these tendencies engage with Instagram in a particular way [40, 42]. More specifically, they engage in self-deprecating comparison, show more feelings of discomfort, and seek social approval through attention-seeking motives. Interestingly, women exhibit more loss of control, anxious posting, social approval-seeking, and self-deprecating comparison use patterns than men, while older individuals display less emotional escape-seeking, social connection,

information seeking, anxious posting, discomfort, and self-deprecating comparison than younger ones.

Research into the role of motives in social media use with novel questionnaires [40] reveals that Instagram usage can be motivated by a wide range of motives, including *self-expression, curiosity, documenting, entertainment, connection, following trends, emotional coping, increased visibility, information gathering, professional use, and making an impact*. While the use of Instagram is primarily driven by a desire to be visible, likable, and attractive, and to draw attention to the self, rather than by the need to maintain interpersonal relationships [20, 72], individual motives are related to distinctive usage patterns, such as *urge and craving, anxious posting, seeking social approval, and social comparison*, whereas they are less related to *passive use* [21, 40]. These individual motives interact with other predisposing factors such as SCO and FoMO [40].

The results of these empirical studies offer useful insights to prevent negative consequences of problematic social media use, in the sense that individuals with specific motives, usage patterns, and predisposing factors can be identified, and preventive interventions can be tailored to them. As opposed to universal prevention, which targets the population, such selective or indicated prevention focusing on high-risk groups, is more cost-effective [73]. Thus, it makes sense to target younger individuals who frequently engage in social comparison and/or who experience a high fear of missing out. These individuals' identities are likely to be other-oriented, meaning that they tend to seek external information to define themselves and actively seek attention and confirmation of belonging by posting and comparing themselves on social media. The negative effects of Instagram use on them can be mitigated by explaining the curated and highly edited nature of Instagram's content, raising awareness of their motivation and usage patterns, and encouraging them to build their identity and self-concept from within, reducing reliance on others' posts and reactions [21].

In terms of *reinforcing factors* in problematic social media use, process models like the I-PACE model for addictive behaviors [74] can be used to understand social media behavior. This model posits that usage results from the interplay between conditioned learning processes and reinforcement mechanisms, which provide gratification or compensation of use [33, 74]. These processes, affected by specific motives, psychosocial traits, limited social competencies, and reductions in inhibitory control and executive functions, may lead to problematic usage. For instance, situational FoMO while browsing Instagram can act as a reinforcing factor. Users may feel overwhelmed by the constant exposure to massive and varied content, which reinforces their platform use, especially when paired with upward social comparison [29]. Qualitative findings from a recent study [21] show that despite acknowledging Instagram's staged

nature, users experience a sense of urgency, immediacy, and FoMO which compel them to remain engaged. These reinforcing mechanisms can be addressed in tailored interventions to promote self-regulation, and thus break these cycles.

Enabling factors, defined as elements that can either facilitate or obstruct desired behavioral and environmental changes, are often shaped by societal influences [62]. Perceived social support and having a rich and nurturing life beyond social networks can be assumed to have a protective function. Barriers to healthier Instagram use include FoMO and the compulsion to engage with the platform driven by notifications [42, 64]. Young individuals whose identities revolve around social networks find it challenging to alter their usage patterns, as their social lives are deeply entwined with these platforms [21]. As such, the context itself in which youth are embedded becomes a powerful barrier to change.

Addressing the predisposing, reinforcing, and/or enabling factors that determine problematic Instagram use is complex, but indicated prevention programs can make use of insights from experiences with the nascent concepts of *digital detox, digital well-being, and digital disconnection* [75–77]. These approaches involve taking voluntary breaks from social media to heighten awareness of consumption habits and reduce overload-induced stress. Although a recent systematic review reported inconclusive results regarding these approaches, possibly due to diverse intervention types and unclear target mechanisms [76], qualitative research revealed that disconnecting initially leads to negative feelings like disorientation, boredom, and increased FoMO, but in the longer term can foster more mindful social media usage [78]. While these interventions are nascent, the quest for sustained change and improved social media habits among young users remains pertinent and worth pursuing.

Some guidelines to prevent problematic use of Instagram in youth

Mental health refers to a state of well-being that allows individuals to achieve their potential, manage daily life stressors, work fruitfully, and contribute to their communities [79]. Mental health *promotion* refers to actions including education and creating environments that enable individuals to control the determinants of their (mental) health, while *prevention* entails strategies to reduce the incidence, prevalence, and recurrence of mental disorders [80]. Effective interventions often require collaboration across multiple sectors [79], with particular emphasis on safeguarding the mental health of adolescents and youth.

Problematic use of the Internet and social networks has emerged as a significant concern for public health. An international meeting on the public health implications of excessive use of the Internet organized by WHO [81] highlighted

the need for increased research to address knowledge gaps, and evaluate policies, strategies, and interventions to mitigate health risks associated with excessive Internet use. A recent systematic review reported inconclusive evidence on the effectiveness of preventive measures for Internet over-use [82], finding that primary prevention programs exhibit considerable heterogeneity in theoretical approaches, design, outcome assessment, and effectiveness evaluation.

Addressing these shortcomings demands careful design, theory-based approaches, evidence-based strategies, and stakeholder involvement, aligned with well-established psychology prevention guidelines [83]. The use of planning models can enhance the development and implementation of effective interventions in this domain, as they offer structured frameworks for the development and evaluation of interventions. For instance, PRECEDE-PROCEDE is a comprehensive health promotion planning model consisting of two phases. PRECEDE involves identifying the predisposing, reinforcing, and enabling factors that influence health behaviors, while PROCEDE focuses on the implementation and evaluation of interventions. The model emphasizes a thorough assessment of determinants, stakeholder involvement, and tailoring interventions based on identified needs, providing an integrated and focused approach to health promotion planning. [62, 84, 85]. Another model that is often used in health promotion is RE-AIM, an evaluation framework for assessing the public health impact of interventions focusing on five dimensions: Reach, Effectiveness, Adoption, Implementation, and Maintenance. It provides a structured approach to evaluating and improving interventions, emphasizing long-term impact and facilitating the translation of research into practice [86–88]. Both models can be used in a complementary manner as they promote a systematic and evidence-based approach to health promotion and behavior change initiatives.

In addition to using these models allowing for a systematic, comprehensive approach, the following recommendations can be made to address the issues mentioned in this paper: (1) to promote ethical social network design; (2) to advocate for responsible Instagram use; and (3) to foster applied research about responsible Internet use and prevention.

Promoting ethical social network design

Preventing problematic Internet and social network use is not only a task for the health sector, but also for social network developers, technology companies, governments, and regulators. The current business model of social networks is exploitative, as it capitalizes on users' attention, and needs to be reevaluated with the well-being of the population as a priority. That change should be promoted by governments and users. Numerous policy examples are available and should be further encouraged, discussed, and disseminated

[8•, 89•, 90•]. Alternatively, some key points for designers and companies to reduce the risk of problematic Instagram use include:

- *Ensuring transparency of information and a symmetric relationship with users.* The current relationship between companies and users is asymmetrical, as they gather extensive data on users, but they do not share sensitive information with them [91]. To promote transparency, companies must provide comprehensive information about their operations, design, purposes, and potential risks. This information should be shared in a clear, user-friendly way that empowers the user to make informed decisions on matters that affect them. Companies should actively seek consent from users, and it should be obtained fairly, avoiding nudging users to accept [92].
- *Continuous monitoring, auditing, and accountability.* Policymakers should establish strong mechanisms for safeguarding individuals by systematically auditing algorithms, monitoring companies, and enforcing accountability when harm occurs [93, 94].
- *Companies should promote agency and freedom to choose.* Instagram uses an algorithmic timeline that prioritizes which posts individuals will see first. Embracing ethical design would grant users the ability to customize their interaction with the platform. This may involve choosing a chronological timeline, opting in or out of suggested content and personalized product recommendations, and managing the type of notifications they receive [95].
- *Banning the infinite scroll feature.* Infinite scroll removes cues that prompt users to switch to other activities, thus keeping them on the platform longer than intended [96, 97]. Natural stopping points should not be eliminated, and prohibiting features like autoplay, auto-loading, and showing unsolicited content should be considered. Users should be encouraged to take breaks, give consent, or receive notifications after extended scrolling.
- *Actively promoting time limits.* Instagram must offer built-in features for users to set daily and weekly time limits and easily access usage statistics. Implementing pop-ups or nudges showing daily usage and suggesting breaks would help users monitor and manage their time, as was shown in one experimental study [98]. Additionally, pop-ups signaling exceeded time limits should include the option to exit the platform. New users should be prompted to establish these limits and be reminded if they haven't.

Promote responsible use of Instagram

The most cost-effective approach to mitigate problematic social network use is to approach at-risk individuals or groups with tailored interventions [73]. This approach may

not only benefit problematic Instagram users but possibly also users of other social networks, by addressing shared risk factors. In this regard, four specific types of recommendations can be made to clinical psychologists, psychotherapists, clinicians, teachers and parents working with young people: (1) addressing specific predisposing variables, (2) shaping habits, (3) enhancing self-regulation, and (4) strengthening life skills. These recommendations are complementary, and prevention programs should ideally address multiple categories simultaneously. Some of them are inspired by those proposed by a multidisciplinary and multinational group of experts in a consensus report on the prevention of problematic Internet use during the COVID-19 pandemic [99].

Addressing specific predisposing variables

As outlined above, *social comparison orientation* and *fear of missing out* have been identified as predisposing variables of problematic Instagram use [5••, 100, 101]. The following strategies can be used to help reduce their impact on Instagram users.

- To address *social-comparison orientation* among youths, it is important to raise awareness that: (1) comparing to others is a natural human tendency with utility in various contexts, but that (2) it is unfair to engage in such comparisons on social media, particularly on Instagram, where positive content overshadows negative content and where others often present idealized, heavily edited versions of themselves [40]; that (3) comparison on Instagram invariably results in feelings of frustration, inadequacy, sadness, and loneliness [5••, 38]; that (4) imperfections and insecurities are part of being human, and nobody leads a flawless life; and that embracing self-acceptance and accepting others as they are is vital. Additionally, encouraging youth to self-reflect on their comparison habits and developing educational resources and specific guidelines for reducing comparisons are of paramount importance. One recent diary intervention on social comparisons on social media found promising results for this approach [102].
- To address *Fear of Missing Out* among young people, it is crucial to promote awareness that: (1) the vastness of online content makes it impossible to keep up with everything, and one need not constantly stay updated; (2) individual differences mean not everything that interests others will appeal to everyone, and that's perfectly acceptable; (3) it is acceptable not to be involved in every online or real-life event. Another approach is to help youth recognize that FoMO directs their focus outward, causing them to overlook their internal experiences [103]. Interventions should encourage individuals to allocate their

attention inward, where it really matters, and appreciate the real world, their existing circumstances, and their potential. Practicing gratitude and self-compassion are pivotal elements in developing this strategy [104].

Shaping habits

Establishing healthy Instagram consumption habits often entails breaking unproductive or perceived unhealthy usage patterns. Although it may not be easy to break automatic patterns of use, especially if Instagram incentivizes prolonged use, developing awareness of these habits is crucial. Some specific helpful guidelines are:

- *Developing awareness.* Encouraging youth to engage in self-reflection about their Internet and Instagram use is the first, important step [105]. Firstly, realizing how platforms are designed to profit by retaining user attention through targeted ads and push notifications helps users decide if they want to continue using these platforms in a way that aligns with their values and benefits their lives. Secondly, self-reflection can help to clarify their own motivations for using Instagram, their usage patterns [21, 40], and their effects on their thoughts, emotions, and overall well-being [5••]. Identifying problematic patterns, (e.g. engaging in self-deprecating comparisons that trigger sadness and failure) allows users to take corrective actions, such as addressing the inclination to compare and employing alternative strategies for behavioral regulation [21, 106].
- *Encouraging to break automatic patterns.* Youth should be guided in recognizing discomfort or overwhelm arising from Instagram use, and learn that they can make decisions, and self-regulate to reduce mindless engagement on the platform. Breaking the habit of mindlessly engaging in using the platform can be a challenge, and requires helping them to identify triggers for “mindless” use (e.g., FoMO, isolation, notifications, boredom, etc.) which can then be addressed by adjusting the behavior (e.g. disabling notifications, switching activities). A key message is that users are accountable for their usage and should strive for a conscious, controlled interaction with the platform [106–108].
- *Encouraging to take one step at a time if needed.* To change habits, it can be useful to take small steps that require minimal action [109] but lead towards a more mindful use of Instagram. These small actions may include setting time limits, tracking usage time, disabling automatic login, using analog tools (e.g., alarm clock), and finding alternative ways of entertainment when boredom drives usage [110, 111].
- *Promoting positive, mindful, and intentional use of the platform.* Encouraging mindful use includes avoiding early morning and late-night scrolling, in favor of healthier

practices like journaling, meditation, and gratitude practice [105, 112]. Setting specific time slots for Instagram use, interactions, and profile curation could help maintain *intentional network hygiene*. Users should unfollow unhelpful profiles, carefully select the profiles they follow, and be mindful of likes, comments, and shares given to prevent feeding Instagram's algorithm. Careful awareness and authenticity over *what* and *why* they post should be prioritized over trying to meet others' standards, as genuine connections are more valuable than portraying an idealized but unrealistic image [106, 113–116].

Enhancing self-regulation

Self-regulation is the ability to control one's thoughts, emotions, and behaviors when pursuing long-term goals, and is crucial to maintain healthy behaviors and good mental health [117]. For Instagram use, developing self-regulation strategies can help individuals cope with the challenges they may encounter.

- *Emotional-regulation strategies.* Youth often turns to Instagram to cope with negative states [40]. Therefore, providing psychoeducation and training on emotional regulation strategies should be part of the prevention strategy, whereby they can learn that emotions serve as signals that something is happening that needs to be observed, named, and addressed [118–122]. Effective emotional regulation strategies can also help users manage difficult situations on the platform, such as the fear of judgment or negative reactions to their content.
- *Self-control strategies.* Commonly employed self-control strategies concerning social network use include self-talk, straightforward self-control, modifying a feature on the device, and building a safe context with no direct access to social media [111]. However, the possibility to exert self-control may be hindered by individual levels of self-control, impulsive behavior patterns, and implicit and explicit attitudes toward social media [123, 124]. Understanding self-control as a toolbox of skills that can be deployed to resist temptation can be a way to advance the training of these skills in interventions, potentially starting at a young age [125].
- *Cognitive reappraisal.* Cognitive reappraisal or *reframing* is an attempt to alter the subjective evaluation of a situation that elicits emotions to modify its emotional impact. This can help to improve self-regulation [126, 127]. Some studies have found that training this skill can promote active coping and full engagement with life's negative experiences [128–130]. It may allow users to assign different, nuanced meanings to difficult situations that could arise from their Instagram use.

Strengthening life skills

Life skills encompass essential competencies to navigate life's challenges effectively [131]. They are acquired through education, experience, and training. Life skills education programs are promising psychosocial interventions to enhance youth's mental health and to bolster coping mechanisms, resilience, and emotional intelligence [132•, 133]. Key life skills that can be cultivated among youth to manage their Instagram use include:

- *Digital literacy and social media literacy.* Despite being avid Instagram users, many young individuals lack comprehensive knowledge of the technology behind it and safety measures to lessen risks, so developing digital literacy is crucial, and high in the education agenda [134, 135]. More specifically, social media literacy can enable them to make informed decisions, control their online presence better, and choose how to use the platform, hopefully engaging in collaboration and civil participation [136, 137].
- *Critical thinking.* Fostering critical thinking skills is crucial for assessing the credibility of information [131, 138], given the vast, often incomplete, or inaccurate content encountered on Instagram. Promoting critical thinking can help to recognize and assess the bite-sized, hyper-condensed, partial, idealized, exaggerated, and unrealistic ideas, standards, ideals, and lifestyles that are portrayed there [21, 35, 139].
- *Social skills.* Social skills include the ability to communicate thoughts and feelings and interact verbally and non-verbally with others in different settings [131]. Real-life relationships are vital to feeling connected to others, being a part of a community, having a sense of belonging, and enjoying a satisfactory life [140, 141]. For people with less developed social skills, Instagram can be a tool to connect with others in a low-stakes environment [142, 143]. Yet, as online interactions fuel para-social connections that do not often translate into deeper connections [144, 145], social skills development remains vital.
- *Healthy lifestyles.* Promoting activities that contribute to healthy living reduces reliance on Instagram for entertainment or emotional management. Regular sleep, balanced nutrition, stress reduction, physical activity, and connecting with nature are integral to overall health [99, 146].
- *Promoting seeking professional help if needed.* Youths experiencing significant difficulties or interpersonal problems due to Instagram use should be encouraged to seek professional support [99]. Early intervention can alleviate symptoms and promote coping strategies, and psychoeducation can help destigmatize seeking professional help.

Promoting applied research on responsible Instagram and SNS use

In order to prevent harm and promote a healthier use of Instagram, social networks, and internet use in general, more research is needed to understand the processes leading to problematic use and translate these insights into best practices and actionable recommendations. Extending the work of other scholars in the field [35, 59, 61], researchers, academic institutions, governments, and organizations can contribute by:

- *Promoting research on responsible Internet use and prevention.* Despite considerable efforts to comprehend the mechanisms behind problematic social network use, there is a need for more research to document how responsible internet use can be promoted and how adverse outcomes can be prevented [61]. Given that future generations will depend on technology and use it extensively, research could have a profound impact on the mental health burden of the future.
- *Encouraging collaborations between researchers and social network developers:* Collaboration between researchers and technology companies can contribute to the ethical improvement of these platforms. Identifying features that enhance well-being and those that lead to problematic use can lead to improved designs of social network platforms. Companies should enhance transparency and share user data with researchers for objective, independent assessments of social network usage [35]. Utilizing these abundant data can drive platform improvements and ensure user benefits.
- *Enhancing research quality.* While diversity in research methods is valuable, certain approaches hold greater policy relevance than others. Standardizing operationalizations and measurements of problematic social network use and its determinants can reduce disparities between study methods and outcomes and enable the aggregation of results in future reviews and meta-analyses [4, 29, 82]. Longitudinal studies should be prioritized over cross-sectional ones, and behavioral data should be favored over self-reported data [32••, 35, 59]. Utilizing experience sampling methods can help to capture within-subject effects, which are particularly significant in the study of social network usage patterns [32••, 61]. Furthermore, expanding research beyond the typical samples such as youth and undergraduate students, to encompass more representative populations, can lead to a better understanding of risk factors and general and specific vulnerabilities. Research across various social networks should be encouraged to account for unique interaction contexts and affordances [35]. Responsible analysis of statistical significance and discouraging the overreporting of negligible effects should be embraced as best research practices [32••, 59].

- *Sustaining research funding:* Providing adequate funding is imperative to enable research, especially given the ever-evolving nature of social networking sites. Whereas social network platforms continuously introduce new features and improvements that can impact research outcomes, inadequate resources for research hinder the capacity to keep pace with these changes, thus potentially compromising the validity of theories and research methodologies. Allocating sufficient resources for researchers' training and long-term projects is therefore essential to conduct high-quality, timely, and informative research.

Conclusion

This paper aimed to identify the factors that influence Instagram use, paying attention to the design of interfaces, individual characteristics and motives of users as well as social factors, with the purpose of identifying targets for the prevention of problematic use. Based on these analyses, we have formulated recommendations for social network developing companies, governments, researchers, and users to mitigate the negative consequences of problematic use and to promote healthier use.

While the ethical design, research, and policy implementation of social networks require ongoing efforts, individuals can take immediate steps. Promoting *critical thinking* and a more intentional, present use of Instagram, guided by solid information on potential benefits and risks can empower individuals and give them back *agency* over their behaviors. Pursuing a selective approach to prevention by targeting vulnerable youth and addressing the predisposing factors of social comparison orientation and FoMO as well as self-regulation can help reduce the negative effects of Instagram use. Moreover, *life-skills training* can enable youth to deal effectively with the challenges of this fast-paced interconnected world.

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Declarations

Competing interests The authors declare no competing interests.

Conflict of Interest SMRS and SVdB have nothing to disclose.

Human and Animal Rights and Informed Consent No animal or human subjects were used in this study.

References

Papers of particular interest, published recently, have been highlighted as:

- Of importance
- Of major importance

1. Naslund JA, Bondre A, Torous J, Aschbrenner KA. Social media and mental health: benefits, risks, and opportunities for research and practice. *J Technol Behav Sci*. 2020;5:245–57.
2. Wong HY, Mo HY, Potenza MN, Chan MNM, Lau WM, Chui TK, et al. Relationships between severity of internet gaming disorder, severity of problematic social media use, sleep quality and psychological distress. *Int J Environ Res Public Health*. 2020;17(6):1879.
3. Shannon H, Bush K, Villeneuve PJ, Hellemans KG, Guimond S. Problematic social media use in adolescents and young adults: systematic review and meta-analysis. *JMIR Ment Health*. 2022;9(4): e33450.
4. Appel M, Marker C, Gnambs T. Are Social Media Ruining Our Lives? A Review of Meta-Analytic Evidence. *Rev Gen Psychol*. 2020;24(1):60–74. <https://doi.org/10.1177/1089268019880891>.
5. •• Faelens L, Hoorelbeke K, Cambier R, et al. The relationship between Instagram use and indicators of mental health: A systematic review. *Comput Human Behav Rep*. 2021;4: 100121. <https://doi.org/10.1016/j.chbr.2021.100121>. ()
6. Zulli D. Capitalizing on the look: insights into the glance, attention economy, and Instagram. *Crit Stud Media Commun*. 2018;35(2):137–50. <https://doi.org/10.1080/15295036.2017.1394582>.
7. Goldhaber MH. The attention economy and the Net. *First Monday*. 1997;2(4). <https://doi.org/10.5210/fm.v2i4.519>.
8. • Bhargava V, Velasquez M. Ethics of the attention economy: The problem of social media addiction. *Bus Ethics Q*. 2021;31(3):321–59. <https://doi.org/10.1017/beq.2020.32>. ()
9. Cloarec J. The personalization–privacy paradox in the attention economy. *Technol Forecast Soc Change*. 2020;161. <https://doi.org/10.1016/j.techfore.2020.120299>.
10. Abbott M. The epidemiology and impact of gambling disorder and other gambling-related harm. In: WHO Forum on Alcohol, Drugs, and Addictive Behaviours, Geneva, Switzerland; 2017.
11. Cash H, Rae C, Steel A, Winkler A. Internet addiction: A brief summary of research and practice. *Curr Psychiatry Rev*. 2012;8:292–8. <https://doi.org/10.2174/157340012803520513>.
12. Eyal N. Hooked: How to build habit-forming products. Penguin; New York, NY, USA; 2014.
13. Ertemel A, Aydın G. Technology addiction in the digital economy and suggested solutions. *Addicta Turk J Addict*. 2018;5:665–90. <https://doi.org/10.15805/addicta.2018.5.4.0038>.
14. Kozyreva A, Lewandowsky S, Hertwig R. Citizens versus the internet: Confronting digital challenges with cognitive tools. *Psychol Sci Public Interest*. 2020;21(3):103–56. <https://doi.org/10.1177/1529100620946707>.
15. Anderson IA, Wood W. Habits and the electronic herd: The psychology behind social media's successes and failures. *Consumer Psychol Rev*. 2021;4(1):83–99. <https://doi.org/10.1002/arcp.1063>.
16. Andrejevic M. The work of being watched: Interactive media and the exploitation of self-disclosure. *Crit Stud Media Commun*. 2002;19(2):230–48. <https://doi.org/10.1080/07393180216561>.
17. Alter A. Irresistible: The rise of addictive technology and the business of keeping us hooked. Penguin Press; New York, NY, USA; 2017.
18. Montag C, Lachmann B, Herrlich M, Zweig K. Addictive features of social media/messenger platforms and freemium games against the background of psychological and economic theories. *Int J Environ Res Public Health*. 2019;16(14):2612. <https://doi.org/10.3390/ijerph16142612>.
19. Sedera D, Lokuge S. Flaws in flawlessness: Perfectionism as a new technology-driven mental disorder. Forty-first International Conference on Information Systems, India; 2020. Available from: <https://arxiv.org/abs/2010.12032>.
20. Kim Y, Kim JH. Using computer vision techniques on Instagram to link users' personalities and genders to the features of their photos: An exploratory study. *Inf Process Manage*. 2018;54(6):1101–14.
21. Romero S, Van den Broucke S, Van Beggelaer W. Understanding Motives, Usage Patterns, and Effects of Instagram Use in Youths: A Qualitative Study. *Emerg Adulthood*. 2022;10(6):1376–94. <https://doi.org/10.1177/21676968221114251>.
22. Casaló LV, Flavián C, Ibáñez-Sánchez S. Understanding consumer interaction on Instagram: the role of satisfaction, hedonism, and content characteristics. *Cyberpsychol Behav Soc Netw*. 2017;20(6):369–75. <https://doi.org/10.1089/cyber.2016.0610>.
23. Griffiths MD, Balakrishnan J. The psychosocial impact of excessive selfie-taking in youth: A brief overview. *Educ Health*. 2018;36(1):3–6.
24. McComb SE, Mills JS. Young women's body image following upwards comparison to Instagram models: The role of physical appearance perfectionism and cognitive emotion regulation. *Body Image*. 2021;38:49–62. <https://doi.org/10.1016/j.bodyim.2021.03.012>.
25. Harren N, Walburg V, Chabrol H. Studying Social Media Burnout and Problematic Social Media use: The implication of perfectionism and metacognitions. *Comput Hum Behav Rep*. 2021;4. <https://doi.org/10.1016/j.chbr.2021.100117>.
26. Cramer EM, Song H, Drent AM. Social comparison on Facebook: Motivation, affective consequences, self-esteem, and Facebook fatigue. *Comput Human Behav*. 2016;64:739–46. <https://doi.org/10.1016/j.chb.2016.07.049>.
27. Latif K, Weng Q, Pitafi AH, Ali A, Siddiqui AW, Malik MY, Latif Z. Social comparison as a double-edged sword on social media: The role of envy type and online social identity. *Telematics Inform*. 2021;56. <https://doi.org/10.1016/j.tele.2020.101470>.
28. Liu C, Ma J. Social media addiction and burnout: The mediating roles of envy and social media use anxiety. *Curr Psychol*. 2020;39(6):1883–91. <https://doi.org/10.1007/s12144-018-9998-0>.
29. Reer F, Tang WY, Quandt T. Psychosocial well-being and social media engagement: The mediating roles of social comparison orientation and fear of missing out. *New Media Soc*. 2019;21(7):1486–505. <https://doi.org/10.1177/1461444818823719>.
30. Foroughi B, Griffiths MD, Iranmanesh M, Salamzadeh Y. Associations between Instagram addiction, academic performance, social anxiety, depression, and life satisfaction among university students. *Int J Ment Health Addict*. 2021;1–22. <https://doi.org/10.1007/s11469-021-00510-5>.
31. Tanega C, Downs A. Addictive Technology: Prevalence and Potential Implications of Problematic Social Media Use. *Psi Chi J Psychol Res*. 2020;25(2). <https://doi.org/10.24839/2325-7342.JN25.2.151>.
32. •• Valkenburg PM, Meier A, Beyens I. Social media use and its impact on adolescent mental health: An umbrella review of the evidence. *Curr Opin Psychol*. 2022;44:58–68. <https://doi.org/10.1016/j.copsyc.2021.08.017>. ()
33. Wegmann E, Brand M. A narrative overview about psychosocial characteristics as risk factors of problematic social networks use. *Curr Addict Rep*. 2019;6(4):402–9. <https://doi.org/10.1007/s40429-019-00286-8>.

34. Browne M, Hing N, Rockloff M, et al. A multivariate evaluation of 25 proximal and distal risk-factors for gambling-related harm. *J Clin Med*. 2019;8:509.
35. Verduyn P, Ybarra O, Résibois M, Jonides J, Kross E. Do Social Network Sites Enhance or Undermine Subjective Well-Being? A Critical Review. *Soc Issues Policy Rev*. 2017;11(1). <https://doi.org/10.1111/sipr.12033>.
36. Andreassen CS. Online Social Network Site Addiction: A Comprehensive Review. *Curr Addict Rep*. 2015;2:175–84. <https://doi.org/10.1007/s40429-015-0056-9>.
37. Frison E, Eggermont S. Browsing, posting, and liking on Instagram: The reciprocal relationships between different types of Instagram use and adolescents' depressed mood. *Cyberpsychol Behav Soc Netw*. 2017;20(10):603–9. <https://doi.org/10.1089/cyber.2017.0156>.
38. Lup K, Trub L, Rosenthal L. Instagram# instasad? Exploring associations among Instagram use, depressive symptoms, negative social comparison, and strangers followed. *Cyberpsychol Behav Soc Netw*. 2015;18(5):247–52. <https://doi.org/10.1089/cyber.2014.0560>.
39. Yang CC. Instagram use, loneliness, and social comparison orientation: Interact and browse on social media, but don't compare. *Cyberpsychol Behav Soc Netw*. 2016;19(12):703–8. <https://doi.org/10.1089/cyber.2016.0201>.
40. Romero S, Van den Broucke S, Billieux J, et al. Development, psychometric validation, and cross-cultural comparison of the "Instagram Motives Questionnaire" (IMQ) and the "Instagram Uses and Patterns Questionnaire" (IUPQ). *J Behav Addict*. 2022. <https://doi.org/10.1556/2006.2022.00088>.
41. Closson LM, Bond TA. Social network site use and university adjustment. *Educ Psychol*. 2019;39(8):1027–46. <https://doi.org/10.1080/01443410.2019.1618443>.
42. Rozgonjuk D, Sindermann C, Elhai JD, Montag C. Fear of Missing Out (FoMO) and social media's impact on daily-life and productivity at work: Do WhatsApp, Facebook, Instagram, and Snapchat Use Disorders mediate that association? *Addict Behav*. 2020;110: 106487. <https://doi.org/10.1016/j.addbeh.2020.106487>.
43. Chen S, Schreurs L, Pabian S, Vandenbosch L. Daredevils on social media: a comprehensive approach toward risky selfie behavior among adolescents. *New Media Soc*. 2019;21(11–12):2443–62. <https://doi.org/10.1177/1461444819850112>.
44. Mills JS, Musto S, Williams L, Tiggemann M. "Selfie" harm: Effects on mood and body image in young women. *Body Image*. 2018;27:86–92. <https://doi.org/10.1016/j.bodyim.2018.08.007>.
45. Pounders K, Kowalczyk CM, Stowers K. Insight into the motivation of selfie postings: Impression management and self-esteem. *Eur J Mark*. 2016;50(9/10):1879–92. <https://doi.org/10.1108/EJM-07-2015-0502>.
46. Weiler B, Gstaettner AM, Scherrer P. Selfies to die for: A review of research on self-photography associated with injury/death in tourism and recreation. *Tour Manag Perspect*. 2021. <https://doi.org/10.1016/j.tmp.2020.100778>.
47. Dumas TM, Maxwell-Smith M, Davis JP, Giulietti PA. Lying or longing for likes? Narcissism, peer belonging, loneliness and normative versus deceptive like-seeking on Instagram in emerging adulthood. *Comput Human Behav*. 2017;71:1–10. <https://doi.org/10.1016/j.chb.2017.01.037>.
48. Dumas TM, Maxwell-Smith MA, Tremblay PF, Litt DM, Ellis W. Gaining likes, but at what cost? Longitudinal relations between young adults' deceptive like-seeking on Instagram, peer belonging and self-esteem. *Comput Human Behav*. 2020;112: 106467. <https://doi.org/10.1016/j.chb.2020.106467>.
49. Drenten J, Gurrieri L, Tyler M. Sexualized labour in digital culture: Instagram influencers, porn chic and the monetization of attention. *Gender Work Organ*. 2020;27(1):41–66. <https://doi.org/10.1111/gwao.12354>.
50. Hosseinmardi H, Mattson SA, Rafiq RI, Han R, Lv Q, Mishra S. Detection of cyberbullying incidents on the Instagram social network. arXiv preprint arXiv:1503.03909. 2015. https://doi.org/10.1007/978-3-319-27433-1_4.
51. Moreno MA, Ton A, Selkie E, Evans Y. Secret society 123: Understanding the language of self-harm on Instagram. *J Adolesc Health*. 2016;58(1):78–84. <https://doi.org/10.1016/j.jadohealth.2015.09.015>.
52. Vitak J, Chadha K, Steiner L, Ashktorab Z. Identifying women's experiences with and strategies for mitigating negative effects of online harassment. In: Proceedings of the 2017 ACM Conference on Computer Supported Cooperative Work and Social Computing. 2017:1231–1245. Portland, Oregon, USA: ACM. Available from: <https://dl.acm.org/doi/10.1145/2998181.2998337>.
53. Boyd D. Why America is self-segregating. *Data & Society*. 2017:1–10. <https://points.datasociety.net/why-america-is-self-segregating-d881a39273ab>.
54. DellaPosta D, Shi Y, Macy M. Why do liberals drink lattes? *Am J Sociol*. 2015;120(5):1473–511.
55. Feltman CE, Szymanski DM. Instagram use and self-objectification: The roles of internalization, comparison, appearance commentary, and feminism. *Sex Roles*. 2018;78(5):311–24. <https://doi.org/10.1007/s11199-017-0796-1>.
- 56.●● Meier A, Reinecke L. Computer-Mediated Communication, Social Media, and Mental Health: A Conceptual and Empirical Meta-Review. *Commun Res*. 2021;48(8):1182–209. <https://doi.org/10.1177/0093650220958224>. ()
- 57.●● Cataldo I, Billieux J, Esposito G, Corazza O. Assessing problematic use of social media: where do we stand and what can be improved? *Curr Opin Behav Sci*. 2022;45: 101145. <https://doi.org/10.1016/j.cobeha.2022.101145>. ()
- 58.●● Flayelle M, Schimmenti A, Starcevic V, Billieux J. The pitfalls of recycling substance-use disorder criteria to diagnose behavioral addictions. In: Heather N, Field M, Moss A, Satel S, eds. *Evaluating the Brain Disease Model of Addiction*. Routledge; 2022:339–349. <https://doi.org/10.4324/9781003032762-34>
Provides a critical account on the application of the biomedical model of addiction to non-substance related addictive behaviors.
59. Orben A. Teenagers, screens and social media: A narrative review of reviews and key studies. *Soc Psychiatry Psychiatr Epidemiol*. 2020;55(4):407–14. <https://doi.org/10.1007/s00127-019-01825-4>.
60. Satchell LP, Fido D, Harper CA, et al. Development of an Offline-Friend Addiction Questionnaire (O-FAQ): Are most people really social addicts? *Behav Res*. 2021;53:1097–106. <https://doi.org/10.3758/s13428-020-01462-9>.
61. Valkenburg PM. Social media use and well-being: What we know and what we need to know. *Curr Opin Psychol*. 2021;45. <https://doi.org/10.1016/j.copsyc.2021.12.006>.
62. Green L, Kreuter M. The precede–proceed model. In: *Health Promotion Planning: An Educational Approach*. 3rd ed. California, USA: Mayfield Publishing Company; 1999:32–43.
63. Brailovskaia J, Rohmann E, Bierhoff HW, Schillack H, Margraf J. The relationship between daily stress, social support and Facebook Addiction Disorder. *Psychiatry Res*. 2019;276:167–74. <https://doi.org/10.1016/j.psychres.2019.05.014>.
64. Burnell K, George MJ, Vollet JW, Ehrenreich SE, Underwood MK. Passive social networking site use and well-being: The mediating roles of social comparison and the fear of missing out. *Cyberpsychology*. 2019;13(3). <https://doi.org/10.5817/CP2019-3-5>.

65. Casale S, Fioravanti G. Why narcissists are at risk for developing Facebook addiction: The need to be admired and the need to belong. *Addict Behav.* 2018;76:312–8. <https://doi.org/10.1016/j.addbeh.2017.08.038>.
66. Elhai JD, Levine JC, Dvorak RD, Hall BJ. Fear of missing out, need for touch, anxiety and depression are related to problematic smartphone use. *Comput Human Behav.* 2016;63:509–16. <https://doi.org/10.1016/j.chb.2016.05.079>.
67. Elhai JD, Levine JC, Hall BJ. The relationship between anxiety symptom severity and problematic smartphone use: A review of the literature and conceptual frameworks. *J Anxiety Disord.* 2019;62:45–52. <https://doi.org/10.1016/j.janxdis.2018.11.005>.
68. Roberts JA, Pullig C, Manolis C. I need my smartphone: A hierarchical model of personality and cell-phone addiction. *Pers Individ Dif.* 2015;79:13–9. <https://doi.org/10.1016/j.paid.2015.01.049>.
69. Satici SA. Facebook addiction and subjective well-being: A study of the mediating role of shyness and loneliness. *Int J Ment Health Addiction.* 2019;17(1):41–55. <https://doi.org/10.1007/s11469-017-9862-8>.
70. Wang P, Zhao M, Wang X, et al. Peer relationship and adolescent smartphone addiction: The mediating role of self-esteem and the moderating role of the need to belong. *J Behav Addict.* 2017;6(4):708–17. <https://doi.org/10.1556/2006.6.2017.079>.
71. Wegmann E, Brand M. Internet-communication disorder: It's a matter of social aspects, coping, and Internet-use expectancies. *Front Psychol.* 2016;7:1747. <https://doi.org/10.3389/fpsyg.2016.01747>.
72. Yau JC, Reich SM. Are the qualities of adolescents' offline friendships present in digital interactions? *Adolescent Res Rev.* 2018;3(3):339–55. <https://doi.org/10.1007/s40894-017-0059-y>.
73. Mrazek PJ, Haggerty RJ. Reducing Risks for Mental Disorders: Frontiers for Preventive Intervention Research. Washington DC: National Academies Press; 1994.
74. Brand M, Wegmann E, Stark R, et al. The Interaction of Person-Affect-Cognition-Execution (I-PACE) model for addictive behaviors: Update, generalization to addictive behaviors beyond internet-use disorders, and specification of the process character of addictive behaviors. *Neurosci Biobehav Rev.* 2019;104:1–10. <https://doi.org/10.1016/j.neubiorev.2019.06.032>.
75. Abeele MMV, Halfmann A, Lee EW. Drug, demon, or donut? Theorizing the relationship between social media use, digital well-being, and digital disconnection. *Curr Opin Psychol.* 2022;45. <https://doi.org/10.1016/j.copsyc.2021.12.007>.
76. Radtke T, Apel T, Schenkel K, Keller J, von Lindern E. Digital detox: An effective solution in the smartphone era? A systematic literature review. *Mobile Media & Communication.* 2022;10(2):190–215.
77. Syvertsen T, Enli G. Digital detox: Media resistance and the promise of authenticity. *Convergence.* 2020;26(5–6):1269–83. <https://doi.org/10.1177/1354856519847325>.
78. Coyne P, Woodruff SJ. Taking a Break: The Effects of Partaking in a Two-Week Social Media Digital Detox on Problematic Smartphone and Social Media Use, and Other Health-Related Outcomes among Young Adults. *Behav Sci.* 2023;13(12):1004. <https://doi.org/10.3390/bs13121004>.
79. World Health Organization. Mental health: strengthening our response. <https://www.who.int/news-room/fact-sheets/detail/mental-health-strengthening-our-response>. 2022.
80. World Health Organization. Mental health: strengthening our response. <https://www.who.int/mediacentre/factsheet/fs220/en/>. 2016.
81. World Health Organization. Public health implications of excessive use of the Internet, computers, smartphones and similar electronic devices: Meeting report. Japan, 27–29 August 2014. http://apps.who.int/iris/bitstream/10665/184264/1/9789241509367_eng.pdf. 2015.
82. Romero S, Van den Broucke S. The effectiveness of prevention programs for problematic Internet use in adolescents and youths: A systematic review and meta-analysis. *Cyberpsychol: J Psychosoc Res Cyberspace.* 2021;15(2). <https://doi.org/10.5817/CP2021-2-10>.
83. American Psychological Association. Guidelines for prevention in psychology. *Am Psychol.* 2014;69(3):285–96. <https://doi.org/10.1037/a0034569>.
84. Gielen AC, McDonald EM, Gary TL, Bone LR. Using the PRECEDE/PROCEED Model to Apply Health Behavior Theories. In: Glanz K, Rimer FM, Viswanath K, editors. *Health Behavior and Health Education: Theory, Research and Practice.* 4th ed. Jossey-Bass; 2008. p. 407–33.
85. Green L. Toward cost–benefit evaluations of health education: some concepts, methods, and examples. *Health Educ Monogr.* 1974;2(Suppl. 2):34–64.
86. Glasgow RE. RE-AIMing research for application: ways to improve evidence for family medicine. *J Am Board Fam Med.* 2006;19(1):11–9. <https://doi.org/10.3122/jabfm.19.1.11>.
87. Glasgow RE, Klesges LM, Dzawaltowski DA, Bull SS, Estabrooks P. The future of health behavior change research: what is needed to improve translation of research into health promotion practice? *Ann Behav Med.* 2004;27(1):3–12. https://doi.org/10.1207/s15324796abm2701_2.
88. Glasgow RE, Vogt TM, Boles SM. Evaluating the public health impact of health promotion interventions: the RE-AIM framework. *Am J Public Health.* 1999;89(9):1322–7.
89. Algorithm Justice League. The Algorithmic Justice League's 101 overview. <https://www.ajl.org/learn-more>. Published 2020. **Provides important information towards equitable and accountable AI.**
90. Center for Humane Technology. Policy reforms toolkit. <https://www.humanetech.com/policy-reforms>. Published 2022. **Provides a toolkit to continue drafting policies that address asymmetries of power between technology companies and democratic societies.**
91. Hermstruwer Y. Contracting around privacy: the (behavioral) law and economics of consent and big data. *J Intell Prop Info Tech Elec Com L.* 2017;8:9.
92. Acquisti A, Brandimarte L, Loewenstein G. Privacy and human behavior in the age of information. *Science.* 2015;347(6221):509–14. <https://doi.org/10.1126/science.aaa1465>.
93. Donovan J, Caplan R, Matthews J, Hanson L. Algorithmic accountability: A primer. Data & Society Research Institute; 2018. Available from: <https://datasociety.net/library/algorithmic-accountability-a-primer/>.
94. Bandy J. Problematic Machine Behavior: A Systematic Literature Review of Algorithm Audits. *Proc ACM Hum-Comput Interact.* 2021;5(CSCW1):74. <https://doi.org/10.1145/3449148>.
95. Eg R, Demirkol Tønnesen Ö, Tennfjord MK. A scoping review of personalized user experiences on social media: The interplay between algorithms and human factors. *Comput Human Behav Rep.* 2023;9: 100253. <https://doi.org/10.1016/j.chbr.2022.100253>.
96. Natarajan N. Do They Stop? How Do They Stop? Why Do They Stop? Whether, How, and Why Teens Insert “Frictions” Into Social Media's Infinite Scroll. *Int J Commun.* 2024;18:20.
97. Rixen JO, Meinhardt LM, Glöckler M, Ziegenbein ML, Schlothauer A, Colley M, Rukzio E, Gugenheimer J. The Loop and Reasons to Break It: Investigating Infinite Scrolling Behaviour in Social Media Applications and Reasons to Stop. *Proc ACM Hum-Comput Interact.* 2023;7(MHCI):228. <https://doi.org/10.1145/3604275>.

98. Purohit A, Jan B, Schöbel S, Janson A, Holzer A. Designing for Digital Wellbeing on a Smartphone: Co-creation of Digital Nudges to Mitigate Instagram Overuse. *Proceedings of the 56th Hawaii International Conference on System Sciences* 2023. <https://doi.org/10.24251/HICSS.2023.499>.
99. Király O, Potenza MN, Stein DJ, et al. Preventing problematic internet use during the COVID-19 pandemic: Consensus guidance. *Compr Psychiatry*. 2020;100: 152180. <https://doi.org/10.1016/j.comppsych.2020.152180>.
100. Verduyn P, Gugushvili N, Massar K, Täht K, Kross E. Social comparison on social networking sites. *Curr Opin Psychol*. 2020;36:32–7. <https://doi.org/10.1016/j.copsyc.2020.04.002>.
101. Fioravanti G, Casale S, Bocci Benucci S, Probst A, Falone A, Ricca V, Rotella F. Fear of missing out and social networking sites use and abuse: A meta-analysis. *Comput Human Behav*. 2021;122: 106839. <https://doi.org/10.1016/j.chb.2021.106839>.
102. Andrade FC, Erwin S, Burnell K, Jackson J, Storch M, Nicholas J, Zucker N. Intervening on Social Comparisons on Social Media: Electronic Daily Diary Pilot Study. *JMIR Ment Health*. 2023;10: e42024. <https://doi.org/10.2196/42024>.
103. Alutaybi A, Al-Thani D, McAlaney J, Ali R. Combating Fear of Missing Out (FoMO) on Social Media: The FoMO-R Method. *Int J Environ Res Public Health*. 2020;17(17):6128. <https://doi.org/10.3390/ijerph17176128>.
104. Phillips WJ, Wisniewski AT. Self-compassion moderates the predictive effects of social media use profiles on depression and anxiety. *Comput Human Behav Rep*. 2021;4: 100128. <https://doi.org/10.1016/j.chbr.2021.100128>.
105. Weaver JL, Swank JM. Mindful Connections: A Mindfulness-Based Intervention for Adolescent Social Media Users. *J Child Adolesc Couns*. 2019;5(2):103–12. <https://doi.org/10.1080/23727810.2019.1586419>.
106. Ryan E, Linehan C. A qualitative exploration into personal psychological agency in Instagram use. *Comput Human Behav Rep*. 2022;6: 100196. <https://doi.org/10.1016/j.chbr.2022.100196>.
107. Bandura A. Adolescent development from an agentic perspective. In: Pajares F, Urdan T, editors. *Self-Efficacy Beliefs of Adolescents*. Greenwich, CT: Information Age; 2006. pp. 1–43.
108. Kögler H-H. Agency and the Other: On the intersubjective roots of self-identity. *New Ideas Psychol*. 2012;30(1):47–64. <https://doi.org/10.1016/j.newideapsych.2010.03.010>.
109. Verplanken B, Orbell S. Attitudes, Habits, and Behavior Change. *Annu Rev Psychol*. 2022;73:327–52. <https://doi.org/10.1146/annurev-psych-020821-011744>.
110. Olson JA, Sandra DA, Chmoulevitch D, et al. A Nudge-Based Intervention to Reduce Problematic Smartphone Use: Randomised Controlled Trial. *Int J Ment Health Addiction*. 2023;21:3842–64. <https://doi.org/10.1007/s11469-022-00826-w>.
111. Brevers D, Turel O. Strategies for self-controlling social media use: Classification and role in preventing social media addiction symptoms. *J Behav Addict*. 2019;8(3):554–63. <https://doi.org/10.1556/2006.8.2019.49>.
112. Tandon A, Kaur P, Dhir A, Mäntymäki M. Sleepless due to social media? Investigating problematic sleep due to social media and social media sleep hygiene. *Comput Human Behav*. 2020;113: 106487. <https://doi.org/10.1016/j.chb.2020.106487>.
113. Barsova T, Cheong ZG, Mak AR, Liu JC. Predicting Psychological Symptoms When Facebook's Digital Well-being Features Are Used: Cross-sectional Survey Study. *JMIR Form Res*. 2022;6(8): e39387. <https://doi.org/10.2196/39387>.
114. Meynadier J, Malouff JM, Loi NM, et al. Lower Mindfulness is Associated with Problematic Social Media Use: A Meta-Analysis. *Curr Psychol*. 2024;43:3395–404. <https://doi.org/10.1007/s12144-023-04587-0>.
115. Chan SS, Van Solt M, Cruz RE, Philp M, Bahl S, Serin N, ... Canbulut M. Social media and mindfulness: From the fear of missing out (FOMO) to the joy of missing out (JOMO). *J Consumer Aff*. 2022;56(3):1312–1331. <https://doi.org/10.1111/joca.12476>.
116. Kreling R, Meier A, Reinecke L. Feeling Authentic on Social Media: Subjective Authenticity Across Instagram Stories and Posts. *Social Media + Society*. 2022;8(1). <https://doi.org/10.1177/20563051221086235>.
117. Hofmann W, Luhmann M, Fisher RR, Vohs KD, Baumeister RF. Yes, but are they happy? Effects of trait self-control on affective well-being and life satisfaction. *J Pers*. 2014;82(4):265–77. <https://doi.org/10.1111/jopy.12050>.
118. Iwakabe S, Nakamura K, Thoma NC. Enhancing emotion regulation. *Psychother Res*. 2023;33(7):918–45. <https://doi.org/10.1080/10503307.2023.2183155>.
119. Tornquist M, Miles E. Trait self-control and beliefs about the utility of emotions and emotion regulation in self-control performance. *Self Identity*. 2023;22(4):639–68. <https://doi.org/10.1080/15298868.2022.2146183>.
120. Paschke K, Diestelkamp S, Zapf A, Busch K, Arnaud N, Prehn-Kristensen A, Reis O, Stark M, Cloes JO, Schulz AL, Brauer H, Krömer T, Thomasius R, the Res@t Consortium. An app-based training for adolescents with problematic digital-media use and their parents (Res@t digital): protocol for a cluster-randomized clinical trial. *Front Psychiatry*. 2024;14. <https://doi.org/10.3389/fpsy.2023.1245536>.
121. Cohen N, Ochsner KN. From surviving to thriving in the face of threats: the emerging science of emotion regulation training. *Curr Opin Behav Sci*. 2018;24:143–55. <https://doi.org/10.1016/j.cobeha.2018.08.007>.
122. Doré BP, Silvers JA, Ochsner KN. Toward a Personalized Science of Emotion Regulation. *Soc Personal Psychol Compass*. 2016;10(4):171–87. <https://doi.org/10.1111/spc3.12240>.
123. Zahrai K, Veer E, Ballantine PW, Peter de Vries H. Conceptualizing Self-control on Problematic Social Media Use. *Australas Mark J*. 2022;30(1):74–89. <https://doi.org/10.1177/1839334921998866>.
124. Zahrai K, Veer E, Ballantine PW, de Vries HP, Prayag G. Either you control social media or social media controls you: Understanding the impact of self-control on excessive social media use from the dual-system perspective. *J Consumer Aff*. 2022;56(2):806–48. <https://doi.org/10.1111/joca.12370>.
125. Fujita K, Orvell A, Kross E. Smarter, not harder: A toolbox approach to enhancing self-control. *Policy Insights Behav Brain Sci*. 2020;7(2):149–56. <https://doi.org/10.1177/237273222094124>.
126. Gross JJ, John OP. Individual differences in two emotion regulation processes: implications for affect, relationships, and well-being. *J Pers Soc Psychol*. 2003;85:348–62. <https://doi.org/10.1037/0022-3514.85.2.348>.
127. Haga SM, Kraft P, Corby E-K. Emotion regulation: antecedents and well-being outcomes of cognitive reappraisal and expressive suppression in cross-cultural samples. *J Happiness Stud*. 2009;10:271–91. <https://doi.org/10.1007/s10902-007-9080-3>.
128. Dryman MT, Heimberg RG. Emotion regulation in social anxiety and depression: a systematic review of expressive suppression and cognitive reappraisal. *Clin Psychol Rev*. 2018;65:17–42. <https://doi.org/10.1016/j.cpr.2018.07.004>.
129. Hu T, Zhang D, Wang J, Mistry R, Ran G, Wang X. Relation between emotion regulation and mental health: A meta-analysis review. *Psychol Rep*. 2014;114(2):341–62. <https://doi.org/10.2466/03.20.PR0.114k22w4>.
130. Pogrebtsova E, Son Hing L, González-Morales MG. Effectiveness of an emotion regulation intervention versus an active control on daily well-being and cognitive reappraisal: An experience sampling randomized controlled trial. *Int J Stress Manag*. 2022;29(4):400–12. <https://doi.org/10.1037/str0000259>.

131. World Health Organization. Life skills education for children and adolescents in schools. <https://apps.who.int/iris/handle/10665/63552>. 2020.
132. • Reinecke L, Gilbert A, Eden A. Self-regulation as a key boundary condition in the relationship between social media use and well-being. *Curr Opin Psychol*. 2022;45:101296. <https://doi.org/10.1016/j.copsyc.2021.12.008> **Important article on the role of self-regulation and self-control as boundary conditions of the effects on social media on psychological well-being.**
133. Nasheeda A, Abdullah HB, Krauss SE, Ahmed NB. A narrative systematic review of life skills education: effectiveness, research gaps, and priorities. *Int J Adolesc Youth*. 2019;24(3):362–79. <https://doi.org/10.1080/02673843.2018.1479278>.
134. Leaning M. An Approach to Digital Literacy through the Integration of Media and Information Literacy. *Media Commun*. 2019;7(2):4–13. <https://doi.org/10.17645/mac.v7i2.1931>.
135. Law NWY, Woo DJ, de la Torre J, Wong KWG. A global framework of reference on digital literacy skills for indicator 4.4.2. UNESCO Institute for Statistics; 2018. Available from: <http://uis.unesco.org/sites/default/files/documents/ip51-global-framework-reference-digital-literacy-skills-2018-en.pdf>.
136. Polanco-Levicán K, Salvo-Garrido S. Understanding Social Media Literacy: A Systematic Review of the Concept and Its Competences. *Int J Environ Res Public Health*. 2022;19(14):8807. <https://doi.org/10.3390/ijerph19148807>.
137. Manca S, Bocconi S, Gleason B. “Think globally, act locally”: A glocal approach to the development of social media literacy. *Comput Educ*. 2021;160: 104025. <https://doi.org/10.1016/j.compedu.2020.104025>.
138. Taibi D, Scifo L, Bruno N, Fulantelli G. Social Media Literacy to Support a Conscious Use of Social Media in Adolescents and Improve Their Psychological Well-Being: A Pilot Study. *Sustainability*. 2023;15:12726. <https://doi.org/10.3390/su151712726>.
139. Iftikhar I, Yasmeen B, Nadeem M, Ahmad N. Filtered reality: Exploring gender differences in Instagram use, social conformity pressure, and regret among young adults. *J Hum Behav Soc Environ*. 2023;1–19. <https://doi.org/10.1080/10911359.2023.2244020>.
140. Stavrova O, Luhmann M. Social connectedness as a source and consequence of meaning in life. *J Posit Psychol*. 2016;11(5):470–9. <https://doi.org/10.1080/17439760.2015.1117127>.
141. Lambert NM, Stillman TF, Hicks JA, Kamble S, Baumeister RF, Fincham FD. To belong is to matter: Sense of belonging enhances meaning in life. *Pers Soc Psychol Bull*. 2013;39:1418–27. <https://doi.org/10.1177/0146167213499186>.
142. Valkenburg PM, Peter J. Preadolescents’ and adolescents’ online communication and their closeness to friends. *Dev Psychol*. 2007;43(2):267. <https://doi.org/10.1037/0012-1649.43.2.267>.
143. Wegmann E, Brand M. A narrative overview about psychosocial characteristics as risk factors of a problematic social networks use. *Curr Addict Rep*. 2019;6:402–9. <https://doi.org/10.1007/s40429-019-00286-8>.
144. Jarzyna CL. Parasocial Interaction, the COVID-19 Quarantine, and Digital Age Media. *Human Arenas*. 2021;4(3):413–29. <https://doi.org/10.1007/s42087-020-00156-0>.
145. Verswijvel K, Heirman W, Hardies K, Walrave M. Designing and validating the friendship quality on social network sites questionnaire. *Comput Human Behav*. 2018;86:289–98. <https://doi.org/10.1016/j.chb.2018.04.050>.
146. Wang X, Arafa A, Liu K, Eshak ES, Hu Y, Dong JY. Combined healthy lifestyle and depressive symptoms: a meta-analysis of observational studies. *J Affect Disord*. 2021;289:144–50. <https://doi.org/10.1016/j.jad.2021.04.030>.

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