

Silvana Melissa ROMERO SALETTI

PREVENTING PROBLEMATIC INSTAGRAM USE IN YOUTH: PAVING WAYS FOR A BETTER UNDERSTANDING



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Résumé

Les réseaux sociaux facilitent l'interaction sociale, mais leur utilisation peut également entraîner des problèmes de santé mentale. Bien que la nécessité d'atténuer ces effets négatifs potentiels soit reconnue, la conceptualisation et mesure, et les déterminants et conséquences de l'utilisation problématique d'Internet (UPI) restent flous. Cette thèse présente une série d'études utilisant un éventail de méthodes, dont l'examen systématique et la méta-analyse, l'enquête qualitative, l'analyse psychométrique et la modélisation d'équations structurelles, afin d'améliorer la compréhension d'UPI, et d'Instagram en particulier, pour informer la prévention. Il a été noté que la recherche et les interventions sont souvent basées sur le cadre théorique de la *dépendance*, ce qui ne rend pas justice à la spécificité de l'UPI. L'identification de motifs et de modèles distincts d'utilisation d'Instagram servi de base au développement et à la validation de deux mesures d'auto-évaluation (l'IMQ et l'IUPQ). Grâce à ces instruments, il a été démontré que *l'orientation vers la comparaison sociale* et *l'anxiété de ratage* ont des effets directs et indirects sur les motifs et les modèles d'utilisation d'Instagram, et que ces modèles sont liés à la dépression, à l'anxiété et au stress par la solitude. Les implications de ces résultats et des suggestions pour une meilleure prévention sont fournies.

Abstract

Social networks facilitate social interaction, but their use can also lead to mental health problems. While it is recognized that preventive efforts are needed to mitigate these potential adverse effects, the conceptualization, measurement, determinants, and consequences of problematic internet use (PUI) remain unclear. This thesis presents a series of studies using a range of methods including systematic review and meta-analysis, qualitative inquiry, psychometric analysis, and structural equation modeling to improve the understanding of PUI and, particularly, Instagram use, to inform prevention. It is noted that research and interventions are often based on the *addiction* framework, which does not do justice to the specificity of PUI. The identification of distinctive motives and patterns of Instagram formed a basis for the development and validation of two self-report measures (the IMQ and the IUPQ). Using these instruments, it was shown that *social comparison orientation* and *fear of missing out* have direct and indirect effects on motives and patterns of Instagram use, and these patterns are related to depression, anxiety, and stress through loneliness. The implications of these findings and suggestions for better prevention are provided.

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Chapter 1. General Introduction

1. Theoretical and empirical underpinnings

Modern society is rapidly advancing, continuously changing, and embracing emerging technologies. The Internet and, subsequently, smartphones, revolutionized the world as we used to know it, removing communication barriers, and enabling instant and easy access to the world, thus becoming one of the key drivers of social change. They have changed personal relationships, education, entertainment, business, and almost everything we know, as predicted two decades ago (Di Maggio et al., 2001; Bargh & MacKenna, 2004). Today, two-thirds of the world's population have Internet access, and more than six billion people have smartphone subscriptions (Statista, 2022a; 2022b). Digitalization of personal and professional life has generated an increase in the time spent online, with estimates rising steadily since 2011. In 2021, it was estimated that people employ 192 minutes per day on average on Internet, out of which 155 minutes are spent on mobile devices and 37 minutes on a desktop computer, with the use of the latter declining steadily in the last five years (Statista, 2022c). The increase in the use of mobile devices is foreseen as mobile social media seems to have provided an added layer of connectivity to social life by integrating media production, distribution, and consumption into one device (Karsay et al., 2022).

At the same time, there is a growing interest of researchers, clinicians, educators, employers, and parents to understand, treat and educate young people who spend a substantial amount of time on smartphones and other IT devices. This can be partly explained by individual observations of the changes in young people's attitudes and behaviors but can also be understood as an expression of *moral panic*: a phenomenon by which a person, group, or event is perceived as challenging social norms (Cohen, 1972). While in the past this concern was mainly related to the use of radio and television by youths, this panic is now centered on new technologies and their potentially deleterious effects on children and youth (Orben, 2019). Hence, the advances in Internet and social media use can lead to polarized views, which can be either utopian or dystopian (Livingstone et al., 2018).

Young people who grew up with IT technology are called GenZ (Hill Holiday, 2018), *digital natives* (Prensky, 2001), and lately, *iGen* (Twenge, 2017). Their views are usually opposed to those of *digital immigrants* - including *Millennials* - who had to adopt IT later in life (Evans & Robertson, 2020). GenZ are believed to

be great multitaskers, who prefer digital media over traditional media, and are used to interacting and communicating in a world that is always connected. They are tech-savvy, master smartphones and social media, and prefer to learn in high-tech environments (Cruz & Diaz, 2016; Davies, 2020; Evans & Robertson, 2020; Scholz & Vyugina, 2019). But, it is also believed that they have a short attention span and working memory, that they are impulsive, high in sensation-seeking, more easily distracted by their smartphones, and constantly looking for instant gratification (Chen & Yan, 2016; Lopez-Fernandez et al., 2017; Selwyn, 2009; Teo, 2013; Uncapher et al., 2016). A study examining 40,377 children and teens concluded that the above-average screen user is less happy, less curious, seems more distracted, has lower self-control and less emotional stability, and is more often unable to finish tasks (Twenge & Campbell, 2018). Yet, these conclusions have also been contested since the results were not appropriately interpreted (Ophir et al., 2019). So, although the interest in understanding the effects of technology on its users is genuine, most research regarding this subject leads to opposed, often polarized views.

The concerns regarding the adverse effects of digital technology use on empathy, social interaction, well-being, and many other important outcomes have increased in the last decade (Billieux et al., 2015a; Greenfield, 2014; Kuss et al., 2014; Orben, 2019). This led to the assertion that we are *alone together*, meaning that although technology brings us together, it also disconnects us from others when we over-engage with it (Turkle, 2013). Overuse of digital technologies is now recognized as a public health concern (World Health Organization, WHO, 2014), and a growing number of people are seeking treatment to manage problematic online behaviors (e.g., excessive involvement in online games, cybersex, or social networking) (Kuss & Billieux, 2016; Kuss & López-Fernández 2016).

When facing such phenomena, the normal response of policymakers would be to turn to researchers, who can investigate the problem and provide answers which can inform policies (Okasha, 2002). However, the pace at which information technology advances makes it impossible to keep up with it. As a result, the risk of studying the problem without having solid theoretical foundations as the basis for scientific understanding is high (Orben, 2019). This is the case for technological addictions, Internet addiction, social network addiction, and subsequent phenomena, such as problematic use of Instagram.

This thesis aims to provide a better understanding of the use of Instagram by youth and to investigate its correlates and possible consequences through a series of

studies. The underlying idea is that these insights can inform preventive efforts. To provide a basis for this research, a review of the theoretical concepts and empirical evidence regarding problematic internet use is required. In the following sections, we will introduce the concept of Internet addiction and its limitations, describe the phenomenon of social networks, their problematic use, and the potential consequences of such use. We will also describe Instagram and its features, present explanatory approaches to understand the problematic use of the platform, and discuss the overall implications for research and prevention. A section covering the context of the COVID-19 pandemic and its implications for internet and social media use will also be presented. Finally, we will outline the theoretical framework for this thesis, formulate the research objectives, describe the studies that were undertaken to attain those objectives, and end with an outline of the chapters of the thesis.

1.1 The rise and fall of the concept of Internet addiction

Internet addiction has rapidly become one of the most extensively studied types of behavioral addiction (Weinstein et al., 2015). However, it remains a highly controversial concept. Drawing on theoretical and clinical observations, scholars and clinicians in the late 1990s started claiming that excessive use of the Internet was a growing problem that should be recognized as an *addiction* (Griffiths, 1998; Thompson, 1996; Young, 1996; 1998). Young (1996, 1998) was one of the first to suggest the term Internet addiction and argued that it encompassed five subtypes of specific internet addictions: (1) cyber sexual addiction (cybersex and cyberporn), (2) cyber relationships or social media addiction, referring to online social interactions, (3) net compulsions (gambling, shopping), (4) information overload, including web surfing and information searching, and (5) computer addiction which included video-game playing (Young et al., 1999). Davis (2001) would later distinguish between *general Internet addiction*, which is an addiction to the internet in all its forms, and *specific Internet addiction*, which refers to the different online behaviors to which one gets addicted (e.g., social networking, gaming, gambling, etc).

Many other terminologies emerged such as *compulsive internet use* (Greenfield, 1999a), *pathological internet use* (Kandell, 1998), *virtual addiction* (Greenfield, 1999b), *compulsive computer use* (Black et al., 1999), and *problematic internet use* (Shapira et al., 2000; Fineberg et al., 2018). These terms are sometimes used interchangeably in the literature (Cash et al., 2012; Starcevic & Aboujaoude, 2017), and refer to a wide range of activities that may serve different purposes for

the individual (e.g., gambling, gaming, pornography viewing, buying, cyberbullying and social networking). As such, the question remains whether these terms are useful. They are extremely broad and misleading since the Internet is just a medium, a “delivery mechanism”, that fuels a variety of activities that can be indulged through its use (Balhara, 2018; Starcevic & Aboujaoude, 2017; Widyanto & Griffiths, 2006). Based on this observation, some authors propose to study different kinds of problematic engagement in internet-related behavior separately (Pawlikowski et al., 2014; Petry et al., 2018; Starcevic & Aboujaoude, 2017) and advocate for a *spectrum hypothesis* that holds that online behavior should be conceptualized within a spectrum of related, yet distinct disorders that have both common and unique etiological factors (Starcevic & Billieux, 2017). *Problematic internet use* is the preferred umbrella term to designate this set of behaviors (Fineberg et al., 2018).

Initial research on this topic assumed that the excessive use of digital technologies should be considered *non-chemical addictions* or *behavioral addictions* (Marks, 1990), based on their similarities with substance addictions. Relevant to this discussion is the introduction of the *components model of addiction* (Griffiths, 2005; Kim & Hodgins, 2018; Shaffer et al., 2004), which argues that all addictions (substance and non-substance related) have six common components that need to be present:

- *Salience*. The addictive activity (e.g., smoking, consuming a drug, playing video games, or browsing social networks) dominates the person’s thoughts, feelings, and behavior, becoming the most important for them.
- *Mood modification*. The activity produces a buzz, a high, or a relaxed feeling of flow, generating a mood shift that makes them feel better.
- *Tolerance*. The person needs to engage in increasing amounts of the activity to achieve the same former effects.
- *Withdrawal*. The person experiences distress or unpleasant physical effects when unable to perform or access the activity. The withdrawal effects can be psychological or physiological.
- *Conflict*. The person experiences conflict within him or herself and with others or experiences negative consequences or damage to their relationships, work, education, and social and recreational areas.
- *Relapse*. The person is unable to control him- or herself and reverts to the activity after trying to stop for some time.

According to this model, technological addictions result from biopsychosocial processes and share neurobiological and psychosocial risk factors. However, to date, no scientific consensus has been reached regarding their conceptualization and diagnosis. For instance, despite evidence supporting similarities between substance dependency and Internet addiction, it is debatable whether the latter should be classified as a behavioral addiction or an impulse-control disorder (Cash et al., 2012; Starcevic & Aboujaoude, 2017). Also, not all forms of problematic Internet use may meet the threshold to be a diagnosable condition, as functional impairment attributable to Internet usage needs to be present (Billieux et al., 2017). Questions remain about whether other forms of problematic internet use meet the physiological criteria of tolerance and withdrawal, and some of these behaviors share similarities with obsessive-compulsive disorders (e.g., compulsively checking notifications or emails) or social anxiety (e.g., using social media to avoid face to face interaction) (Fineberg et al., 2018; Ioannidis et al., 2016).

As a result of this, even though Internet addiction has been extensively studied, it has not been included in official classification manuals of mental health disorders such as the *DSM* or the *ICD*. This is in contrast with other behavioral addictions. The first behavioral addiction recognized as a “Substance-related and Addictive Disorder” was *gambling disorder* in 2013 (American Psychiatric Association, 2013; Potenza et al., 2009) while *gaming disorder* was only included in the ICD-11 in 2018 (WHO, 2018). The lack of official recognition of an addiction to the internet or other IT technology is not without consequence for its diagnosis, since using the same criteria and cut-off levels can increase the reliability of diagnosis and would be useful for epidemiological research as well as for RTCs on therapeutic approaches. It could also motivate individuals to seek treatment, as was the case when gambling disorder was listed as a psychiatric disorder in 2013 (Kuss & Billieux, 2016). As such, reaching a consensus regarding the conceptualization and classification of these disorders could have a positive impact on prevention policies and treatment for affected individuals.

To date, two positions regarding technological addictions prevail. Some consider that they should be understood from the *biomedical model* of addictive disorders, favoring symptoms (Block, 2008; Potenza, 2015). Others suggest that this position fails to consider the heterogeneity and multi-determined nature of technology overuse and prefer *process-based approaches* to research (Billieux et al., 2015b; 2015c; Kuss & Billieux, 2016; Perales et al., 2020). A process-based approach requires an in-depth understanding of the mechanisms and psychological processes that underly specific excessive online behaviors and a thorough characterization of

the behavior (Billieux et al., 2015b; Kardefelt-Winther et al., 2017). For example, excessive involvement could be a consequence of maladaptive coping through escapist usage motivations or dissociative mechanisms related to adverse life events or pre-existing psychopathology (Billieux et al., 2013; Kardefelt-Winther, 2014; Schimmenti & Caretti, 2010). Using a process-based approach also remedies over-pathologizing everyday life behaviors and leisure activities when applying the substance-addiction criteria to those behaviors, as these often fail to distinguish high – but healthy – involvement from problematic one (Billieux et al., 2019; Castro-Calvo et al., 2021; Cataldo et al., 2022; Flayelle et al., 2022; Kardefelt-Winther et al., 2017; Satchell et al., 2021). Recognizing a condition is necessary to address the increasing demand for treatment, promote information and prevention, and facilitate the implementation of regulations (King & Delfabbro, 2018; Perales et al., 2020). But, as suggested by Perales et al. (2020), to diagnose problematic behaviors unequivocally, functional impairment needs to be a criterion for distinguishing dysfunctional behavior from high but non-problematic participation in a specific activity, to avoid the rise of new symptom-based disorders. In other words, high engagement and passion with no impairment should not be considered problematic.

Another problem that this conceptualization issue poses is that many assessment questionnaires have been developed based on a *confirmatory approach* (see Billieux et al., 2015b; Kardefelt-Winther et al., 2017). For instance, studies identifying new expressions of behavioral addiction are typically confirmatory in nature and follow the same methodological pattern (Billieux et al., 2015c): (1) the research process confirms what researchers believe to be true rather than generating new findings, as the behavior in question is considered an addiction *a priori*; (2) diagnostic criteria and related screening tools are constructed paraphrasing or adjusting items pertaining to substance addictions symptoms; (3) the tools are used to collect data on the relationships of the behavior with known risk factors, which tend to appear; (4) validity is established by analogy, and thus a new behavioral addiction is created. This poses serious questions regarding the validity of these questionnaires to capture the phenomena at hand.

Given the many issues surrounding the concept of *Internet addiction* and the emergence of empirical evidence suggesting that it is not a homogenous concept and that there is a need to differentiate between behaviors, *problematic use of social networks* will be used throughout this thesis as a term to designate the problem.

1.2 Social networks, their problematic use and consequences

Social networks (SN) are defined as web-based services that allow individuals to create a profile within a bounded system, articulate a network of contacts, and view, traverse and analyze the characteristics of that network (Boyd & Ellison, 2007). Facebook, Twitter, Snapchat, Instagram, and TikTok are a few examples. While these services vary in how they incorporate different information, communication tools, and media sharing (e.g., blogging and microblogging, photo and video-sharing, shopping, etc.), their core feature is to allow the user to have an articulated list of friends/followers and create a personal profile. A person can create content within a profile by posting text, pictures, or videos, usually combining them with captions, descriptions, hashtags, etc. Friends/followers can like, comment, and tag someone on those posts. Usually, social networks also support private messaging.

Social networks are a subtype of *social media*, which refers to “*the web 2.0 capabilities of producing, sharing, and collaborating on content online (i.e., user-generated content, implying a social element)*” (Kuss & Griffiths, 2017, p.2). Therefore, the term *social media* encompasses a wider range of activities than SN. Social media sites emerged during the early 2000s and include social networks, video-sharing sites, and blogging and microblogging platforms, allowing users to create and share their content (Boyd, 2014). Social media are ever-changing, and their content is highly individualized, determined by complex algorithms that differ from person to person, and that can change by the hour (Orben, 2019). Browsing these platforms now represents the main activity of Internet users (Tanega & Downs, 2020). Their ubiquity, availability, appeal, diversity, and uncontrollability are concerning, as youth seems to be permanently online (Orben, 2019; Vorderer et al., 2016).

Riva, Wiederhold and Cipresso (2015) further differentiate SN from other social media by their ability to offer two opportunities: (1) to make one’s social networks visible and available, and therefore identify personal, social, and professional opportunities that could not be apparent otherwise; and (2) to allow engaging in impression management, which implies the possibility to decide how to present yourself to your network. From a psychological viewpoint, SN can thus be defined as:

“digital spaces that enable a user to create and/or modify their social experience according to their needs to manage and support their social

network (organize and extend it), to express their social identity (describe it and define it), and to analyze the social identity components of their social networks (explore and compare them)” (p.5).

These digital spaces are a hybrid combination of virtual links and real connections that enable altering and controlling one’s social experience and identity in a new manner. They shape the relationship with the self and others while tensions between impression management and reputation management, personal branding and privacy management, and strong and weak bonds among the network co-exist.

Since their emergence approximately two decades ago, there has been an ever-growing presence of SN in everyday life (Ihssen & Wadsley, 2021). Approximately 4.2 billion people use SN worldwide, with Facebook remaining the most popular one holding 2.7 billion monthly active users (Statista, 2021a). Recent global statistics show a 13.2% (490 million) increase in active social media users compared to 2020 (Chaffey, 2021), and the average daily time spent on SN amounts to 2 hours and 22 minutes (Kemp, 2020). These numbers vary according to cultural and socio-demographic variables and continue to rise (Tang & Koh, 2017). Among adults who use their smartphones for at least 3 hours per day, most report accessing SN at least once every hour (Huang & Su, 2018). Of the so-called generation Z (aged 18-24 years), 91% use at least one SN, and 51% of them split their time between Facebook, Instagram, and Snapchat (Hill Holiday, 2018). The vast majority of these interactions (98.8%) occur via mobile phones and smartphones (Chaffey, 2021).

Social networks offer numerous benefits, such as social connectivity, entertainment, accessibility of information, creative expression, and the exchange of opinions and ideas (Longobardi et al., 2020). Some studies have highlighted their positive effects on well-being, as they boost communication skills and learning opportunities (Bue, 2020; Savolainen et al., 2020). However, they have also been associated with several problems, ranging from mental health issues to reduced mental and physical well-being (Faelens et al., 2021; Foroughi et al., 2021; Tanega & Downs, 2020; Valkenburg et al., 2022; Wegmann & Brand, 2019). Intensive use of SN has also been related to adverse effects such as cyberbullying, stranger danger, revenge porn, identity theft, online harassment, exposure to inappropriate content, and “addiction” to these platforms (Buglass et al., 2017; Romero-Rodríguez et al., 2020; Savolainen et al., 2020).

Of special interest are the relationships between social network use, mental health indicators, and well-being (Faelens et al., 2021; Foroughi et al., 2021; Wegmann & Brand, 2019). While some models propose that psychopathological symptoms can explain excessive use of Internet and social networks (Wegmann et al., 2017), the opposite could also be true, whereby excessive use of social networks leads to loneliness and symptoms of depression, anxiety, and stress. Accumulated research has given conflicting results, leading to positive, negative, and non-significant relationships (Appel et al., 2020; Meier & Reinecke, 2021; Karsay et al., 2022; Orben, 2020; Orben et al., 2022; Schemer et al., 2021).

1.3 Some theoretical approaches explaining problematic SN use

Andreassen & Pallesen (2014) define *social networks addiction* as:

“...being overly concerned about SNSs, to be driven by a strong motivation to log on to or use SNSs, and to devote so much time and effort to SNSs that it impairs other social activities, studies/job, interpersonal relationships, and/or psychological health and well-being” (p.4054).

As with Internet addiction, *social network addiction* has been used interchangeably along with different terms, such as *problematic social networks use*, *Facebook addiction*, *smartphone addiction*, or *problematic mobile phone use*. This emphasizes that the addictive potential of these applications is mainly due to the communicative exchange, a desire to stay connected, and the experienced loss of control due to use, regardless of the device used (Wegmann & Brand, 2019).

To address problematic use of SN it is important to understand the processes that underly the behavior. For that purpose, use can be made of psychological theories attempting to explain the behavior. One of the explanatory theories for problematic use of media that has consistently been well supported by empirical evidence is the *Uses & Gratifications theory* (Katz et al., 1973). This theory proposes that the usage of media is motivated and that it produces the gratification of specific needs, which enhances the likelihood of repeated use of that specific media in a comparable situation. The theory is based on four principles: “(1) *media use is goal-directed or motivated*, (2) *people use media to satisfy their needs and desires*, (3) *social and psychological factors mediate media use*, and (4) *media use and interpersonal communication are related*” (Kircaburun et al., 2020, p.529). Several needs have been reported to underly the use of social networks: entertainment, information, identity, social interaction, relaxation, opinion expression and

integration (Wegmann & Brand, 2019; Sheldon & Bryant, 2016). Findings from previous research also indicate that each social networking platform answers to *unique motives*, both sought and obtained (Alhabash & Ma, 2017). Taking Facebook as an example, *the dual-factor model* differentiates between two basic needs that are motivators behind its use: (a) *the need to belong*, which is an intrinsic driver of social connectedness; and (b) *the need for self-presentation*, which is a process that deals with impression management (Casale & Fioravanti, 2015; Nadkarni & Hofmann, 2012).

This model aligns well with the assumptions of Valkenburg and Peter (2007), who propose two competing hypotheses explaining social network use: the *social compensation hypothesis*, and the *rich-get-richer hypothesis*. The first one assumes that individuals with high social needs and low social competence have difficulties exchanging in face-to-face interaction; thus, online communication applications offer them the possibility to compensate for this deficit, resulting in a preference for online interaction. The second hypothesis proposes that individuals with low social anxiety and high social competence use social networks as additional tools for staying connected (Wegmann & Brand, 2019). Lately, it has been hypothesized that the *fear-driven pathway* is characterized by compulsive use, whilst the *reward-driven pathway* is characterized by addictive-like use (Wegmann et al., 2022). Both models still need more empirical validation.

A more thorough approach to explaining SN use behavior can be found in the I-PACE model (Brand et al., 2019). This model suggests that specific motives, predisposing psychosocial characteristics (e.g., personality variables and psychopathological symptoms) and social deficits interact with affective and cognitive processes and with reductions in inhibitory control and executive functions, leading to the continued use of social networks in certain situations. Based on conditioned learning processes and reinforcement mechanisms, these complex interactions result in gratification or compensation when SN are used (Brand et al., 2019; Wegmann & Brand, 2019).

Drawing on these theories and the empirical evidence supporting them, some psychosocial, individual characteristics have been highlighted as potential predictors of potential problematic use of social networks. These include attachment styles, interpersonal sensitivity, social anxiety, shyness, loneliness, perceived social support, coping styles, need to belong, narcissism, social comparison orientation and *fear of missing out* (FoMO) (Brailovskaia et al., 2019; Burnell et al., 2019; Casale & Fioravanti, 2018; Elhai et al., 2016; 2019; Eralsan-

Capan, 2015; Lee, 2020; Roberts et al., 2015; Satıcı, 2019; Schmuck et al., 2019; Stöven & Herzberg; Wang et al., 2017b; Wegmann & Brand, 2016).

Two of these individual predisposing factors are of special interest to our research: *social comparison orientation* (Gibbons & Buunk, 1999), and *fear of missing out* (FoMO, Przybylski et al., 2013). In line with the *social comparison theory*, which describes how individuals learn about themselves through comparison with others (Festinger, 1954), *social comparison orientation* (SCO) refers to the individual tendency to compare with others (Reer et al., 2019). As explained above, social networking sites provide many opportunities for self-presentation, and as such, facilitate comparison. Since individuals share much of their daily lives in SN and expose themselves to a continuous flow of information shared by others, comparison processes are easily triggered in individuals with high SCO (Lee, 2020; Vogel et al., 2015). Experiments involving Facebook and Instagram users have demonstrated that depending on the SCO level, the engagement with the SN, positive and negative affect, upward social comparison, and body satisfaction differ. Specifically, distinctive engagement and more negative consequences are found in individuals with high SCO (de Vries et al., 2018; Kleemans et al., 2016; Lee, 2014; Wang et al., 2017a). This tendency to compare can lead to specific patterns of social network usage.

The second construct of interest is *fear of missing out* (FoMO). FoMO can be defined as the pervasive apprehension a person feels when they believe someone else (or a group of others) is having pleasurable experiences from which one is absent (Przybylski et al., 2013). FoMO has been extensively studied in relation to media consumption (Alt, 2015; Baker et al., 2016; Elhai et al., 2016; Oberst et al., 2017) and has been shown to influence why and how a person chooses to engage with particular social media, in this case, social networks. On a theoretical level, FoMO is usually described and assessed in an online context, but neither its definition nor the items of the FoMO scale refer to online behavior (Przybylski et al., 2013). It can therefore be assumed that it is not a unitary phenomenon, but rather a complex construct that involves both an *individual predisposition* and a specific cognition regarding something that occurs online or that is related to specific situations (Conlin et al., 2022).

It is important to remember that youths are immersed in digital worlds and are thus constantly exposed to content that can trigger FoMO. Businesses, brands, and influencers promote their products, services, and experiences by eliciting positive affect (e.g., anticipated elation and self-enhancement), but also negative affect

(e.g., anticipated expense regret). In that sense, FoMO can serve to influence consumption (Good & Hyman, 2020; Neuman & Rhodes, 2022). Besides advertisements, and content posted by strangers, being exposed to content from important others (e.g., friends or peers) can also enhance the chances of experiencing situational FoMO.

In previous literature, FoMO has been conceptualized as a personality trait embedded in the Self-determination theory (Deci & Ryan, 2010). As such, it is considered a sort of self-regulating limbo that triggers intrinsic motivation to engage in behaviors that help satisfy basic needs for autonomy, competence, and relatedness-closeness (Przybylski et al., 2013). Furthermore, FoMO is closely linked to the *need to belong* (Baumeister & Leary, 1995). For instance, it has been found that high FoMO individuals feel more excluded when they observed others being together and they experienced social pain (Lai et al., 2016). It seems that high-trait FoMO individuals attribute more importance to what others think (Dogan, 2019), and those with interdependent self-construals tend to judge themselves more and are more prone to experiencing FoMO (Zhang et al., 2020).

Importantly, FoMO should be conceived of as an *affective reaction* based on a comparative process: it does not only entail feeling excluded, but is also related to others being included, and thus envy and social comparison processes play an important role. In that sense, FoMO can be linked to the relationship between social comparison orientation and social media usage patterns. Social media users who are more prone to socially compare their lives with those of their peers may experience FoMO more often (Neuman & Rhodes, in press). As FoMO involves a negative affective experience that threatens well-being (Xie et al., 2018) and social comparison orientation is a precursor of FoMO, which intrinsically involves a comparison process (Reer et al., 2019), both concepts should be considered as potential predictors of problematic social network use.

Having identified the key characteristics of problematic social network use, how they differ from Internet addiction, and potential explanatory mechanisms and key variables, we will now focus on Instagram as a particular social network that provides the context for specific use behaviors.

1.4 Instagram and its engaging features

To understand the behavior of social media users it is necessary to consider the design and the interface of social networks. Although, in theory, users can decide how they engage with a particular media, the design and interface of media are a

clear expression of how their creators *want* them to behave (Friz & Gehl, 2016; Zulli, 2018). Instagram, for instance, works by fostering an *attention economy* (Davenport & Beck, 2001), which relies on the users' attention as a source of revenue (Bhargava & Velasquez, 2021; Williams, 2018). The longer a user is active and engaged on the platform, the higher the likelihood of being exposed to ads that can lead to consumption, and the higher the profits for the company (Lanier, 2018). Therefore, specific features are built into the platform to increase the time spent on a site, such as the *infinite scroll* feature, video *autoplay*, *push notifications* and reminders, and variable *rewards* in the form of likes and shares (Cash, 2012; Ertemel & Aydin, 2018; Harris, 2016). Many of these features perpetuate habit loops. As proposed by the *hook model* (Eyal, 2014), individuals will engage with platforms in an "auto-pilot" mode in response to triggers (e.g., notifications) and rewards (e.g., likes, recognition). It is therefore undeniable that the design elements embedded in social media platforms play a key role in engaging their users and that they can thus lead to problematic use patterns (Alter, 2017; Price, 2018).

Instagram is a photo-based social network launched in 2010 and created by Kevin Systrom and Mike Krieger. It was acquired by Facebook (now Meta) in 2012. At present, it has 2 billion active monthly users worldwide: it is the second most engaged social network after Facebook and the fourth most prominent worldwide (Statista, 2022d). Importantly, it is also the fastest-growing SNS, due to its popularity among teenagers and young adults (Jackson & Luchner, 2018), with at least 71% of its users being under 35 and having an equal distribution of men and women users (Statista, 2022e). The average user spends roughly one hour per day on Instagram (Statista, 2022f), and over 500 million connections and 4 billion likes are given worldwide every day.

Instagram uses *images* as the primary means of communication. It has numerous built-in photo filters that help create visual effects and enhance their appearance with low effort. The convenient and straightforward interface has many attractive features: take, filter, edit, and post pictures and videos in the user's profile (up to 1 minute), live broadcast, and post larger videos through Instagram TV. One particularity of Instagram is its asymmetrical networking structure. Unlike Facebook or Snapchat, which require friendships to be mutual, Instagram allows one to follow an account without that account having to follow you in return. This way, the platform makes it possible to *follow* individuals (e.g., influencers, celebrities, and brands) without being related to them in real life (Moore & Craciun, 2021).

In the beginning, Instagram only allowed sharing pictures and videos in the form of posts on a user's profile. These posts are accompanied by a caption and, many times, hashtags (#) which are used to categorize any given post, making it easier to find when looking for pictures of a specific topic by placing the hashtag in front of a word or a phrase (e.g., #travel). Instagram was the first to introduce hashtags on social media. Posts can be *liked*, *commented on*, and *shared* by followers. There is no dislike button or other reaction buttons as on Facebook. *Likes* constitute an obvious way to obtain rewards and recognition and therefore serve as status and popularity cues. The number of likes portrays audience support, and people tend to check how many likes they obtained (Blease, 2015; Martinez-Pecino & Garcia-Gavilán, 2019; Zell & Moeller, 2018). Depending on the user profile account settings, a profile can be *private* or *public*. In a private account, only the people that the user has approved as a follower will be able to like, comment, and share their photos and videos. However, if the account is set as public, anyone can do so. If a person is looking to grow an audience and have a large follower base, having a public account is the only way to get exposure and reach new potential followers.

In August 2016, Instagram launched *stories*, a feature that allows users to take and upload pictures or videos and adorn, edit, enhance, use filters on them, add the current location or temperature, text, music, questions, polls, etc. The particularity of this feature is that these stories disappear after 24 hours of being posted. The user can also see who has viewed their stories, provided that it is done within those 24 hours, after which that information is no longer available. *Stories* gave users a reason to share everyday moments live as they happen and to engage in story sharing and viewing regularly. It opened a window for users to showcase themselves for followers who can watch and engage in story viewing to not miss out on what is happening on their network. Since 2018, 500 million Instagram user accounts watch *stories* every day (Statista, 2019), and 86% of the accounts create content with the *stories* feature. This has resulted in increased average time spent on the app and in enhanced interaction rates, as the sense of urgency that follows from the availability limit of 24 hours motivates users to stay on Instagram for longer and return to the app more quickly (Moore & Craciun, 2021). Other features that induce users to stay longer on the app are the infinite scroll, video autoplay, push notifications and reminders, and variable rewards in the form of likes and shares (Cash, 2012; Ertemel & Aydin, 2018; Harris, 2016).

Instagram has evolved tremendously in the past few years, and, besides *stories* and the user profile, it proposes an explore page, reels, boutique, and messenger. The *explore page* displays content proposed by the Instagram algorithm based on the

posts that are browsed, liked and followed by the user. *Reels* are short, edited videos that typically last 10 seconds and resemble content found on TikTok, whilst the IGTV functionality allows the broadcasting of longer videos that can last up to one hour. Instagram also allows shopping through a *boutique* feature that resembles a commercial space where the users are presented with articles that might interest them, based on their previous interactions on the platform. Lastly, the *direct messaging* feature of the app permits users to exchange private text messages, photos, or videos, and to make video calls. In addition, like Snapchat, it offers the possibility to send photos and/or videos that disappear right after being opened by the recipient.

New functionalities and features are regularly introduced to Instagram to keep up with competing, existing, or emerging social media. As such, the stories feature mimics the functioning of Snapchat while reels were introduced after the appearance of TikTok. Moreover, these functionalities keep users engaged for longer once they log into the platform, the latest being adding a *like* button to the stories, a map functionality to search for local businesses, and Reels templates (Bojkov, 2022).

One powerful Instagram feature that differentiates it from other social networks, and which is very attractive to young people, is that it houses specific tools to manipulate aesthetics. As explained before, users have the option to add filters to enhance the quality of the images they post and to make them look more sophisticated and professional. While these correcting features and filters can boost creativity among individuals and content creators, they also contribute to presenting a curated and highly edited version of reality that does not represent what most individuals experience. They allow greater control over self-disclosure (Sedera & Lokuge, 2020; Valkenburg & Peter, 2011) and stimulate enhanced self-presentation and impression management (Kim & Kim, 2018).

This may have consequences for content creators and content consumers or followers. An individual who creates content on Instagram may feel pressured to comply with the high aesthetic expectations and standards that provide him or her with more attention and recognition. As such, the difference between real life and an ideal self-image created online gets blurred, which can lead to creating a more perfect image, especially concerning the physical appearance, status, and lifestyle (Griffiths & Balakrishnan, 2018; Hellmann, 2016; McComb & Mills, 2021). Perfectionistic self-promotion on social media has been associated with greater stress and anxiety (Harren et al., 2021; Hellman, 2016). At the same time,

followers are at risk of engaging in upward comparisons with content produced by others, which can lead to frustration and envy. Moreover, overexposure to a continuous stream of content and publicity and constant attempts to live up to the idealized presentation by others can be exhausting (Cramer et al., 2016; Harren et al., 2021; Latif et al., 2020; Liu & Ma, 2018).

It appears then, that Instagram is not developed to optimize social connection as it claims, but instead emphasizes personal identity and the implementation of self-presentation, self-promoting behaviors, and obtaining social recognition (Dumas et al., 2017; Kim & Kim, 2018). As being seen and getting attention on Instagram is just as valuable as watching and giving attention (Andrejevic, 2009), a *successful* Instagram user is one whose activities generate the attention of followers and networks (Zulli, 2018). As such, Instagram encourages self-disclosure and continuous surveillance, which in turn, fosters the *attention economy*.

So, what makes Instagram potentially even more dangerous than other SNSs, is the apology for perfection and aestheticism that dominates the platform (Hwang, 2019). Each social network has its own culture, and Instagram's culture promotes idealized and aspirational images, with users mostly sharing the highlighted and embellished versions of their lives. It is important to realize that Instagram was the first social media to implement filters as a built-in feature permitting the manipulation and modification of photos to make them more appealing (Longobardi et al., 2020). A strong glorification of the individual, his or her physical appearance, and his or her successes can set unrealistic expectations for those consuming that content.

Whereas most research on social networks thus far has focused on Facebook Instagram research has only been gaining momentum in recent years. Yet its features and affordances provide a specific context in which potentially harmful use behaviors can develop as a result of experiences of social comparison and *fear of missing out*. It is therefore of interest to investigate Instagram further, as we do in this thesis.

1.5 Research on problematic social network use and its impact on prevention

As already mentioned, concerns over social network use in youth have been growing consistently over the last few years. Not surprisingly, research into the relationship between social network use and mental health outcomes has also grown exponentially. However, the associations between screen use, social media

use, and well-being that have been reported are rather small, and the research examining these questions does not deliver concrete results, as was shown in a recent review of reviews by Orben (2020). While this absence of clear-cut results is partly due to the poor quality of many studies, it is also a fact that the evidence is conflicting. Some scholars have argued that the relationship between social media use and well-being is complex and that this explains why research can lead to either positive, negative, or non-significant relationships (Appel et al., 2020; Karsay et al., 2022; Meier & Reinecke, 2021; Schemer et al., 2021; Valkenburg, 2021; Valkenburg et al., 2022). Yet the inconsistency in results can also be due to the lack of theoretical foundations on which the research into behavioral addictions, Internet addiction, problematic use of the Internet, problematic smartphone use, and problematic use of social networks is based (Billieux et al., 2015a, Ophir et al., 2019; Orben, 2019). As Grimes et al. (2008) pointed out, four elements are usually present in studies on new technology and its effects: (a) the technology or medium, (b) an audience, (c) the behavior that is presumed to be caused by the technology, and (d) a theory or methodology provided to generate evidence. In our field of study, typically (a) is broadly defined (smartphones, internet, social media); (b) are commonly children, teenagers, and university students; (c) is a behavior causing concern, such as mental health, well-being, or depression, and (d) are survey studies using instruments that do not consider the specificities of the behaviors. The risk of proceeding in this manner is that generalizations lead to believe that all members of the audience will be affected by the new technology in the same way and that using information technology is enough to cause long-term change (Grimes et al., 2008; Orben, 2019), disregarding the individual differences and the complex and intertwined processes that are involved in excessive internet use behaviors.

In 2018, a European research network (European Problematic Use of the Internet Research Network, EU-PUI) was set up to study the problematic usage of the internet, in response to its emerging recognition as an important public health issue (Fineberg et al., 2018). The network intends to unite a multidisciplinary group of researchers across borders and disciplines to advance the understanding of PUI. It advocates for a better understanding of the nature of different forms of PUI and their societal cost, to develop adaptive treatment and prevention programs. In their manifesto, the EU-PUI proposes 9 priorities to drive their work, some of which are relevant to this thesis:

- *Reliable consensus-driven conceptualizations of different forms of PUI.* After presenting the difficulties in understanding, conceptualizing, and describing PUI, a call is launched for studies to fully describe the

behaviors and disorders that comprise PUI across genders, age groups and cultures.

- *Age and culture-appropriate assessment instruments to screen, diagnose and measure the severity of the different forms of PUI.* The network acknowledges the variety of instruments developed in the past and debates over whether a single instrument or separate instruments for each form of PUI are needed. In any case, the network pleads to harmonize assessment tools to assure comparability of findings.
- *Characterize the impacts of different forms of PUI on health and quality of life.* Research on the prevalence and functional impact of PUI suggests that the societal risk of PUI may be growing. For Internet addiction, estimates vary between 0.8-26.7%, although there is a high variability due to differences in assessment instruments and thresholds used. The network appeals to obtain reliable estimates of incidence, prevalence, and remission rates to calculate the relative cost and outcome of evidence-based interventions, develop meaningful public health policies, and direct resources.
- *Generate and validate effective interventions, both to prevent PUI and to treat its various forms once established.* Early identification of at-risk individuals may reduce the future burden of disease and help prevent functional consequences. However, for most forms of PUI, no evidence-based treatments exist, clinical research is still at an early stage, and the few publications that deal with preventive interventions are concerned with heterogeneous interventions. Structural prevention, related to game design, youth protection, and other measures that counteract excessive or addictive use are needed.

The priorities set forth by the EU-PUI network can advance the research regarding the problem by calling for *nuance and agreement* in research. Similarly, some prominent researchers in the field (Orben et al., 2022; Satchell et al., 2021; Valkenburg et al., 2022) have suggested some key improvements that could help conduct better science and lead to more useful conclusions:

- (1) Providing consistent operationalizations of the phenomena at hand to avoid discrepancies and be able to combine effects in future reviews and meta-analyses.
- (2) Embracing transparency and better reporting of the research analysis and data management.
- (3) Being careful when analyzing statistical significance and avoid over-reporting negligible effects.

- (4) Removing self-reported *screen time* and *time spent* on social networks and the Internet as outcomes, as they are clearly flawed measures of media effects.
- (5) Developing better measurement tools.
- (6) Increasing the focus on individual differences by recruiting diverse and representative samples, and conducting experience sampling, which tracks people in their daily life and provides more natural behavioral data, different from self-reports.

This section intended to present the state of the art of research in the behavioral addictions field applied to Internet use. Although it is challenging to conduct research in a field where there is no consensus about the definitions and correlates for many of the variables, the recommendations listed above are important to direct research on the use of Instagram by youth. In that way, they serve as a basis for the studies presented in this thesis and may inform preventive policies, programs, and interventions in the future.

1.6 The COVID-19 context and its impact on youth

Before providing the outline of this thesis, it is important to highlight a contextual element which impacted the research conducted and social media use as the subject of this investigation, i.e., the COVID-19 pandemic.

COVID-19, caused by a variant of the coronavirus termed SARS-CoV-2, is a disease that can cause severe and sometimes fatal respiratory syndromes. It was identified in December 2019 in Wuhan, China, and on 11 March 2020, the World Health Organization declared the disease a pandemic, after it rapidly spread globally. Three years have passed since the alarm was raised and governments introduced a series of steps to harness its effects. In order to limit the spread of the disease and release the pressure on health systems lockdowns, *social distancing*, and the use of masks were some of the measures proposed while waiting for a vaccine or a cure for the disease.

The COVID-19 pandemic substantially changed many aspects of people's everyday lives, forcing them to constantly adapt to prevent the spread of the virus as the pandemic continued to develop and unfold. Time spent at home increased considerably for most individuals with the consequent loss of routine and structure (Király et al, 2020). In addition, the fact of being in confinement, alone or with family members, coupled with fear of getting the disease, uncertainty about the future, and financial insecurity contributed to heightened stress, anxiety,

depression, and a decrease in well-being (Ahorsu et al., 2020; Brooks et al., 2020; Schimmenti et al., 2020; Wiederhold, 2020).

For youth, the adjustment to the confinements, curfews, and social distancing enforced since the pandemic's onset was particularly difficult (Anderson et al., 2020; Geirdal et al., 2020). For those studying, switching to online education, distancing physically from school and friends, and being unable to enjoy leisure and entertainment activities was difficult. For those working, the risk of losing their jobs and needing to find ways to reinvent themselves after being laid-off caused severe pressure (Power et al., 2020), and those lucky enough to preserve their jobs had to adapt to teleworking in different or novel conditions. Having to share small spaces with other family members, taking care of children while working and managing the household, and adopting new routines, creating frustration and burden. In addition, the absence of real interaction and reduced social support, along with loneliness and isolation, were cumulative stressors that may have impacted mental health (Geirdal et al., 2020; Holmes et al., 2020; Wade et al., 2020).

The pandemic also impacted the way people use the internet and engage with it. Overall, Internet usage surged by 47% in the first quarter of 2020, mainly due to COVID-19, and there are reports of a 27% increase in Facebook traffic flow, 25% more monthly TikTok downloads, and a double amount of video and voice calls on WhatsApp (Arora et al., 2021). Moreover, a survey among internet users aged 16 to 64 in 18 different countries carried out between June and July 2020 found that 43% (46% for women and 41% for men) reported spending more time using SNs (Kemp, 2020). Another study conducted in April 2020 with more than a thousand European participants showed that the use of Facebook, Instagram, Twitter, and particularly TikTok had increased during confinement. Also, passive use of Facebook was negatively related to well-being through upward social comparison, while active use of Instagram was positively related to satisfaction with life and negative affect through social support. Use of TikTok was not associated with well-being (Masciantonio et al., 2021). Nevertheless, more differential research is needed to understand how each social network shaped social interaction during these difficult times.

A point to consider is that the COVID-19 pandemic was also accompanied by an *infodemic*, in the sense that there was massive coverage of the pandemic through various channels, including SNs such as Facebook, Twitter, and YouTube. This spurred the spread of rumors, misinformation, and fake news that could influence

people's beliefs, fears, and behaviors (Cinelli et al., 2020). Overload of information and constant use of social media can lead to increased psychosocial problems (Aristovnik et al., 2020; Gao et al., 2020), although being connected to others is also fundamental for well-being, especially in difficult situations such as those generated by the pandemic.

It is reasonable to assume that these contextual factors may have impacted how often people used social media and why and how they used them. That may affect the results of the studies that were conducted for this thesis. It is impossible to measure this effect, as no data was gathered before the pandemic which would allow us to make comparisons. Nevertheless, it is important to mention this collective reality in which the studies took place and consider it while reading and interpreting the results and conclusions of this thesis.

Having reviewed the theoretical and empirical underpinnings of problematic Instagram use, the next sections will cover the theoretical stance of this thesis, and the research questions and objectives.

2. A hypothetical model for problematic Instagram use

As argued in the preceding paragraphs, Instagram provides a specific context in which potentially harmful use behaviors can develop. However, while research on social network use is rapidly expanding, most of this research has focused on Facebook, whereas Instagram has not been thoroughly studied yet. Therefore, it would be interesting to document in depth which variables can underly specific Instagram motives and patterns of use, and to explore the potential consequences of these patterns with a view to inform preventive efforts. Yet before doing so, it is important to revisit the conclusions from the theoretical and empirical evidence presented so far that are relevant to understand Instagram use.

- (1) *The use of Internet, smartphones and social networks* are ubiquitous and have become embedded in the life of youth, whereby the possibilities of connecting, sharing information, and having rewarding or frustrating experiences have exponentially increased.
- (2) *Social networks* are unique platforms that provide an unlimited stream of content, information, new connections, and immediate access to what is happening worldwide. Yet, the amount of accessible content and the fact that it is constantly updated makes it virtually impossible for an individual to interact with and process it all.

- (3) *Instagram* is a particular social network that has specific features that promote self-presentation and glorification of aesthetics; its primary objective is not to establish social connections but to enhance self-promotion. It is therefore important to study this platform specifically to establish which variables can predispose young people to use Instagram in particular ways and generate different consequences.
- (4) Research on social media use is challenging, as most of the constructs have not yet been consensually defined, and the nature of the Internet, smartphones and social network use are still debated in the literature.
- (5) At the same time, the lack of conceptual clarity in a rapidly evolving field makes it even more pressing to integrate the findings from previous research to produce meaningful insights that can inform prevention or intervention efforts.
- (6) It can be assumed that some individuals (e.g., those with psychopathological symptoms or social deficits) are particularly vulnerable than others to develop a problematic use of the Internet and social networks and that for a small percentage of users, psychological problems may develop from their use. For these vulnerable groups, targeted clinical interventions may be required. However, from a preventive perspective, attention should not only be focused on those who *present* problematic use that would benefit from treatment, but also among regular users who are *at risk* of developing problematic internet and social media use.
- (7) Internet-related behaviors are complex and are based on the interactions between individual dispositional variables, context-related factors, situational variables, and the design of the platform.
- (8) Adopting a process-based approach to research that avoids pathologizing a behavior is needed to provide a better understanding of social network use in youths. While social network use is not problematic per se, it is recognized that some ways of using social networks can have negative consequences for the individual's mental health or well-being. And while some risks are generic to all social networks, it is possible that, due to its specific features, Instagram can be particularly conducive to problematic use.

Taking these points into consideration, a hypothetical model can be proposed that integrates the factors that may impact problematic Instagram use (Figure 1). According to this model, a distinction should be made between the behavior of interest (i.e., specific patterns of use), its individual and contextual determinants, and its consequences.

On the antecedent side, the determinants of problematic use are both situational and personal. Concerning the first, individuals are immersed in a context where the use of the Internet, smartphones, and social networks are ubiquitous. With regard to the second, a range of individual variables are presumed to be potential predisposing factors for problematic Instagram use, as discussed earlier in this chapter. Amongst those, two have been identified as particularly relevant: Social Comparison Orientation and Fear of Missing out. Both are closely related to each other and involve individual tendencies that can be triggered when exposed to Instagram content and features. Specifically, we hypothesize that individuals with a high comparison orientation and high trait FoMO will be more drawn to Instagram due to its appealing features and endless exposure to content that glorifies the individual and serves self-promotion.

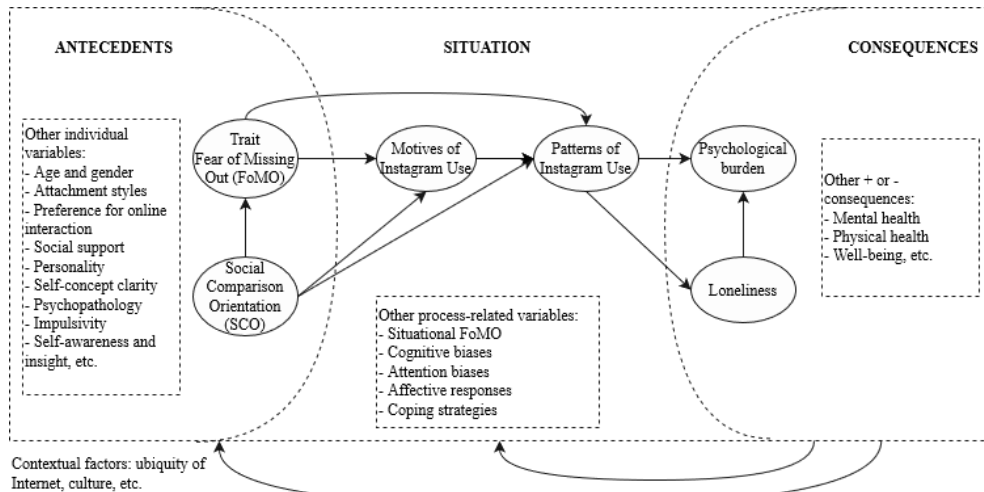


Figure 1. Proposed hypothetical model

It is also hypothesized that these individuals will have different motives or reasons to use Instagram and that they will engage with the platform in particular ways. Previous research has identified that motives are unique and specific to the person and the media used, and that they predispose how an individual will use it (Alhabash & Ma, 2017; Wegmann & Brand, 2019; Sheldon & Bryant, 2016). Instagram usage patterns, defined here as the *repeated or regular ways to engage with Instagram* have not been established yet in scientific literature. However, in social network research, a distinction between active and passive use is usually made (Gerson, 2017; Trifiro & Gerson, 2019; Verduyn et al., 2017). While this

distinction remains controversial, it is plausible that besides active and passive ways of engaging with a social network, there are different uses for Instagram. For instance, it is not the same to passively scroll through the feed or to produce content making use of filters, engaging in story sharing and viewing, or waiting for the shared content to be reacted upon (being liked or commented). Discovering and describing these patterns can therefore provide valuable insights.

As shown in Figure 1, other process-related variables can affect Instagram motives and the usage patterns, such as situational FoMO, coping strategies, and affective and cognitive processes and biases. However, for the sake of parsimony, it was decided to not include these variables in this thesis.

In terms of potential consequences of Instagram use, the impact on mental health and well-being has been thoroughly investigated in the field (Faelens et al., 2021; Foroughi et al., 2021; Tanega & Downs, 2020; Valkenburg et al., 2022; Wegmann & Brand, 2019), but the results remain inconclusive. This may be due, in part, to a lack of consensual definitions and flawed measurements of usage patterns. Therefore, using a different instrument that considers the variety of usage patterns can lead to more precise conclusions. As such, it can be hypothesized that certain Instagram usage patterns can lead to some mental health outcomes such as depression, anxiety, and stress symptoms and that loneliness may act as a mediator (O'Day & Heimberg, 2021; Satici, 2019). Loneliness has been consistently related to psychopathology, and although it can be considered to be a predisposing factor for online involvement (Käll et al., 2020; O'Day & Heimberg, 2021; Song et al., 2014), it is also possible to hypothesize that *particular uses of Instagram* can either induce or reduce loneliness, and in turn could lead to stress, anxiety and depression.

Evidence on loneliness as an outcome of social media use is mixed. For instance, experimental research on Facebook use found that limiting daily use of SNs leads to a significant decline in experienced loneliness (Hunt et al., 2018), whereas two studies found that excessive or problematic Instagram use is related to increased loneliness (Ponnusamy et al., 2020; Yurdagül et al., 2019). However, one study (Mackson et al., 2019) found no link between Instagram use and loneliness. Another study revealed that broadcasting, as opposed to browsing and interacting with others on SNs was related to increased loneliness (Yang, 2016), suggesting that *the type of Instagram use needs to be distinguished*. A recent systematic review on social media use, anxiety and loneliness showed that the keys to understanding the relationships between these variables are to underscore why and

how people are using social media, and whether engaging in social comparisons or feeling envious of others while using social media can lead to negative outcomes (O'Day & Heimberg, 2021). So, overall, there seems to be just enough evidence to suggest an association, but there is a need to explore this more in depth.

Finally, as with most behaviors, the links between these variables are not unidirectional. Engaging in SNs constantly produces feedback loops, whereby the effects of the behavior inform the individual, have an impact on some of their individual characteristics, and can also inform the next behavior. This is indicated by the arrows at the bottom part of the figure. Although our research does not aim to test these feedback loops, it is reasonable to assume that these processes exist, and should be theorized differently.

3. Objectives and research questions

As mentioned before, the field of behavioral addictions and problematic use of the Internet poses various challenges, and the state of knowledge regarding the relationship between social network use and mental health outcomes remains inconsistent and inconclusive, partly because of an unclear conceptual and theoretical basis. As a result, it is not possible yet to formulate very specific hypotheses based on theoretical models that explain the determinants of PUI. Instead, the studies that make up this thesis are meant to explore potential determinants and their interrelationships. The objectives of this thesis are therefore broad and driven by a wish to better understand the phenomenon at hand and to provide research that is useful and informative.

Objective 1 – On primary prevention efforts for PUI

Although there is no consensus regarding the conceptualization of problematic behaviors concerning the use of the Internet, that has not stopped researchers from conducting prevention and intervention efforts to reduce or correct their damaging consequences. The first objective of the thesis is to identify the primary prevention programs for problematic use of Internet that are available in the scientific literature. As this field of study is still young and evolving, and the conceptualizations of the problem are still diffuse, it is of particular interest to explore which definitions of PUI have been used, which specific aims preventive interventions try to achieve, which tools are used to measure change, and what are their outcomes. That information can help to identify knowledge gaps and propose further studies to address those gaps. Thus, the research questions for objective 1 are:

- (1) What are the available primary prevention programs for PUI in youth?
- (2) What definitions of PUI are used to guide the proposed programs?
- (3) Which tools are used to measure the outcomes?
- (4) How is the effectiveness of the program measured?
- (5) Is the available evidence enough to determine that these programs are effective against no intervention?

Objective 2 – On problematic use of Instagram

As addressed before, an important way to contribute to the understanding of PUI is to describe how youths use social networks, what are the reasons why they use them, and what distinguishes Instagram from other social networks, given that most of the research in this area has been done on Facebook and Instagram has very specific and appealing features that promote self-presentation and glorification of the individual. Also, previous research is clear on the impact of motives on social media engagement and on the importance of describing different usage patterns as opposed to time spent online or active and passive use. Thus, a second objective is to describe what Instagram means for young people, *why* they use it, *how* they use it, and which *consequences* they perceived of using it, to provide a better understanding of these phenomena. Consequently, the research questions for objective 2 are:

- (1) What does Instagram mean for youth?
- (2) What motivates young people to use Instagram?
- (3) Are there any specific patterns of use of Instagram?
- (4) What are the perceived consequences of that use?

Objective 3 – On measuring problematic use of Instagram

Research into PUI would benefit from new measurement instruments that are valid, reliable, and applicable consistently across studies. For instance, developing new measurements considering specific Instagram motives and capturing distinctive usage patterns can help advance the field and bring more clarity to understanding the processes underlying use behaviors. Therefore, a third objective is to develop

and psychometrically validate two measures of motives and patterns of Instagram use, drawing on the outcomes of the study that answers objective 2. Furthermore, it will be important to establish their measurement invariance across language and gender so they can be used in cross-cultural research. Therefore, the research questions for objective 3 are:

- (1) Will the Instagram Motives Questionnaire (IMQ) be a valid and reliable measure of motives for Instagram Use?
- (2) Will the Instagram Uses and Patterns Questionnaire (IUPQ) be a valid and reliable measure of patterns of Instagram Use?
- (3) Will the IMQ and IUPQ be invariant across gender and languages?

Objective 4 – On understanding the correlates of problematic Instagram use

Another important step in gaining a better understanding of the problematic use of Instagram is to determine its relationship with correlates that have been established in previous studies on social network use. The fourth aim of this thesis is to understand the relationship between Instagram motives and patterns of use with two specific but interrelated variables: *social comparison orientation*, and *fear of missing out*, as both tendencies have been consistently found to actualize and have an effect on user behavior. Hence, the research questions for objective 4 are:

- (1) How are the motives and patterns of Instagram use related?
- (2) What are the mechanisms through which comparison orientation is related to Instagram motives and patterns of use?
- (3) What are the mechanisms through which fear of missing out is related to Instagram motives and patterns of use?

Objective 5 – On understanding the consequences of problematic Instagram use

The question of whether social network use and Instagram use, leads to negative consequences for mental well-being continues to puzzle researchers, as the results of different studies have been inconclusive, and the relationships can be bidirectional. However, as stated in point 2 of this chapter, we believe that specific usage patterns on Instagram can have an effect on mental health outcomes. Therefore, the fifth objective of this thesis is to clarify those relationships by relating the patterns of Instagram use to frequently measured mental health

outcomes, notably loneliness, depression, anxiety, and stress symptoms. Therefore, the research questions for objective five are:

- (1) What is the mechanism through which the patterns of Instagram use are related to loneliness?
- (2) What is the mechanism through which the patterns of Instagram use are related to depressive symptoms?
- (3) What is the mechanism through which the patterns of Instagram use are related to anxiety symptoms?
- (4) What is the mechanism through which the patterns of Instagram use are related to stress symptoms?
- (5) Does loneliness mediate the relationships between Instagram use patterns and depression, anxiety and stress symptoms?

Objective 6 – On generating insights that can inform better prevention

The last objective of this thesis is to use all the insights obtained through the different studies to make suggestions for the development of policies, programs and interventions to prevent problematic Instagram use. Therefore, the *research question for objective 6* is:

- (1) Which insights from the previous studies can inform policymakers, researchers, and individuals for better prevention of problematic Instagram use?

To answer each of these research questions, several studies were performed, using a combination of complementary approaches, both inductive and deductive, qualitative, and quantitative. An overview of these studies is shown in Table 1.

Table 1. Objectives, research questions, study design and methods

Objectives	Research questions	Study design and methods
On primary prevention efforts for PUI	What are the available primary prevention programs for PUI in youth? What definitions of PUI are used to guide the proposed programs? Which tools are used to measure the outcomes? How is the effectiveness of the program measured? Is the available evidence enough to determine that these programs are effective against no intervention?	A systematic review of available primary prevention programs for problematic internet use and meta-analysis if suitable
On problematic use of Instagram	What does Instagram mean for youth? What motivates young people to use Instagram? Are there any specific patterns of use of Instagram? What are the perceived consequences of that use?	Qualitative interview study using the grounded theory approach to understand in-depth the meanings, motives, patterns, and consequences of Instagram use in youth (aged 18-28)
On measuring problematic use of Instagram	Will the Instagram Motives Questionnaire (IMQ) be a valid and reliable measure of motives of Instagram Use? Will the Instagram Uses and Patterns Questionnaire (IUPQ) be a valid and reliable measure of patterns of Instagram Use? Will the IMQ and IUPQ be invariant across gender and languages?	Two studies on the development and psychometric validation of two measurement instruments (IMQ and IUPQ) to measure motives and patterns of Instagram use in a wide sample of youth aged 18-34. Obtention of validity and reliability evidence and measurement invariance across language and gender
On understanding the correlates of problematic Instagram use	How are the motives and patterns of Instagram use related? What is the mechanism through which comparison orientation is related to Instagram motives and patterns of use? What is the mechanism through which fear of missing out is related to Instagram motives and patterns of use?	A structural equation modeling study to obtain the different pathways (direct and indirect) that relate social comparison orientation, fear of missing out, and the motives and patterns of Instagram use

Objectives	Research questions	Study design and methods
On understanding the consequences of problematic Instagram use	What is the mechanism by which the patterns of Instagram use are related to loneliness? What is the mechanism by which the patterns of Instagram use are related to depressive symptoms? What is the mechanism by which the patterns of Instagram use are related to anxiety symptoms? What is the mechanism by which the patterns of Instagram use are related to stress symptoms? Does loneliness mediate the relationships between Instagram use patterns and depression, anxiety and stress symptoms?	A structural equation modeling study to obtain the different pathways (direct and indirect) that relate the patterns of Instagram use and loneliness, depression, anxiety, and stress outcomes.
On generating insights that can inform better prevention	Which insights from the previous studies can inform policy makers, researchers, and individuals for better prevention of problematic Instagram use?	Theoretical review of current evidence and synthesis of the findings of the previous studies. Recommendations for prevention.

4. Outline of the thesis

This thesis is organized in eight chapters. Five of these chapters correspond to one of the studies that were conducted to answer the different research questions that follow from the six objectives of the thesis. As some of these studies have been published in a scientific journal or submitted for consideration as a publication, the reader will find the abstract of the study and, whenever a chapter has already been published, the reference, at the beginning of each chapter.

Chapter two presents a systematic review and meta-analysis of available programs for primary prevention of Problematic Internet use among youth. The main conclusions of this study were pivotal to deciding to focus on Instagram as a specific behavior that needed to be thoroughly researched. Chapter three presents a qualitative study involving in-depth interviews with nineteen Instagram users. The qualitative analysis of the interviews using a grounded theory approach revealed a set of meanings, motives, patterns of use and consequences of problematic Instagram use that can inform further research. Chapter four presents a detailed account of two studies. The first concerns the development of the Instagram

Motives Questionnaire (IMQ) and the Instagram Uses and Patterns Questionnaire (IUPQ), using exploratory factor analysis on a sample of users aged 18-34. The second study surveyed a large sample of users in three different languages (English, French, and Spanish), and used confirmatory factor analysis and measurement invariance procedures to establish the reliability and validity of these two instruments to measure motives and patterns of Instagram use. Chapters five and six present a questionnaire study of the effects of social comparison orientation and fear of missing out on the motives and patterns of Instagram use, and a study of the effects of the patterns of Instagram use on mental health outcomes (loneliness, depression, stress, and anxiety), respectively. Both studies used structural equation modeling to establish the intricate relationships between the variables considered, yielding interesting and unique findings.

In chapter seven, the main findings of the thesis, along with a revision of current evidence serve to outline some recommendations and suggestions for the prevention of problematic Instagram use that can inform social network developers, researchers, and individuals. To conclude, chapter eight presents a discussion of the main findings and the conclusions of this doctoral dissertation.

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Chapter 2. The effectiveness of prevention programs for Problematic Usage of Internet in adolescents and youths: a systematic review and meta-analysis

Abstract

Background and aims: Problematic usage of the internet (PUI) can lead to dysfunction and undesired consequences, especially in adolescents and youths. Preventive interventions can reduce these negative consequences but should be built on sound evidence. This review synthesizes the available evidence on the effectiveness of primary prevention programs for PUI in adolescents and youths. It adds to previous reviews by broadening the search to general and specific problematic behavior. *Methods:* Two independent reviewers performed a systematic search for published studies on PUI and internet addiction in English, French and Spanish using PubMed, PsycINFO, Cochrane Register of Controlled Trials and Scopus. Published experimental and quasi-experimental studies that assessed the effectiveness of primary prevention programs targeting PUI behaviors were considered for inclusion. Full texts for eligible studies were retrieved and assessed for quality. *Results:* Five studies were retained for narrative synthesis. Three of them based the intervention strategy on an underlying theory, one on media literacy, and one used an educational-based approach. A meta-analysis showed that all five interventions were effective in preventing internet addiction separately. However, when using the Hartung-Knapp-Sidik-Jonkman (HKSJ) estimator and removing one of the studies because of a disproportionate Hedges' g , combined effects were no longer significant. *Discussion and conclusions.* Although PUI is a popular topic, little is known about ways to prevent it. This review demonstrates that prevention programs can be based on different theoretical approaches, but that the available evidence is too heterogeneous to derive generalizable conclusions about their effectiveness.

Reference

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1. Introduction

The increased availability of Internet and its extended use through smartphones has given rise to concerns about their effect on wellbeing. Adolescents (12-17 years) and emerging adults (18-29 years) seem particularly vulnerable since they access the internet more than other age groups (Anderson et al., 2017). Roughly two-thirds of the world's population who use the internet are among the 15-24 age group (Kardefelt-Winther et al., 2019), and in Europe, 95% of individuals between 16-29 access the internet daily (EUROSTAT, 2020). As “digital natives”, youths rely on the internet for performing various day-to-day tasks, for information, knowledge exchange and study, and for socializing, getting entertained, and playing (D'Hondt et al., 2015; Kardefelt-Winther et al., 2019; Wallace, 2014). Consequently, youths become more reliant on visual communication, are eager for instant gratification, and are more likely to engage in risky behaviors due to technology misuse (Teo, 2013).

Using the Internet brings many benefits to the majority of its users. A recent literature review report concerning children up to 18 years old suggested that moderate use of digital technology tends to be beneficial for their mental wellbeing and stimulating for their social relationships (Kardefelt-Winther, 2017b). Nonetheless, its excessive, uncontrolled, or compulsive use can lead to psychological ailments such as depression, anxiety, stress, and loneliness (Elhai et al., 2017; Kim et al., 2009). Other undesired consequences have also been reported, such as impaired academic and working performance, sleep deprivation, family problems, and reduced social activities (Wallace, 2014). In turn, these problems result in high public health and societal costs (World Health Organization, 2015).

1.1 What constitutes Problematic Usage of Internet?

Maladaptive use of the Internet can be conceptualized as a behavioral addiction. It has been referred to by various terms, including internet addiction (IA), compulsive internet use, internet dependence, and pathological internet use (Spada, 2014; Volpe et al., 2015). This conceptualization, however, remains controversial (D'Hondt et al., 2015; Starcevic, 2013), since it is based on *confirmative approaches* (Billieux et al., 2015) which over-pathologize the condition by applying substance use criteria without distinguishing a broader spectrum of behaviors. For instance, no clear distinction is made between high involvement versus dysfunctional involvement. As long as the debate continues on what constitutes a behavioral addiction (Kardefelt-Winther, 2014), whether researchers may be “overpathologizing” everyday life behaviors, or whether the internet is not

just a vehicle that fuels disordered behaviors (Griffiths, 2018), the use of the addiction framework and criteria borrowed from substance or gambling addictions fail to explain why internet-related conditions occur and persist (Kardefelt-Winther, 2017a).

As an alternative, the term *Problematic internet use* (PIU) has been suggested. This umbrella term (Fineberg et al., 2018) describes a maladaptive pattern of internet use that involves an apparent loss of control over the behavior, the occurrence of psychological, social, or professional negative consequences and worries, and obsessive thoughts when it is not possible to use the internet (D'Hondt et al., 2015). The term includes, but is not limited to, online gaming, gambling, buying, and pornography viewing, as well as social networking and cyberbullying (Fineberg et al., 2018).

Some clinical aspects of these behaviors resemble those of addictions. This is particularly the case for gambling and pornography viewing, which involve impaired control over the behavior, craving, persistence despite damaging effects, and preoccupation with the associated functional impairment. However, it is unclear whether all PIU behaviors meet addiction's physiological criteria, such as increased tolerance and withdrawal (Volpe et al., 2015). Some PIU behaviors have been claimed to share similarities with symptoms of other disorders such as obsessive-compulsive disorders, anxiety disorders, and impulse control disorders (Spada, 2014; Volpe et al., 2015).

1.2 Problematic Usage of Internet as a public health concern

Given the difficulties of defining and operationalizing PIU's phenomenon, it is not surprising that prevalence rates vary significantly (Mihajlov & Vejmelka, 2017). Reported rates among adolescents and college students from China, South Korea, the United States, and European countries vary from 1 to 26% (Rumpf et al., 2014; Wu et al., 2013). Regarding gender differences in IA tendencies, a recent meta-analysis comprising 115 independent samples involving 204,352 participants from 34 countries found a small effect of gender, implying that men tend to have more IA symptoms than women. This effect was greater for Asian countries. Meta-regression revealed smaller effect sizes in countries with higher GDP per capita and higher internet penetration. The authors point out that although they used general IA measures in their meta-analysis, gender may have different effect sizes both in magnitude and directionality for specific behaviors such as gaming (where

men could show higher IA symptoms) and social networking (where women could show higher symptoms) (Su et al., 2019).

In line with the conceptualization of PIU as a behavioral addiction or other disorders, clinical interventions for PIU and IA have been developed and implemented, most of which are based on therapeutic and pharmacological strategies that are commonly used for substance disorders, obsessive-compulsive disorder and impulse control disorders (Mihajlov & Vejmelka, 2017). A meta-analysis of 16 studies with 670 participants found that psychological and pharmacological interventions effectively improve IA symptoms, reduce the time spent online, and decrease depression and anxiety (Winkler et al., 2013).

While the effectiveness of treating PIU and IA thus seems increasingly well documented, the evidence regarding the ways to prevent PIU and to promote adequate Internet use is much less well developed. Nevertheless, the topic is high on the public health agenda. An international meeting on the public health implications of excessive use of the internet, computers, smartphones, and similar electronic devices organized by the World Health Organization in 2014 reached the conclusion that there is a need to: (1) define the scope, phenomenology, and typology of PIU; (2) intensify international research to address current knowledge gaps, generate essential information for the development of PIU prevention and treatment policies; and (3) document and evaluate policies, strategies, and interventions to prevent and reduce health risks and disorders associated with PIU (World Health Organization, 2015). In line with these recommendations, it is essential to address the gaps between what we know about PIU and what researchers and clinicians actually do to prevent PIU.

1.3 Prevention programs for PUI

To our knowledge, three published studies exist that have used the PRISMA guidelines for systematic reviews to document the prevention of PIU. The first one (Throuvala et al., 2019) sought to identify prevention programs or protocols for IA targeting adolescents in the school context, examine their effectiveness and highlight their strengths, limitations and best practices. Fifteen intervention studies were included in the review, but due to the heterogeneity of their scope, content, outcome evaluation, and assessment tools used, the findings regarding the effectiveness of the programs remained inconclusive. The second review (Bağatarhan & Siyez, 2015) focused on the effectiveness of prevention programs for internet addiction during adolescence, drawing on multiple research databases in Turkish and English. Of the 435 articles found, only 5 met the inclusion criteria.

However, as the only search terms used for this review's outcomes were "problematic internet use", and "internet addiction", it is likely that some relevant articles were overlooked. The third review (Vondráčková & Gabrhelík, 2016), conducted in Spanish and English, used more specific search terms to target the different PIU behaviors, such as: "gaming addiction", "sex addiction", and "social network addiction". This review traced 179 articles published between January 1995 and April 2016, but only six of them described and evaluated specific prevention interventions. All three reviews agree that the literature on the prevention of internet addiction and PIU is scarce and of limited quality. Particular points of criticism are the absence of consensual diagnostic criteria, which leads to a diversity of IA/gaming assessment tools used; the various methodological limitations in the programs' designs; and the use of the time spent on internet/games as an outcome variable (Throuvala et al., 2019). The reviews also agree that there is a need to introduce and implement interventions for at-risk populations and effectiveness evaluations using well-designed studies. None of the reviews used meta-analysis to synthesize the findings.

The more consistent use of robust outcome measures is encouraged when selecting a measure that will prove the effectiveness of a preventive intervention since it can enable comparison of results across studies and allow for easier consolidation of findings (Breedvelt et al., 2020; Fineberg et al., 2018). Nonetheless, as mentioned before, there is quite some diversity regarding PIU conceptualization, assessment and various outcome measures could be used in primary prevention studies. First, questionnaires designed to measure PIU or IA symptoms, such as the well-established Young's Internet Addiction Test (Young, 1998) or similar. This could also include questionnaires designed for specific behaviors such as gaming and gambling (for a list, see Fineberg et al., 2018). Although not reliable as a standalone measure, many researchers attempt to quantify screen time, time spent online, duration, or frequency of internet access as PIU measures (Throuvala et al., 2019). Finally, other common outcomes that can be measured in primary prevention programs outside behavior are: knowledge, attitudes, and skills, and their measurement will depend on the complexity of the program and whether it is theory-driven or not (Leschied et al., 2018). Despite this could pose a problem when trying to synthesize the results from empiric research, in order to address this variety, various outcome measures could be included in our selection criteria.

The present systematic review aims to address these points by investigating the state of published research investigating the effectiveness of primary prevention programs for PIU. To that effect, multiple databases were searched using both

general terms (e.g., “compulsive internet use”, “internet addiction”) and specific terms (e.g., “gaming addiction”, “online gambling”) targeting the different behaviors that are comprised by PIU in both adolescents and youths. Since a lack of consensus about terms is one of the most pressing concerns in this field, using a wide variety of terms referring to PIU behaviors allows finding more relevant studies and enables to map which behaviors are most often targeted in preventive interventions. In addition, it allows investigating how authors conceptualize PIU, which risk and protective factors are addressed, which strategies are used, and what evidence exists regarding their effectiveness.

2. Methods

This systematic review was conducted in accordance with the PRISMA guidelines for systematic reviews. The protocol for this review was registered in the PROSPERO database of prospectively registered systematic reviews (CRD42019135887).

2.1 Eligibility criteria

To be included in this review, studies needed to meet the following criteria:

1. Be published studies concerning primary prevention programs for PIU or Internet Addiction in general or address specific behaviors that PIU comprises, such as problematic smartphone use, problematic social networking, gaming disorder, cybersex addiction, online gambling, and online buying.
2. Their target population should be adolescents and youths aged 12 to 29 years old, as these are the groups that report most PIU behaviors and access the internet more than other age groups (Anderson et al., 2017)
3. The studies need to provide a quantitative evaluation of the program’s effectiveness by measuring at least one of these possible outcomes: a) symptom reduction outcomes using a valid and reliable questionnaire such as Young’s Internet Addiction Test or questionnaires designed to measure specific behaviors (gaming, gambling, etc.); b) usage outcomes that quantify time spent online, duration or frequency; c) knowledge, attitude or awareness levels shifts; d) skill enhancement improvement outcomes such as self-efficacy, self-control, problem-solving, critical thinking, etc.
4. Be published in English, Spanish, and French, since those are the authors' native or expert languages.

Conversely, studies were excluded when they:

1. Were not concerned with primary prevention programs and the assessment of their effectiveness as their primary objective.
2. Addressed cyberbullying, which is an extension of bullying usually studied on its own and with the particularity of being a behavior perpetrated with the intention to harm, of repetitive nature and with a clear power imbalance between the aggressor and the victim (Tokunaga, 2010). The effectiveness of cyberbullying preventive interventions has been extensively and systematically reviewed over the past few years (Gaffney et al., 2019; Tanrikulu, 2018).
3. Were concerned with early intervention, treatment or rehabilitation instead of primary prevention.
4. Did not have a control group in the evaluation design.

2.2 Search strategy and information sources

A three-step search strategy was used to locate published research. First, an initial limited search of Pubmed and PsychInfo was undertaken to identify keywords and index terms. Next, a second search was performed by two researchers across PubMed, PsycINFO, Cochrane Register of Controlled Trials and Scopus, using the following keywords for the targeted behaviors: “problematic internet us*”, “compulsive internet us*”, “pathological internet us*”, “excessive computer us*”, “internet addiction”, “smartphone addiction”, “cellphone addiction”, “excessive mobile phone us*”, “problematic smartphone us*”, “problematic mobile phone us*”, “problematic online gaming”, “internet gaming”, “Online gaming”, “gaming addiction”, “internet gaming addiction”, “internet gaming disorder”, “gaming disorder”, “problematic social media us*”, “problematic social networking us*”, “social network addiction”, “facebook addic*”, “instagram addiction”, “problematic social networking”, “internet sex addiction”, “cybersex”, “online sex addiction”, “online pornography”, “compulsive online pornography viewing”, “online gambling”, “problematic online gambling”, “problematic internet gambling”, “problematic online shopping”, “compulsive online shopping”. These were combined with the targeted intervention key words: “prevention”, “prevent”, “prevention program”, “psychoeducation”, “online program” and with the targeted population: “adolesc*”, “youth*”, “teen*”, “university student*”, “undergraduate student*”, “college student*”. The search was limited to articles in English, French and Spanish and no date limits were imposed. The search strategy was adapted for each database to account for differences in terminology and indexing. Finally, the reference list of all studies selected for critical appraisal was examined to seek for additional studies.

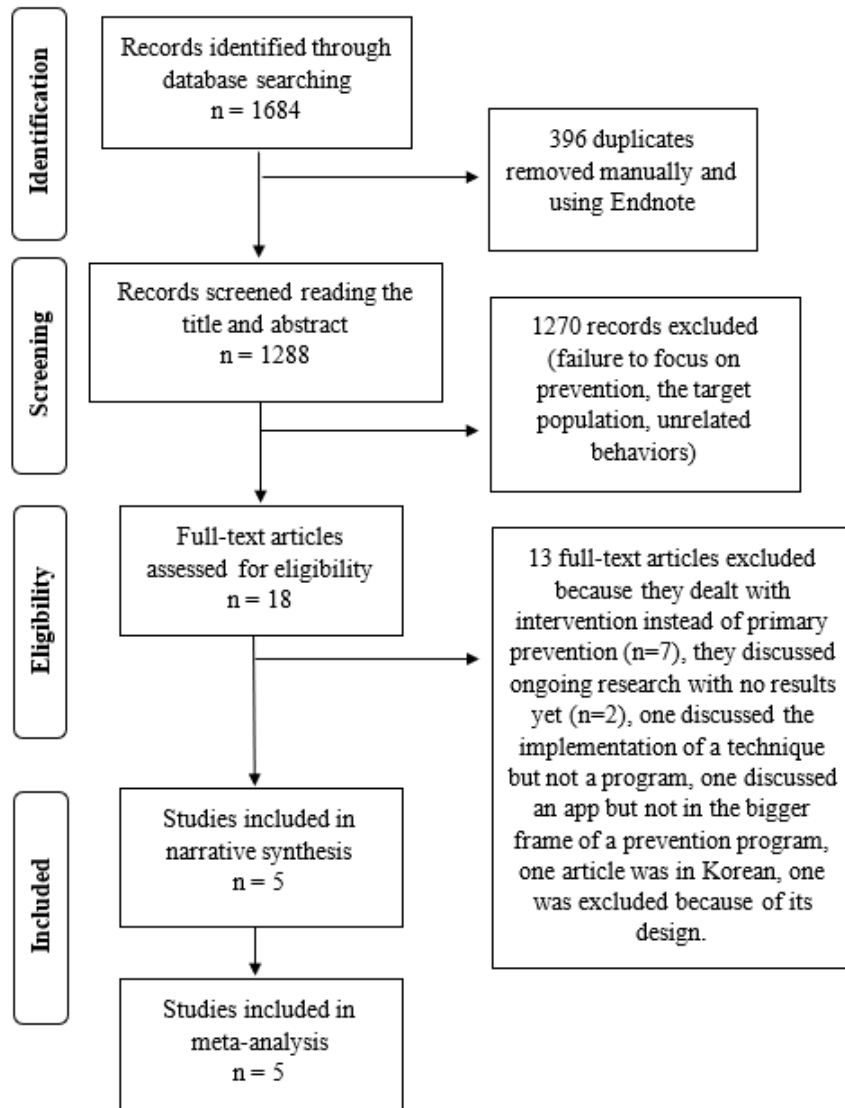


Figure 1. PRISMA flow chart of the selection process

2.3 Study selection and data collection process

The search of all the databases yielded 1684 records (see Figure 1). After removing duplicates with Endnote and manually, 1288 records remained. These were screened by one researcher based on the titles and abstracts. The vast majority were related to the targeted behaviors but did not discuss prevention programs or their effectiveness and as such failed to meet the inclusion criteria. Following their removal, 18 articles were retained, retrieved in full and assessed for eligibility by reading the full text by a second researcher, yielding a high agreement on inclusion (Cohen's kappa = 0.91). Doubts regarding the possibility of including an article were resolved through discussion and agreement with a third researcher. Of the 18 articles, 13 were excluded for various reasons (see Table 1): 7 were concerned with therapeutic interventions rather than primary prevention, 2 discussed ongoing research with no results yet, 1 discussed the implementation of a technique (journaling), 1 discussed an app to imagine consequences of excessive smartphone use, 1 was only available in Korean, and 1 compared two interventions but did not use a control group. As a result, 5 studies were retained for quality assessment.

Table 1. Summary of excluded studies and main reasons for exclusion

Author (year) Country Program name	Main reason for exclusion	Explanation
1. Benson, Eisenach, Abrams, & Stolk-Cooke (2014) USA [no name]	Treatment, not prevention	The study tests the efficacy of a group treatment model for compulsive buying disorder using cognitive-behavioral, dialectical-behavioral, and psychodynamic psychotherapy plus psychoeducation, motivational interviewing, acceptance and commitment therapy and mindfulness.
2. Chow, Leong, & Lee (2018) Hong Kong Time Off	Treatment, not prevention	The study conveys a field trial of a character-based mobile application to stimulate imagination and reflection on consequences on excessive use of smartphones in adolescents.
3. Fontalba Nava (2015) Spain [no name]	No results available	The study aims to develop an intervention model for PUI for high school adolescents. The authors claim to have carried out the program on 26 occasions in 22 schools and 1200 students, but no results are available.
4. Gaysina & Zakirova (2017) Russia [no name]	Treatment, not prevention	The study aims to present a model of psycho-pedagogical prevention of Internet addiction for 10 to 15-year-old students, but assess their internet addiction instead, therefore it is not focused on primary prevention. Doubts regarding quality.

Author (year) Country Program name	Main reason for exclusion	Explanation
5. Joo & Park (2010) Korea <i>Empowerment Education Program</i>	Article in Korean	The study aims to determine the effects of an empowerment education program on internet games addiction, empowerment and stress in middle school students, using a non-equivalent, control group pretest-posttest design.
6. Ke & Wong (2018) Malaysia <i>Internet use for youth</i>	Treatment, not prevention	The study aims to develop a program based on cognitive-behavioral therapy by addressing negative coping styles to reduce PUI in adolescents. 157 participants aged 13 to 18 completed 8 weekly, 90 min sessions, showing improvement after the program.
7. Ke & Wong (2018a) Malaysia <i>Internet Use for Youth</i>	Treatment, not prevention	This study designs and tests a preventive intervention program based in cognitive behavioral therapy for youths with PUI. A total of 45 secondary students from four schools completed the program which was conducted in a group format by registered school counselors.
8. Lee, Seo & Choi (2016) Korea <i>[no name]</i>	Not a program, relies on one strategy: journaling	The study aims to assess the therapeutic effectiveness of a home-based daily journal of smartphone use in Korean adolescents to reduce smartphone addiction.
9. Lindenberg, Halasy, & Schoenmaekers (2017) Germany <i>PROTECT</i>	Treatment, not prevention	The study seeks to develop and test an indicated preventive intervention to reduce IUD (Internet Use Disorder) using a cognitive-behavioral, 4-session brief protocol with 340 students aged 12-18 years old.
10. Marco & Chóliz (2017) Spain <i>Prevtec 3.1</i>	Design	The study seeks to prevent techno-addictions, particularly gaming, by establishing limits and boundaries on the time spent online and gaming, organizing free time and communicating properly with parents. Nonetheless the study designed compared the traditional version of the program with an enhanced version that introduces impulse control techniques. 1110 students aged 9-16 were recruited
11. Odacı & Çelik (2017) Turkey <i>[no name]</i>	Treatment, not prevention	The study seeks to test the efficacy of a reality therapy-based group counselling on college students' PUI and life satisfaction. 20 students out of 418 met the criteria for PUI and were treated.
12. Shek & Leung (2013) Hong Kong <i>Youngster IA Prevention and Counseling Service</i>	Treatment, not prevention	The study portrays the main features of a counseling model for Internet Addiction in adolescents drawing from motivational interviewing, family perspectives and multi-level counseling at individual, peer and family levels.
13. Soto <i>et al.</i> (2018) Spain <i>[no name]</i>	No results available	The study presents the experience of a treatment center in Malaga at developing a proposal for an integral approach for treating dysfunctional uses of ICT (Information and communication technologies). This approach includes both preventive strategies aimed at schools and treatment both at the individual and family level.

2.4 Quality assessment

Downs and Black's (1998) checklist was used to assess the quality of the studies considered for inclusion in this review. This tool has 27 items designed to provide an overall score of quality as well as sub-scores for: reporting quality, external validity, internal validity (study bias, confounding and selection bias) and power. The advantage of this tool over others is that it can be used to assess both randomized and nonrandomized health care interventions. To ensure that a sufficient number of studies could be retained for the analysis, a criterion of 60% positive answers was established, meaning that only medium to high-quality studies were included in the review.

2.5 Data extraction and analysis

For the narrative synthesis, relevant data were extracted for the following categories: authors, year, country, program name, participant's characteristics, intervention characteristics (aim, theoretical background and key strategies used), measures used and main findings. For the meta-analysis, quantitative data was pooled in RStudio using the meta package. Since prevention programs often occur in school settings, the randomization to conditions was sometimes carried out at classroom or school level, which enhances the chance of underestimating the within-study variance. Therefore, it is necessary to adjust the variance of effect sizes to account for clustering (Donner & Klar, 2002; Higgins & Green, 2008). This can be achieved by estimating a design effect using the formula:

$$\text{Design effect} = 1 + (M - 1) \times \text{ICC}$$

where M is the mean cluster size in each study (mean number of students per classroom) and ICC the intraclass correlation coefficient, which was established at 0.025 following recommendations based on previous meta-analysis of school-based interventions (Gaffney et al., 2019). The variance can be multiplied by the design effect to obtain the corrected variance. This correction was applied to the raw data were necessary before pooling it for the meta-analysis. Separate effect sizes regarding Internet addiction were calculated for the post measures for the intervention and control groups, since they were measured using similar scales in all the studies. Not all studies reported follow-up measures, so these could not be included as outcome variables for the analysis. Screen time and self-reported internet use measured by hours or days a week are not reliable and were therefore not used either.

As an estimator of the effect size, Hedges' g 95% confidence interval was used. Hedges' g is preferred over Cohen's d since it corrects for bias due to small sample sizes (Hedges & Olkin, 1984). Its interpretation is similar to Cohen's criteria, distinguishing between small (.20), medium (.50), and large (.80) effect sizes. A random-effects model was used for the analysis. This model assumes that the effects estimated in the studies are not identical but follow some distribution (Higgins & Green, 2008). This is the most appropriate approach as it cannot be assumed that the studies included were functionally identical (Borenstein et al., 2009). To estimate the variance of the distribution of true effect sizes, denoted by τ^2 , the Hartung-Knapp-Sidik-Jonkman (HKSJ, Hartung & Knapp, 2001) method was used along with the more well-known DerSimonian-Laird estimator (DerSimonian & Laird, 1986), which is prone to producing false positives, especially when the number of studies included in the meta-analysis is small and where there is high heterogeneity. The HKSJ method has shown to outperform the DerSimonian-Laird method in many cases and is known for producing more conservative results shown in wider confidence intervals (IntHout et al., 2014). Finally, to assess heterogeneity, which is the extent to which effect sizes vary within a meta-analysis, we used I^2 (Higgins & Thompson, 2002), derived from Cochran's Q statistic and is the percentage of variability in effect sizes not caused by sampling error. Values of I^2 are interpreted as follows: $I^2 = 25\%$, low heterogeneity; $I^2 = 50\%$, moderate heterogeneity; $I^2 = 75\%$, high heterogeneity. If high heterogeneity is observed, an influence analysis based on graphs can be conducted to detect outliers that could influence the pooled effect estimate (Viechtbauer & Cheung, 2010) and the Leave-one-out analysis. The number of studies was too small to perform an Egger's test and further methods to assess publication bias.

3. Results

3.1 Quality assessment

The five studies that met the inclusion criteria obtained the minimum of 60% that was required to assure quality. Overall, the studies obtained good scores for general quality ($M=21$ out of 27 with 77% of positive answers). The score for reporting quality was high ($M=8,6$ out of 10, with 86% of positive answers), as well as for internal validity bias ($M=4,8$ out of 7, with 69% of positive answers). Average scores were obtained for external validity ($M=2,4$ out of 3, with 80% of positive answers) and internal validity confounding ($M= 4,2$ out of 6, with 70% of positive

answers). Four of the five studies gave information about the sample size calculation or power estimations.

3.2 Narrative synthesis

The five studies that met the selection criteria all aimed at preventing Internet Addiction (IA) in general. No published primary prevention programs were found specifically aiming at problematic use of social networks, cybersex addiction, online gambling, online gaming, or online buying that met the criteria. A summary of participant characteristics, intervention characteristics and main findings is given in Table 2.

One study was conducted in Germany (Walther, Hanewinkel, & Morgenstern, 2014), the four other ones in Asia, particularly in China, Iran, South Korea and Turkey (Maheri, Tol, & Sadeghi, 2017; Uysal & Balci, 2018; Yang & Kim, 2018; Yang et al., 2019). All five the studies were published after 2014. Three studies targeted adolescents (10-16 years old), the two other ones, college students (16-24 years old). The Iranian study was conducted solely among women, while the rest were conducted in both boys and girls with equivalent proportions among groups. Four studies used a controlled pre-post design, with one group receiving the intervention while the other did not, and outcomes were measured before and after the intervention. In all studies, the participants were randomized to the conditions, but as the randomization was not concealed, some studies took measures to prevent contamination and interviewer bias. All control groups shared similar characteristics to the intervention groups, and were expected to experience similar changes in their environment apart from the intervention. In all cases, groups were tested at baseline to ensure comparability, which resulted in homogeneity tests that revealed no significant differences in the participants' characteristics between groups. The study by Walther et al. (2014) was the only one that used a cluster-level randomized controlled trial (RCT) design and alerted of slight differences between intervention and control groups in terms of age, socio-economic level, school type, and internet access at baseline.

Three of the programs focused only on IA (Maheri, Tol, & Sadeghi, 2017; Uysal & Balci, 2018; Yang & Kim, 2018), one targeted both computer gaming and IA behaviors (Walther et al., 2014), and one targeted internet addiction in the context of a general health behavior intervention also addressing healthy eating, physical activity, stress reduction and healthy sleep (Yang et al., 2019). Three of the studies did not provide a specific definition of PUI or IA. However, Yang et al. (2019) use the term IA and Young's Diagnostic Questionnaire; Yang & Kim (2018) state that

IA is characterized by psychological dependence, tolerance, withdrawal symptoms and provide a reference to DSM-V; and Walther et al. (2014) focus on the relation between digital media use and adolescent mental health in the context of media literacy. Of the two studies that use an explicit definition, Maheri et al. (2019) define IA as *the excessive use of internet or using the internet as irrational*, referring to Young's criteria of using the internet for more than 38 hours a week as a sign of addiction (Young, 1998); and Uysal and Balci (2018) define IA as *being incapable of overcoming the desire to go online and the feeling of meaninglessness of the time spent offline, overanxiety and aggression, accompanied by a deterioration in relationships with family, friends and school life due to excessive use*. All of the studies emphasize the pressing need for prevention and report the academic, family, financial and social consequences of IA.

Four of the programs discussed in the studies were theory driven and used techniques and resources from either Social Cognitive Theory or the Health Belief Model. Social cognitive theory states that environmental, personal and behavioral factors interact in a bi-directional way, in the sense that environmental factors affect the individuals' self-beliefs and drive behavioral change. Among the personal factors, the main concepts that determine behavioral change are self-efficacy and self-regulation. Both the studies by Uysal and Balci (2018) and by Yang and Kim (2018) rely on this theory and include techniques and activities to address environmental factors as well as personal and behavioral ones.

For instance, Uysal and Balci (2018) scheduled interviews with parents and phone calls to track the students' use of the Internet. Yang and Kim (2018) involved the school nurse to follow up students after the interventions and informed school authorities about the serious and harmful effects of IA. Maheri et al. (2017), on the other hand, used the Health Belief Model, which states that health related behaviors are based on perceived susceptibility (perception of the risk of developing a problem), perceived severity (perception of the seriousness of the consequences), perceived benefits (the belief in the efficacy of the advised action to reduce the risk), perceived barriers (the costs of taking the advised action), cues to action, and self-efficacy. The other programs relied on an educational approach, with one specially involving media literacy (Walther et al., 2014).

Table 2. Summary of studies included for the narrative synthesis of prevention programs for PUI

Author (year) Country/Name Participant Characteristics	Intervention Characteristics	Main findings
1. Maheri et al.(2017) Iran [no name] 160 female medical college students (randomly assigned to CG/IG)	Aim: to increase knowledge of internet addiction, conscience of negative consequences of internet use, acknowledge the benefits of adopting preventive behaviors and overcoming barriers to preventive behaviors Theory: Health Belief Model. Duration: 3 sessions/3 weeks Techniques: group discussions and lectures. Measures: HBM constructs (knowledge, susceptibility, perceived severity, perceived barriers, perceived benefits, cause to action, self-efficacy), Internet addiction (IAT), Hours of internet use per day.	All the HBM constructs showed significant changes for the IG after the intervention in the desired direction. The mean score of internet addiction and the prevalence of internet addiction decreased significantly in the intervention group compared to the control group CGa: M=37; SD=2.3; n=80 IGa: M=21.9; SD=3.7; n=80
2. Uysal & Balci (2018) Turkey <i>Healthy Internet Use Program</i> 84 students aged 11-16 (randomly assigned to CG/IG)	Aim: to reduce PUI by targeting personal (healthy internet use habits), behavioral (develop healthy lifestyles, learning to organize daily activities better) and environmental factors (increasing parents' awareness and appropriate role modelling for correct internet use). Theory: Social Cognitive theory. Duration: Eight 40-80 min sessions/ 3 months Techniques: self-recognition, self-expression, education, watching videos, playing games, making posters, scheduling Measures: Internet addiction (IAS)	The intervention group significantly decreased their scores on the IAS after the intervention. This decrease was sustained at the follow-up 9 months later. CGa: M=84.91; SD=18.72; n=41 IGa: M=76.41; SD=13.85; n=43
3. Walther et al (2014) Germany <i>Connected Worlds</i> 1879 students aged 10 to 14 (cluster-level randomized to CG/IG)	Aim: to assess a curriculum to improve media literacy so media is used and processed in a healthier way and therefore, decrease adolescent computer gaming and internet use behavior Theory: driven by the concept of Media literacy Duration: Four 90min sessions Techniques: self-reflection of patterns of use, critical thinking of online content and activities, booklet and online materials use. Measures: Gaming, Internet use, Addictive internet use	Significant group-time interactions were found for the ISS, showing an increase in the mean for the control group at the three time points (baseline, post-test and follow-up after a year) CGa: M=0.41; SD=0.46; n=1039 IGa: M=0.34; SD=0.43; n=804

Author (year) Country/ Name Participant Characteristics	Intervention Characteristics	Main findings
4. Yang & Kim (2018) South Korea [no name] 1879 students aged 10 to 14 (cluster-level randomized to CG/IG)	Aim: to improve self-control, self-efficacy, internet addiction and time spent on internet among middle school students Theory: Social cognitive theory Duration: Ten 45-minute sessions Techniques: small group interaction, sharing and feedback, role modelling, case observing, video watching, group practice Measures: Self-control, Self-efficacy, Internet addiction (K-Scale), Time spent on internet (minutes per day).	Self-efficacy and self-control increased significantly in the EG after the intervention and Internet Addiction and time spent on internet significantly decreased in the intervention group. CGa: M=85.37; SD=19.16; n=41 IGa: M=61.13; SD=13.23; n=38
5. Yang et al. (2019) China [no name] 532 undergrad students 16-24. (randomly assigned to CG/IG)	Aim: assess the impact of a health education intervention on health behaviors (physical activity, screen time, sugar beverage intake, having breakfast and Internet Addiction tendency), self-efficacy and wellbeing Theory: Social cognitive theory Duration: Seven 2h sessions Techniques: activities that combined knowledge, attitude and practice of behavior. Outcome measures: Health behaviors, Self -efficacy, Physical activity, Screen time, Internet addiction tendency (YDQ)	There was a significant reduction in the proportion of students with high screen time and screen addiction tendency in the intervention group. CGa: no = 221 (82.2%), yes = 48 (17.8%) IGa: no = 237 (90.1%), yes = 26 (9.9%)
IAT = Young's Internet Addiction Test, IAS = Internet Addiction Scale, KFN-CSAS-II = German Computer Gaming Addiction Scale, ISS = German Internet Addiction Scale, K-Scale = Internet Addiction Proneness scale, YDQ = Young's diagnostic questionnaire		

In terms of their aims, all the programs were looking to reduce IA after the intervention, but they differed in the risk and protective factors addressed. Theory-driven programs relied on change in the levels of the constructs deriving from the theories (e.g., increasing self-efficacy, decreasing perceived barriers), while education-based programs relied on increasing knowledge on internet addiction and its consequences to produce an effect on IA. All programs shared the use of presentations and discussions as techniques to produce the desired change. The most often-used techniques were group discussions and reflection, lectures, video watching, role modelling and case observing. The length of the interventions varied from 3 to 10 sessions, and all of them were delivered weekly.

To measure the outcome variables, all programs administered valid and reliable questionnaires measuring IA, including Young's Internet Addiction Test (IAT) or more locally developed scales, such as the German Internet Addiction Scale (ISS) or the Internet Addiction Proneness scale (K-Scale). Some studies also measured screen time and internet use using self-reported measures of minutes or hours a day or days per week of internet use.

As for the results, all the interventions reported significant effects in the desired direction. For the theory driven interventions, significant changes were found for the model based variables, as well as a significant decrease in IA in the intervention group compared to the control group after completing the program (Maheri et al., 2017; Uysal & Balci, 2018; Yang & Kim, 2018). For the media literacy program, an increase of IA over time was found for the control group, but not for the intervention group, when comparing baseline, post-test and follow-up data after one year (Walther et al., 2014). For the health behaviors intervention, a significant reduction was found in the proportion of students with high screen time and IA tendency after the intervention (Yang et al., 2019). It is important to note that three studies (Maheri et al., 2017; Uysal & Balci, 2018; Walther et al., 2014) collected the post-intervention data three to four months after the intervention took place, while two studies (Yang & Kim, 2018; Yang et al., 2019) collected the post-intervention data immediately after the intervention finished. None of the studies sought actively for differences by gender, either in IA symptomatology or in the impact of the intervention.

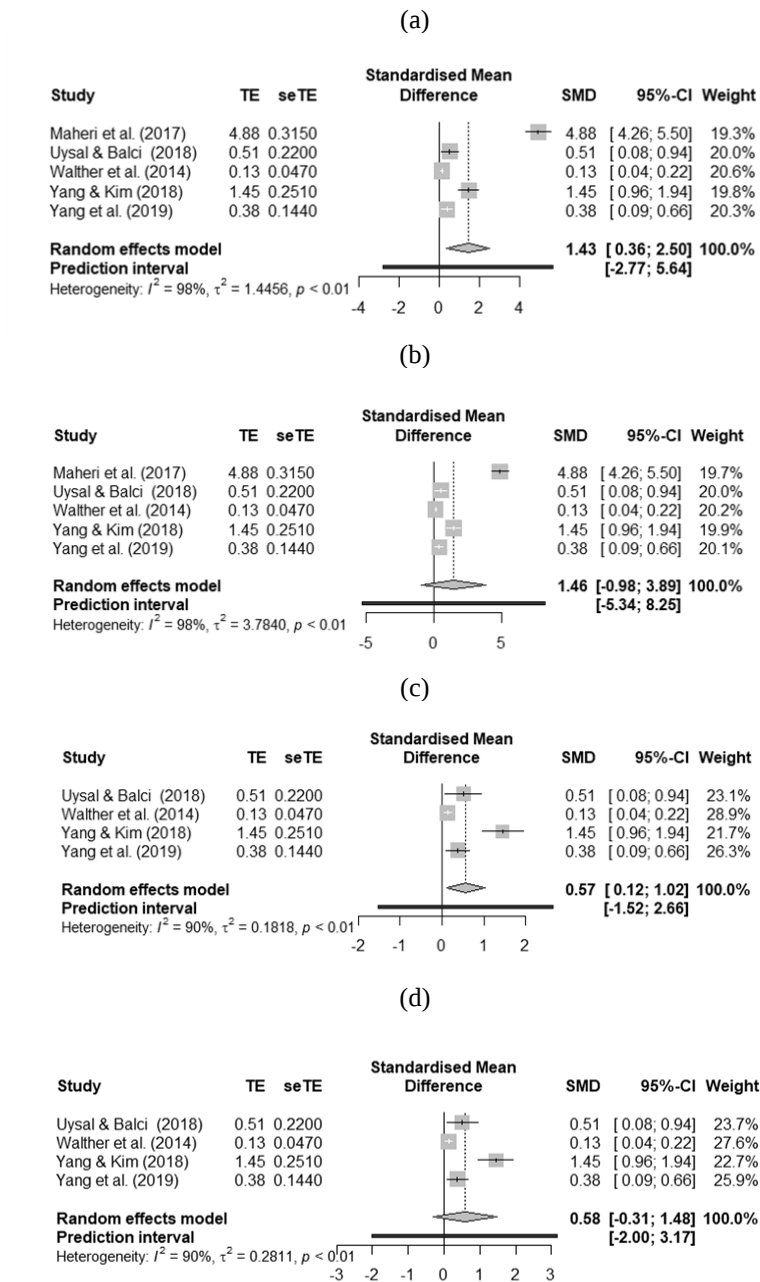


Figure 2. Results of different meta-analysis using a random effects model

3.3 Meta-analysis

Pooling of the samples of the five studies resulted in a total sample of 965 students in the intervention group and 1201 in the control group. Figure 2 shows the forest plots and statistics for the random effects model for the pooled post-test effect differences between the groups. Figure 2a displays the results when using the DerSimonian-Laird estimator, which shows a significant overall effect of the interventions. Two studies gave moderate effect sizes, and three high effect sizes. These findings can be considered as robust since the confidence intervals did not include zero. The pooled effect sizes favor intervention over no intervention ($g=1.43$, 95% CI: 0.36-2.50). However, when the HKSJ estimator is used, more conservative results are obtained, showing no significant combined effect (95% CI: -0.98; 3.89, Figure 2b). Since high levels of heterogeneity were found ($I^2 = 98\%$), subgroup analysis would be indicated to identify sources of variation, but that is not possible due to the small number of studies. Instead, by way of an influence analysis a leave-one-out analysis was performed to further explore the heterogeneity.

As shown in Figure 3, the lowest heterogeneity levels and the lowest overall effects are reached when removing one of the studies (Maheri et al 2019), which has a disproportionate Hedges' g value. Two re-analyses (Figures 2c and 2d) involving the four remaining studies and summarizing the results of 885 cases in the intervention group and 1121 in the control group gave an overall significant effect when using the DerSimonian-Laird estimator ($g= 0.57$, 95% CI: 0.12; 1.02) with a prediction interval at a 95% confidence of [-1.52; 2.66], but a non-significant effect ($g= 0.58$, 95% CI: -0.31; 1.48) with a prediction interval at a 95% confidence of [2.00; 3.17] using the HKSJ estimator. In both cases, heterogeneity remains high at 90%.

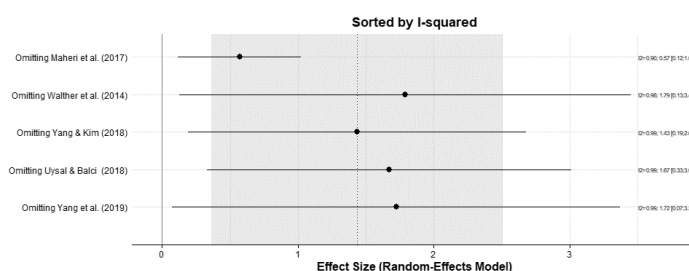


Figure 3. Results of Leave-one-out analysis

4. Discussion

Despite the growing recognition of PIU as an important topic in public health and the acknowledged need for preventive interventions, little is known about the best strategies to prevent this problem or the effectiveness of existing prevention programs. This review aimed to examine the effectiveness of primary prevention programs for PIU in adolescents and youths while also paying attention to the definitions used, the risk and protective factors addressed, and the characteristics of the interventions that are reported in the literature. While precise conceptual and operational definitions of PIU are still lacking, the review integrated studies that aimed to deal with different internet-related problems by considering prevention programs targeting problematic use in general and specific online activities. Such integration is warranted given the commonalities among these behaviors and the fact that restricting the review to one specific online activity would not have given a sufficient number of studies to conduct a meta-analysis.

Although the review did not use the publication date as an inclusion criterion, all of the studies found on this subject were recent and published since 2014. Moreover, only a small number of studies could be found that focused on primary prevention, although some additional studies were identified that are still ongoing (e.g., Lindenberg et al., 2017; Soto et al., 2018). With one exception, which targeted both online gaming and IA symptoms (Walther et al., 2014), all of the studies targeted PIU and IA in general. While it was expected to find more specific studies by including more search terms aiming for specific behaviors, this was not the case. Based on the excluded studies it can be assumed that studies regarding treatment and secondary or tertiary prevention are more common and larger, which suggests that more efforts are placed on treatment of IA, Internet use disorder, PIU, online gaming, smartphone addiction, and compulsive buying disorder than on prevention (Benson et al., 2014; Chow et al., 2018; Ke & Wong, 2018a; Lindenberg et al., 2017). In this regard, primary prevention of PIU is an emergent research topic, contrary to treatment.

The studies included in this review mainly portray PIU from an addiction perspective. This is reflected in the definitions given (in those cases when a definition is provided) and the instruments used to assess the outcome variables. While it is understandable that the authors use the best available definitions and tools at hand for conducting and evaluating prevention programs, this perspective disregards the controversial nature of conceptualizing PIU as an addiction and may over-pathologize the condition (Billieux et al., 2015). Although some clinical aspects of PIU may resemble those of addictions, not all PIU behaviors meet the

physiological criteria of addiction, such as increasing tolerance, and other PIU features resemble more those of other pathologies. So, it appears that the lack of consensus on how PIU should be conceptualized also transpires in prevention programs. As a result, it is not surprising to see a large variability in the reported outcomes and a high level of heterogeneity in the meta-analysis.

Concerning the theoretical underpinnings of the prevention programs, three of the five studies included in this review drew on the Social Cognitive Theory as a framework for designing the program and guiding the intervention. As the SCT addresses environmental and personal (i.e., behavioral) factors, the programs based on this theory focus not only on the adolescent but also on parents and the school setting. This “ecological” perspective has become very common in the recent prevention literature (Kwon, 2011; Romano, 2014). For instance, the healthy settings approach to health promotion understands health as created and lived by people within the settings of their everyday life, and therefore, action should be integrated across risk factors in the social context where people engage in daily activities (Dooris et al., 2007; Suárez-Reyes & Van den Broucke, 2016; World Health Organization, 1986). It is not surprising then that IA prevention programs are conducted in school and university settings. In addition, most of the programs to prevent PIU do not rely solely on education and knowledge exchange to produce the desired change but use a variety of techniques and strategies such as active discussion, reflection, and role modeling. The limited effect of focusing only on knowledge to change behavior has been discussed extensively in the health promotion literature (Pellmar et al., 2002; Ryan, 2009; Van den Broucke, 2014) and has also been acknowledged in preventing internet addiction (Kwon, 2011). Therefore, we believe that future preventive efforts should continue to include the healthy settings perspective and address contextual as well as internal factors, using a variety of techniques addressing multiple determinants of the behavior, rather than providing information only.

While the studies included in this review are of high quality and reported medium to large effect sizes for short-term effectiveness on their own, they are too few in number to warrant robust conclusions regarding their effectiveness when a pooled effect is considered. For conducting a meta-analysis, a certain amount of heterogeneity is acceptable, and it made sense from a conceptual point of view to combine studies that share enough characteristics and for which sufficient data are available. However, the limited number of studies prevented further exploration of potential sources of variance that may have contributed to the data's high heterogeneity. With more studies, a moderator analysis could be considered to

account for the effects of potential moderators such as study design, type of program depending on the underlying theory, culture (especially if including Asian studies), age, and gender. To account for these factors, future reviews could consider increasing the number of studies by including those published in more languages by reducing language restrictions.

Additionally, the low number of studies made it impossible to perform any recommended tests to assess publication bias. The studies that were included favored intervention over no intervention on their own, with medium to high effect sizes, but some had relatively small samples. As studies with significant results and larger effect sizes are more likely to get published than non-significant ones, publication bias cannot be excluded. Additionally, the inclusion of gray literature would have increased the chance of finding studies with non-significant effects. Future research should make an effort to include grey literature but continue to include only high-quality studies in the review.

In sum, five studies were found that met our criteria to prevent PIU in general, without specifying specific online behaviors to assess or address, and having the addiction framework as their departing point. Since the conceptualization of IA and PUI continues to be discussed and debated (Baggio et al., 2018; Starcevic & Aboujaoude, 2017), we believe that prevention efforts should be made for specific problematic behaviors rather than in a general fashion. This will encompass choosing one behavior and accurately conceptualizing it by understanding its phenomenology so that unique risk and protective factors can be detected and addressed. It will also be crucial to develop new measurement tools that consider the behavior's unique nature. Once this is achieved, theory-driven preventive interventions can be developed and, provided rigorous methodologies are used to deliver and evaluate them, meaningful conclusions can be drawn regarding their effectiveness. Only then, reported changes in the behavior could be attributed to the intervention and not to confounding factors or conceptual or methodological limitations.

We believe that the first step towards better research is a rigorous conceptualization of the problematic behavior and its unique features. In the future, efforts to prevent PIU should continue to be carefully designed and theory-informed, use evidence-based and multiple strategies to address the identified risk and protective factors, and involve relevant stakeholders for the implementation, following the prevention guidelines established for the field of psychology (American Psychological Association, 2014). Moreover, careful attention should be placed on the

conceptualization and selection of the behaviors and assessment tools used to measure the outcomes, as they are crucial to guide interventions and measure their effectiveness. In the absence of a consensus about these issues, evaluating the effects of intervention remains difficult, and evaluation results will remain inconclusive, while strong evidence is required to inform practitioners and policymakers.

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Chapter 3. Understanding motives, usage patterns and effects of Instagram use in youth: a qualitative study

Abstract

This article provides an in-depth analysis of the motives and patterns of Instagram use among a sample of Belgian and Peruvian youths. Nineteen participants aged 18-28 underwent in-depth interviews to assess what Instagram means to them, why and how they use it, and what consequences of their use they perceive. The most recurrent motivations for using Instagram were self-expression, curiosity, documenting, entertainment, and connection. Five distinctive usage patterns were identified: urge and craving, passive use, anxious posting, social approval, and social comparison. The perceived consequences include an increased connection to others, the rise of “*Instagram-worthy*” content pursuit, issues with time management, a compulsive urge to enter, and constant comparison. Since Instagram relies mainly on visuals, poses questions about authenticity, identity, and self-presentation, and elicits strong emotional reactions from its users, it fosters social comparison, which may be harmful to youth’s views on themselves, their self-esteem, and their self-worth.

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1. Introduction

The Internet has revolutionized societies worldwide and has become ubiquitous and an essential part of daily life for most people (Talis, 2022). With the development of smartphones, digital media, and social media, the use of the Internet has multiplied, but so has its potential misuse. Over the last decades, research on Internet addiction and problematic Internet use has grown exponentially (Schimmenti et al., 2021; Korte, 2020; Musetti et al., 2016; Talis, 2022) and has produced a growing body of findings regarding the contributing factors, mechanisms, and consequences of Internet addiction and problematic Internet use, despite the wide variability in research methodology and the fact that the conceptualization of these terms remains debated (Aboujaoude, 2010; Billieux et al., 2015; Fineberg et al., 2018; Kardefelt-Winther et al., 2017; Talis, 2022).

Problematic Internet use (PIU) is the preferred term to describe a maladaptive pattern of internet use frequently reported among adolescents and young adults (Fineberg et al., 2018; Schimmenti et al., 2021). PIU comprises difficulties in controlling the behavior involved (e.g., gaming, gambling, buying, etc.) and leads to negative daily life consequences (D'Hondt et al., 2015; Fineberg et al., 2018; Spada, 2014). A specific form of PIU is *problematic social network use*, defined as a maladaptive pattern of seeking and using one or several social networks (SN), thus disrupting normal functioning (He et al., 2017). For instance, the urge to use SN daily can be stronger than the need for sleep and rest, leading users to withdraw from their real surrounding environment (Guedes et al., 2016; Pendergrass & Payne, 2018). Intensive SN use has also been associated with increased alcohol consumption, depressive symptoms, loneliness, suicidal ideation, body image disturbances, diminished self-esteem, and decreased academic performance (Brailovskaia et al., 2020; Bue, 2020; Savolainen et al., 2020; Van Den Eijnden, 2018).

Users typically tend to engage in two or more SN in tandem to fulfill their emotional, social, and informational desires (Brandtzæg, 2012; Quan-Haase & Young, 2010). However, as each SN displays unique features (e.g., text-based like Twitter vs. image-based, like Instagram) and serves specific purposes, using one does not imply using others in the same way (Kuss & Griffiths, 2017; Longobardi et al., 2020). Also, the intermediate processes that link the use of different SN to psychological well-being can differ (Baker & Algorta, 2016; Faelens et al., 2021; Hwang & Cho, 2018). Thus, findings resulting from the study of one SN may not

be generalizable to others (Wong et al., 2019). Therefore, it is essential to investigate SN use separately and specifically.

One of the SN that has recently attracted the attention of clinicians and researchers is Instagram. Instagram is a photo-sharing application and social network platform that relies uniquely on visuals and image-based content. It is the fourth most often-used social network after Facebook, YouTube, and Whatsapp (Statista, 2021a) and is especially popular among young people: 63% of its users are between 18 and 34 years of age (Statista, 2021b). Its attractiveness lies in the possibility of using numerous built-in photo filters that help create visual effects to enhance pictures and videos' appearance with low effort. Additionally, it was the first platform that launched *stories*, giving users a reason to engage in story sharing and viewing daily and creating a sense of urgency that motivates users to stay there longer and return to the app more quickly (Moore & Craciun, 2021). As of 2019, 500 million Instagram users engage with *stories* every day (Statista, 2019).

Research into problematic Instagram use is relatively recent (Kircaburun & Griffiths, 2018) and focuses mainly on the mental health consequences of using the platform. This research has suggested that Instagram use may have the worst impact on mental health of all SN, linking it to social comparison, loneliness, low self-esteem, negative mood, depression, distress, anxiety, and poor well-being (Faelens et al., 2021; Frison & Eggermont, 2017; Hill Holiday, 2018; Kircaburun et al., 2018; Khodarahimi & Fathi, 2017; Marino et al., 2018; Matthes et al., 2020; Ponnusamy et al., 2020; Royal Society for Public Health, 2017; Sherlock & Wagstaff, 2018; Vahedi & Zanella, 2019; Yang, 2016; Yurdağül et al., 2019).

1.1 What makes Instagram so engaging and so pervasive at the same time?

Since Instagram uses images in a picture or video format as the primary means of communication, the life of an image on Instagram extends beyond its creation and is capitalized on its reception, attention, consumption, and appreciation (Ross, 2019). To see an image, it needs to appear in a user's feed, which is personalized, determined by a complex algorithm, and evolves over time based on the use of the platform (Mosseri, 2021). Images, therefore, need to be *valuable*, and one way to become valuable is in the form of *likes*. Likes on Instagram represent a way to obtain rewards and recognition and serve as indicators of status and popularity. As the number of likes is interpreted as received support, users tend to check often how many likes a post has received (Blease, 2015; Martinez & Garcia, 2019; Zell & Moeller, 2018) and are drawn to seek more and more *visibility* through

comments, shares, and reposts. Thus, finding the ultimate balance between selecting a good image, editing it, captioning it, and uploading it at a perfect time is essential to create a successful post (Ross, 2019).

Since being visible on Instagram requires the creation of images that generate engagement, users need to engage in *self-presentation* and *self-disclosure* to curate their online self and control how others perceive them. Previous research has shown that social network platforms are a playground for youths to explore their *identity* (Subrahmantam & Šmahel, 2011; Turkle, 1995), which is the basis for building narratives about themselves through self-assessment and self-reflection (Subrahmantam & Šmahel, 2011). As such, youth can construct their online selves in different ways: they can create, edit, and re-edit who they are, decide to be completely different from who they are offline, or even create multiple selves (Attrill, 2015). Therefore, they can selectively decide the content they will share, so it describes them in the ways that represent their *ideal self-views* (Rosenberg & Egbert, 2011; Vogel et al., 2014).

Recently, Davies (2020) pointed out that GenZs are showing an *online identity duality*: they portray one identity that is highly curated and reflects their uniqueness and individuality, and another that is an ongoing work in progress, which evolves as new information (new trends, new standards, etc.) is taken in. It is also highlighted that *influence metrics*, such as likes, views, or shares, force an evolution *from self-identity to brand identity*. Engaging in *self-branding* means developing a distinctive public image for commercial gain and/or cultural capital, which implies an effort to build a reputation and a desire to capitalize and get value from it (Davies, 2020; Whitmer, 2019, 2021). For that purpose, influence metrics are pivotal: the likes, comments, shares, and views are markers of popularity, sociability, likeability, approval, and acceptance (Kim & Lee, 2011; Vitak & Ellison, 2013; Vogel et al., 2014).

Besides being a tool for exploring their identity and engaging in self-presentation and self-branding, Instagram can also become a source of constant *social comparison*, especially since it encourages a specific aesthetic to generate valuable and engaging content. Evidence suggests that many people believe that others have happier and more successful lives than they do (Chou & Edge, 2012), so exposure to *stories* and pictures of others' "presumed perfect" lives on Instagram may enhance the impression that other peoples' lives are more exciting and satisfying (Faelens et al., 2021; Vogel et al., 2014), which is likely to have an adverse impact on well-being (Faelens et al., 2021). Thus, it seems that the use of Instagram is a

double-edged sword, offering multiple possibilities for self-exploration, creativity, and connection, but also self-presentation, constant comparison, and pressure. However, despite the growing insight into these potential consequences of Instagram, a question that thus far has mainly remained unanswered is what makes youths so drawn to this platform and *why* they continue to engage with it despite its ill effects.

1.2 Approaches to the research of motives of Instagram use

Most research concerning why users engage in social networks has drawn on the Uses and Gratifications (U&G) paradigm (Katz et al., 1973; Ruggiero, 2000). This theory asserts that individuals actively select the media they engage with based on the types of gratifications they wish to obtain (Phua et al., 2017). Basic assumptions of the theory are that: (1) media use is goal-directed or motivated, (2) people use media to satisfy their needs and desires, (3) social and psychological factors mediate media use, and (4) media use and interpersonal communication are related (Katz et al., 1973; Kircaburun et al., 2018; Rubin, 1993).

The U&G paradigm is considered a *micro-level* media effects theory because it bases its observations and conclusions on individual media users instead of groups, institutions, systems, or societies at large (Valkenburg et al., 2016). Media use is a mediator between antecedents and consequences of media effects. Therefore, *the user* is the center point in the process, and by shaping their own selective media use, they partly shape their media effects. They also assert that dispositional, developmental, and social context factors influence selective media use (Valkenburg et al., 2016; Valkenburg & Peter, 2013). Dispositional factors include distal and stable factors such as temperament, personality, and gender, as well as more proximal and transient ones such as beliefs, motivations, and moods. Developmental factors are related to age and life experiences. Social context factors include micro, meso, and macro-level influences that encourage or discourage media use. Therefore, media effects are contingent on individual differences resulting from complex cognitive, affective, motivational, developmental, and social processes (Flayelle et al., 2019).

Recently, U&G has been applied to study goal-directed media consumption behavior in computer-mediated communication (Phua et al., 2017). Since SN are considered important tools for satisfying needs and fulfilling gratifications, it makes sense to apply the U&G approach to identify the types of gratifications sought and obtained. According to the literature, the most critical needs that are

satisfied by SN are self-expression, developing and maintaining relationships, information exchange, recreation, following fashion, and affection expression (Kircaburun et al., 2018; Orchard et al., 2014; Papacharisi & Rubin, 2000; Quan-Haase & Young, 2010; Xu et al., 2012). Additionally, specific motivations for Instagram use include entertainment, convenience, appeal, self-expression, interpersonal social interaction, surveillance, documentation/archive, coolness, creativity, escapism, and peeking (Alhabash & Ma, 2017; Huang & Su, 2018; Hwang & Cho, 2018; Lee et al., 2015; Sheldon & Bryant, 2016). However, a weakness of these studies is that they typically measure gratifications by employing questionnaires that borrow items from research on traditional media (e.g., TV, computers, mobile phones, and the Internet), which are not specific to SN or Instagram.

Previous research on the nature of problematic use of Internet and SN has called for specific research to understand the underlying processes, mechanisms of use, and specific effects (Billieux et al., 2015; Fineberg et al., 2018; Flayelle et al., 2019; Kardefelt-Winther et al., 2017). While Instagram continues to evolve, research exploring in depth *why* users engage with it is scarce. To the best of our knowledge, no studies have investigated the specific motives, patterns of use, and consequences of using Instagram from a qualitative stance. Using qualitative methods can help identify motives and gratifications specific to Instagram, understand them profoundly and connect them to the usage patterns and consequences of use. Therefore, the present study aimed to explore what Instagram means for young people, what motivates them to engage in its use, how they use it, and the perceived consequences of use from a qualitative perspective.

2. Methods

This study is based on the naturalistic paradigm (Guba & Lincoln, 1982) and uses a qualitative approach and the *constructivist grounded theory* method (Charmaz, 2014) to address the research objectives. From our point of view, current research on Instagram motives and usage patterns has not yet been able to shed light on how and why users engage with the platform and could benefit from an in-depth analysis of the meanings and interpretations that youths ascribe to their own Instagram use and themselves as users. Our assumptions are the following: (1) Instagram users select the platform actively because it can meet some of their *needs* and provide *gratifications*; (2) Instagram exerts a powerful influence on its users that produces an engagement that can have potentially adverse consequences; (3) image has a central role in generating sought gratifications and frustrations in

Instagram users. In order to understand why and how youths use Instagram, detailed data from a small sample of cases was taken, which enabled analyzing multiple aspects of the topic and its interrelated elements (Camic et al., 2003). Interviews were conducted with a purposeful sample until theoretical saturation of the data was reached, which means that no significant new insights from the data could add meaning to the emergent categories (Charmaz, 2014).

2.1 Participants

Purposeful sampling allows identifying and selecting information-rich cases who are experienced and knowledgeable about the phenomenon of interest (Cresswell & Plano, 2011; Patton, 2002), adding to the transferability of the findings (Guba & Lincoln, 1982). For this study, a *typical case* (Patton, 2002) would be a participant aged above 18, who owns a smartphone, has an Instagram profile, and is actively posting or watching content. The final sample comprised nineteen participants from Belgium ($n = 9$) and Perú ($n = 10$). It was assumed that including participants from countries with very different political, social, and economic backgrounds would enrich the study by portraying differences and commonalities. These countries were chosen for convenience, as the leading researcher is Peruvian but is conducting studies in Belgium and thus could easily access both samples.

Eleven participants were men, and eight were women. Their mean age was 23.16 years ($SD=2.50$). Twelve of them were students, and the rest were young professionals. For ten participants, Instagram was the social network they used the most. Seven of the rest indicated that it was their second most used account. The mean time of Instagram use per day was 103 minutes ($SD=77$), and the participants had used Instagram for a mean of 5.5 years (min=3 years; max=8 years). Ten participants had their profiles in a private mode, while the other nine had a public profile, meaning that anyone could see their content. Eight participants reported having a second Instagram profile. The number of followers varied considerably, with numbers between 119-143000, meaning there was an *influencer* in the sample. The mean number of publications made was 74. More information on the sample can be found in Table 1.

Table 1. Participant's demographics and favorite social networks

Pseudo	C	Age	Sex	Occupation	Favorite SN1	Favorite SN2	Min/day	Years using Insta	Type of account	# of followers	# of followees	# of publications
Nala	P	18	F	Student	Instagram	YouTube	73	5	Private	669	373	88
Sandy	P	23	F	Intern	Whatsapp	Instagram	180	8	Private	266	178	47
Mary	P	24	F	Student	Whatsapp	Twitter	20	7	Public	608	586	26
Vera	P	24	F	Student	Whatsapp	Instagram	60	7	Public	143000	46	103
Diane	P	27	F	Manager	Instagram	Facebook	180	3	Private	411	2190	107
Sergei	P	19	M	Student	Instagram	Whatsapp	240	5	Public	2812	715	27
Gabo	P	20	M	Student	Whatsapp	Instagram	74	5	Private	293	270	14
Manu	P	23	M	Technician	Facebook	Instagram	60	-	Public	265	444	56
Ali	P	25	M	Student	Instagram	YouTube	93	6	Public	666	550	243
Juan	P	28	M	Student	Instagram	Whatsapp	90	3	Public	265	595	7
Lotte	B	21	F	Student	Instagram	Messenger	120	6	Private	542	488	101
Eli	B	22	F	Student	Instagram	Facebook	90	4	Private	289	462	31
Loise	B	23	F	Student	Instagram	Snapchat	300	6	Public	261	357	238
Tami	B	23	F	Student	Messenger	Instagram	120	8	Private	254	255	70
Rina	B	24	F	Student	Instagram	YouTube	133	5	Public	1052	652	89
Jane	B	26	F	Student	Facebook	Instagram	73	6	Private	119	286	48
Tim	B	23	M	Student	YouTube	Instagram	90	7	Private	782	784	29
Andre	B	23	M	Worker	YouTube	9gag	40	-	Private	-	-	-
Francis	B	24	M	Worker	Instagram	YouTube	25	4	Public	156	332	13

2.2 Materials and procedure

The study protocol was approved by the Ethics Committee of the Université catholique de Louvain and the data collection phase was about to start when the COVID-19 pandemic hit. This situation provided an opportunity to include questions regarding using social networks during the pandemic. The results related to these questions have been published elsewhere (Romero et al., submitted).

In order to recruit participants for the study, an advertisement was posted on social networks (Facebook and Instagram), stating the purpose of the study and the voluntary nature of participation. Before coordinating interviews with potential participants, volunteers received a short questionnaire on their use of social networks and Instagram and an informed consent form describing the purpose of the study and guaranteeing the participants' confidentiality, privacy, and anonymity (see appendices A and B). Both had to be returned to the researchers before scheduling the interview. Any questions regarding the study were addressed prior to the start of the interview, and oral and written consent was sought to record the interview.

The interview started by returning to the answers to some of the questionnaire questions to understand them in depth. The rest of the interview would follow, and the probe continued until the interviewer felt enough information had been gathered. The interview format was semi-structured with some basic questions regarding Instagram motives, usage patterns, consequences, and additional questions that could be asked if needed. Some example questions are: *“What comes to your mind when you think about Instagram?”*, *“When do you use Instagram?”*, *“What do you use Instagram for and why?”*, *“Do you usually comment on posts or react to the stories of the accounts you follow? Why? Why not?”*, *“What changes (positive or negative) have occurred in your life since you use Instagram?”* (see Appendix C).

The interviews were held between July and August 2020. Two native-speaking researchers conducted the interviews in the participant's native language (French or Spanish). Both researchers were appropriately trained to conduct interviews and supervised by the leading researcher. Due to the restrictions imposed for the COVID-19 pandemic, all interviews were held online via Zoom or Microsoft Teams and lasted 60-75 minutes. It is important to notice that at the time of the interviews, both countries were at different stages in addressing the pandemic, with

Belgium coming out of the first wave and gradually lifting the lockdown measures while Peru was going through a critical period of the pandemic and remained in lockdown.

2.3 Data Analysis

The recorded interviews were transcribed and uploaded to NVivo20. Data analysis involved rooting categories in the evidence obtained from the data (*grounding categories*) without trying to validate previous theories concerning the subject. It also implied exploring the connections between categories through *sensitive constant comparison*: looking for commonalities and differences between incidents, identifying subcategories, and integrating them into a larger structure to produce major categories (Bryant & Charmaz, 2007). The interviews were first coded by two researchers (SRS and WVB), and thematic analysis was conducted inductively and iteratively. Starting with an *open coding* process to retrieve initial approximate and provisional categories, and after several meetings were held between the researchers, *focused coding* was performed to allow more condensed codes to emerge. Finally, *axial coding* allowed to build a texture of relationships around the category axis, making the links between categories visible (Charmaz, 2014).

To decide on the number of interviews to be held, the principle of saturation was used, with the aim to reach sufficient *conceptual depth*. The latter involves ensuring a sufficient depth of understanding in data collection and analysis that allows theorization based on the findings. Initial coding of the first interviews, which followed shortly after the interviews, allowed to assess whether rich and thick data had been acquired. Further interviewing and coding were then performed, and once it was confirmed that theoretical saturation had been reached for most major themes, interviewing was stopped, and the rest of the interviews collected up to that point were analyzed. Where possible, and only when the participants granted access to the researchers, some of the public Instagram profiles were reviewed (posts, stories, comments) for triangulation purposes, whereby the user profile information was contrasted with their recollections of their use of the platform.

Lastly, it is essential to mention that in naturalistic inquiry, the rigor and trustworthiness of the findings emerging from the data can be assessed by several criteria (Guba & Lincoln, 1982). Peer debriefing meetings were held among researchers to provide *credibility* to the findings, and data were triangulated with the Instagram profiles that researchers could access with the participants'

permission. Concerning *transferability*, purposive sampling and the *thick description* provided in this report will allow the transferring of the results to future studies. Frequent meetings and discussions among the researchers coding the interviews allowed the proper unfolding of emergent categorizations, thus providing some form of *dependability*. Finally, reflexivity and memo keeping ensured some neutrality, which corresponds to the *confirmability* criterion.

3. Results

An overview of the different themes, sub-themes, and categories that emerged from the interviews is given in Table 2.

3.1 Meanings assigned to Instagram

The most common Instagram-related association expressed by the participants is that it is a *showcase*. They portray Instagram as a place where people can put themselves in the limelight and receive attention by showing their passions, interests, individuality, and uniqueness. Also, by carefully crafting the content they post, they feel they can influence the perception and impressions of what others will think and say about them. The degree of crafting and the intention to manage the impressions of others vary but are equally shared by men and women and are more often shown by those who have a public profile and seek to become influencers. There is some acknowledgment that they control the *persona* they want others to see, thus choosing what they want to share and what they want to conceal from the world.

A second meaning is that of *immediacy and urgency*. Participants concede that Instagram is, in a way, ingrained in their behavior and their routines. They feel the urge to share *live* how they feel, what they are doing, where they are, and with who they are. The more exciting, intriguing, different, and unique they perceive an event or experience to be, the more they need to share it immediately, and their phone is always ready to capture it. Participants also expressed that although the content they share has changed due to the COVID-19 pandemic (e.g., pictures of activities at home instead of travel or party pictures), they continue to share or check what others are up to. However, others refrain from publishing something because, in their view, it would not be interesting or engaging enough.

Table 2. Themes, categories, and their description

Themes	Categories	Description where necessary
Meanings assigned to Instagram	A showcase	
	Immediacy and urgency	
Motives of use of Instagram	Superficiality	
	Search for perfection	
	Realness vs fakeness	
	Pursuit for likes	
	Fear of being judged	
	Implicit rules	
	Algorithm	
	Addictive nature	
	Source of inspiration	
	Self-expression	Includes sharing original or other's content that participants find meaningful, expresses who they are, and has to do with essential aspects of their lives, interests, or work. If it is visually beautiful or interesting, it is even better.
	Curiosity	It includes every reference to scrolling through or peeking at other people's (famous or not) stories or posts out of curiosity regarding what they are up to. This could lead to both positive and negative comparisons.
	Documenting	It includes uploading posts or stories to document and store important moments, events, or experiences in their lives that they can come back to afterward to remember them.
	Entertainment	Includes all the references to using Instagram for its variety of content, use for entertainment, fun, and passing the time
	Connection	Includes any references to using Instagram to keep in touch with friends, family, and acquaintances, generate conversation, meet and reach more people, catch up and make plans with them.
	Following trends	Includes references that being on Instagram is imperative because otherwise, they will miss out since everybody is there and people their age use it.
	Coping with emotions	Includes references to using Instagram as a coping mechanism for uncomfortable emotions or situations (e.g., boredom), to vent, reassure yourself, escape reality for a while, and procrastinate some responsibilities.
	Need to be seen	Includes references to using Instagram to be seen, get attention, and feel validated.
	Information	It includes using Instagram to be up to date with events happening globally, news, learning, getting product recommendations, pursuing new interests, and discovering new stuff.

Themes	Categories	Description where necessary
Usage patterns	Professional use	Includes references of using Instagram to have a platform to promote themselves, their work, their art, for entrepreneurship, to become an influencer, etc.
	Impact others	Includes references regarding the possible effect that the content they post might have on others, for example: informing others, doing activism, making people laugh, generating interest in them, inspiring them.
	Urge and craving	It refers to an urge or reflex to enter the platform. This happens typically daily, many times a day, and is accompanied by difficulty controlling the time on the platform.
	Passive Use	Refers to moderate use, in which the user engages in scrolling and watching stories and videos, but they are unlikely to comment or react to other people's content.
	Anxious posting	It refers to a pattern where the person actively uses the platform, consuming and posting content but feeling anxious, vulnerable, exposed, and afraid of being judged.
	Social approval	It refers to a pattern of usage where the user takes time to craft posts and stories using filters, editing, embellishments, etc., in order to get more likes and reactions from their followers. The emphasis is on the aesthetic side of the posts.
Emotions and feelings	Comparison pattern	Usage pattern in which, after consuming or posting content, the participant engages in upward or downward comparison, triggering feelings of relief or envy, depending on the result of the comparison.
	Positive	Includes: happiness, gratification, curiosity, satisfaction, pride, uplift, comfort, excitement, interest, pleasure, recognition, relief, feeling flattered, security, calmness, admiration, empathy.
	Negative	Includes: stress, anger, discomfort, envy, frustration, sadness, boredom, indifference, shame, anxiety, feeling judged, guilt, insecurity, tension, worry, ambivalence, embarrassment, fear, vulnerability, pressure, disappointment, <i>flème</i> , exposure, burden.
Change and consequences	Increased connection to others Instagram-worthy content Time management Compulsive urge to enter the app Constant comparison	

Superficiality was also widely mentioned, especially since the platform relies on images and videos to convey messages. Participants are aware that the content found on Instagram does not always reflect the full picture but reflects the “positive” or “perfect” side of things. This may seem superficial and frivolous to some, but it is seen as inevitable.

It's just that Instagram is sometimes this kind of frivolous place (...). I mean you post your best picture, your best face and so, on that note, sometimes it gets a bit... like... really superficial, and you think “why are we even worrying about these things?”

- Ali, male, 25, Perú

Along with this superficiality is a constant *search for perfection*. Participants recognize Instagram as a social network with a high aesthetic side. Using beauty criteria and personal standards, they select which photos or videos can be posted and how much they will need to edit and filter them to be “*Instagram-worthy*,” which means: consistent, captivating, and engaging. The captions accompanying the photos must also be well crafted, meaningful, aspirational, and perfectly written.

What motivates me to publish is when I find a photo that is aesthetically beautiful, and I say to myself, “ah, I find it beautiful, so I want to share it”. And precisely, what prevents me from publishing is sometimes I say to myself, “oh, that's a nice picture, but I don't find it like, wow” and I don't see the point of publishing it, so I might as well keep it for myself.

- Tami, female, 23, Belgium

You take a picture of your food, and you put music or a sticker in the background that has to do with that food, and it looks super good, or you edit the story, put effects, color, stripes to make it more striking.

- Sergei, male, 19, Perú

The distinction between “*real*” and “*fake*” on Instagram is blurred. To some extent, participants give themselves permission to be selective with what they share and to curate their posts or stories to a certain degree, but there is much criticism for others’ (especially influencers’) lack of authenticity, fakeness, lying to followers by “over-staging” content, or using other’s content as their own.

...also fakeness because there is this wave of all the influencers "here eating my bowl," right? And it's actually a picture taken from Pinterest! So, I think it's very related to when you want to give a positive image. Not necessarily me, because I post anything, right? As I usually complained about my thesis, I'd go "here, I am suffering with my thesis". That is something real. But not everyone uploads real things, so when I think about Instagram, I think about this fakeness.

- Mary, female, 24, Perú

Both Belgian and Peruvian participants acknowledge the pursuit of *likes*. They explain that the effort put into crafting beautiful posts and stories serves to receive reactions from others. Those with a large following seek to get more engagement and likes. Some participants revealed that the number of likes, comments, and reactions and checking who saw their stories is important to them. They act as reinforcers and provide validation and reassurance. There is also the expectation that specific people "like" the content, such as close friends or family.

Well to be honest, it's a little bit the quest for likes, unfortunately. So, you say, "God I hope I'll have more likes, or at least not fewer likes than last time". So, I can't explain why because I'm not at all hoping to be interesting in people's eyes. But yes, when I post, it's true that I tell myself that I hope I'll have some likes. Because I tell myself that "if you don't have any likes, it's a bit of a shame", it means that you're not... It's a super weird feeling because at the same time I'm not at all like that in everyday life, and I don't want to make myself interesting, but it's true that on Instagram, when you post a nice picture, and you like the picture you posted... well, you want people to like your picture.

- Eli, female, 22, Belgium

On the other hand, participants also expressed that Instagram increases their *fear of being judged*. They acknowledge that, like other social networks, posting content opens the possibility of being judged and criticized, and they are particularly sensitive to it. The opinion of others is important, both for men and women in both countries. The fear of being judged may influence the content that is posted (more curated and *likable*), as well as the fear of making spelling mistakes in the posts' descriptions and the care not to post something that might appear too different from who they usually are.

There's always a little stress because I'm not a big fan of spelling, I get stressed and I say to myself, "if I've made a mistake or something in my photo description, everyone will be able to see it". So, I usually keep my descriptions pretty short too.

(...) Also, I'm rather discreet when posting, but there's always a little stress and I ask myself if I will accept entirely what others will think.

- Jane, female, 26, Belgium

Participants also acknowledged the *implicit rules* or “codes of conduct” they follow. An example of such a rule is the *reciprocity* for likes on posts or reactions to stories: if someone likes your content, you must like the other back, and if someone reacts to your story, you must acknowledge that person with a heart. Another example is to *follow back* someone who follows you. Many participants mentioned that they are following people for the simple reason that the others followed them first. For some, it is an act of courtesy; for others, this is related to social norms that are difficult to break.

Everybody follows each other in the student housing, so it's a bit weird not to follow them back, and I think that's why we were following each other. This is ridiculous because we don't appreciate each other, which was quite open. You see, we knew that we didn't appreciate each other. But well, since everyone followed each other and there was a bit of a sheep-like effect, we followed each other, and that was it. Really to stick to the standards, in fact.

- Tami, female, 23, Belgium

The likes and comments also play a role in the Instagram *algorithm*. Participants know that the content they receive on their news feed and the available stories (including ads) is not the same for everyone. They know it is specifically targeted to them based on their interests and the people and profiles they primarily engage with.

I'm not an Instagram engineer, but there's a default algorithm that means that if there's content shown to me, and I like it, they will know it. They'll send me back another one that could potentially interest me too, and they're very good at it because it's well-targeted so I'm going to stay even more. That is their goal because since it is free, they must make money with ads, and the longer I stay, the more ads I get.

- Francis, male, 24, Belgium

Participants also described the *addictive nature* of Instagram. They know they will have difficulty stopping once they access Instagram because new, engaging, inspirational, funny, entertaining, and easy-to-digest content will continue to show up. As stories are only available for 24 hours, there is pressure to post something

and consume the content posted by friends, influencers, and favorite stars. If one does not connect to Instagram daily, one might miss out on something important.

It's true that Instagram, if I don't go one day, the next day I say to myself, "Damn, I missed the stories of the people I follow and adore." And that's something that stirs me up because then they will tell me "Oh, but I already told you about it" (...), and yes, I am moderately addicted to it, to not say not at all. There is a bit of denial, of social desirability because I like this social network a lot. And it is entirely stupid, but I really like this network. There are lots of pictures, there are so many diverse people, you see a lot of stuff from all over the world without having to be friends or publish your private life. We can display whatever we want, while keeping limits.

- Loise, female, 23, Belgium

The last meaning assigned to Instagram is that it is a *source of inspiration*, particularly for *lifestyle* issues such as sports and fitness, cooking recipes, clothing, or decoration. The consumed content allows access to new, innovative, or trendy ideas in different areas of life, and it becomes a goal to live and look like Instagram personalities and influencers.

Lifestyle why? Because that's really what I consume, isn't it? It's a lifestyle. I mean, if you see, for example, the beauty influencers what they sell you is a *lifestyle*¹. Now, I can follow them, but I also follow many professionals from different fields, like, for example, designers, entrepreneurs, chefs (...) Since these people are dedicated to sharing their work and what they do, what they share with you is *their lifestyle*². What they think, what they do, how they do it in their day-to-day life. That creates an idea about them, who they are, and what is good about their lifestyle, and you can adapt it to yours, right? Eh... let's say the content that I see that can be added to my life is of those people I follow.

- Diane, female, 27, Perú

3.2 Motives of use of Instagram

Based on the answers to the interview questions on the different motives for using Instagram, the most frequently mentioned motive was *self-expression*, that is, sharing what is meaningful. Users view Instagram as a means of self-expression, where a picture, usually accompanied by a caption or a text that describes the moment in esthetic, artistic, or poetic terms, captures a special moment that they

¹ This was emphasized vocally by the participant.

² Idem

wish could last forever. Some participants need to share a beautiful picture or a special moment (e.g., a trip, a new restaurant, something they discovered, etc.). On the other hand, they may also have second thoughts and think that the content will not be attractive or interesting enough for others or that the caption will sound cliché. Users want to be unique, original, different and stand out.

You upload something to your stories because you like it, and you want to upload it, and that's it. Nobody will say anything. If people like it, they will react. But when you post something, you intend to show it publicly, it is something that you want to upload, a picture or a video that you really like, and you want others to see it.

- Sergei, 19, male, Peru

As I was saying, I share moments in general where I'm feeling good, when I'm happy and I am living a nice moment and then, voilà, I want to share it. I want to show that I am content, that I am happy with good people. I live a cool moment and voilà!

- Jane, 26, F, Belgium

Another often-mentioned motive is *curiosity*. Most participants mentioned a not-so-healthy curiosity to check what friends, acquaintances, and influencers post or upload to their stories to keep track of what other people are doing and compare to others. Some participants reported feeling better and relieved when they noticed that their friends were posting content inside their homes and doing fewer activities outside due to the COVID-19 pandemic. Some also reported that checking other people's content helped them fight boredom.

The goal here...is the curiosity to see what happens with other people. And in that sense, I sometimes find it a little unhealthy to tell yourself "Oh, I'm happy to go on Instagram to see what X is doing, what Y is doing", and I find it unhealthy because I think it is a little intrusive.

- Eli, female, 22, Belgium

A third recurring motive is *documenting*. Posting stories and posts is a way of documenting one's experiences and creating long-lasting memories that are easy to access and share. Since the posts remain stored in the app, it liberates space on their smartphone, and they are already curated since what is uploaded is what one wants to show or remember. In addition, pictures will not be unintentionally erased

or lost when posted. Although stories are only viewable by others for 24 hours, Instagram has a “stories archive” that users can access.

They must be photos that I like. And I keep them as a memory. Because if the photo is lost, I'm never going to get it again. So, I would like the memory to remain there in the photo, right? In other words, it will not be erased in this application, and my photo will not be lost. So, it is basically that. It stays as a memory.

- Sandy, female, 23, Perú

Another motive is *entertainment*. Participants describe that when they have some time between tasks, they scroll on Instagram to see the content of their interest, such as their favorite artist or influencer, sports, books, food, exercise routines, beauty, fashion, or activism. There is always something on Instagram to watch and consume, and using the content is a fun way to pass the time.

Participants also brought up *connection* as a motive. Instagram helps to reach out to others. For some, it is a means to start a conversation: If a person reacts to a story or comments on a post, it opens the door for a conversation that can provide connection, whether or not it is meaningful. For others, it allows maintaining social connections that otherwise would not be possible (for example, school friends and acquaintances). Some found reassurance that friends and acquaintances were doing well during the pandemic when they saw what they posted or uploaded on their stories. Others could reach out and meet people they would not have met otherwise. For instance, for men, it opened a path for meeting girls.

I usually upload a story to receive specific comments. Hmm, and get reactions... sometimes from a specific person or not. I think the reason I use Instagram is to talk to other people. People who usually I didn't speak to, it was like “hi, how are you? How is it going?” Things like that, right? People not so close to me. I mean, like... more to generate conversations and things like that, with unusual people (...) It does help me contact my friends, right? Know what they are doing, know if they are okay, right? That, more than anything.

- Gabo, male, 20, Perú

Another reason for Instagram use is *following trends*. Having an Instagram account and entering the platform is imperative not to miss out on the latest trends and information and to belong since *everyone* is using it.

Instagram is the new Facebook. That is, it is a new application that almost all people, if not all, are using. Even my mother has Instagram, my uncles have Instagram, so (laughs) it's a good thing that it has become very popular.

- Ali, male, 25, Perú

Half of the participants mentioned that *coping with emotions* was a motive for Instagram use. They acknowledged that using Instagram distracts from uncomfortable emotions such as boredom, sadness, and rage. Some mentioned that they used Instagram to escape reality, as a reassuring mechanism, procrastinate tedious tasks, or vent their emotions.

(...) simply because I'm bored, and I want to check my Instagram, so sometimes you can have fun with the stories that people upload huh... they upload a story with their grandmother, laughing or telling a joke, then you have fun if you have had a bad day, if you wake up a little sad, a little bored, because of this pandemic then you go to Instagram and see a dance video and say "wow, how cool" and it can make your day, right?

- Sergei, male, 19, Perú

Some interviewees also mentioned the *need to be seen*, *information*, *professional use*, and *impact others* as motives for using the platform. The description of these categories can be found in Table 2.

3.3 Patterns of use

Although participants can use Instagram differently depending on their motives, emotional state, available time, or the need to share something, some distinctive patterns of use were noticed. A *pattern of use* is, thus, a repeated or regular way to engage with the platform and what users do with it. The first pattern reported is an *urge and craving* to use Instagram, which is related to the addictive potential of the platform. Participants typically refer to an “urge” to go on Instagram, described as reflexive or performed automatically, such as clicking on the app to scroll mindlessly or check stories. This occurs daily or sometimes many times per day, in between activities, while doing other things that do not require much attention, or when one gets bored. Checking one’s Instagram feed can thus be the first thing done after waking up and the last thing before going to sleep. It is often accompanied by difficulty controlling the time spent on the platform, as shown by staying more than one intended, procrastinating, and not fulfilling responsibilities. Participants who reported this behavior felt burdened but unable to stop it, as it

takes much effort to control or regulate the time spent. They also mentioned losing track of time and wishing they would use Instagram less to enjoy other activities and focus on other tasks.

It's more in the sense that it's addictive, once you start, you want to stay because you think, "ok this is the last publication I'm checking...oh, but the one just below, it looks good, it looks interesting", and so that's how it is. You scroll, and then you look up, and your 10 minutes turned into 30 minutes. And so, it's in that sense that I try to regulate as much as possible because otherwise (...) I could stay there the whole day without any problem.

- Eli, female, 22, Belgium

An opposite pattern, *passive use* of the platform, was also found. Participants who show this pattern do not have the urge to access their account compulsively but access it to check other people's content or to be entertained by watching stories, videos, and scrolling. On the other hand, they do not post or upload stories or share content themselves and are unlikely to comment or react to other people's content. Occasionally, they like a post, so it appears more frequently on their feed, thus using the algorithm instrumentally.

(...) Given the number of years I am on Insta and my publications, I think I have commented something on Instagram maybe once or twice. Yeah, you can say I am a passive consumer (...) I don't give many likes to people's content either, I don't know what it is (...) since I choose the content I want to see, only if I am very interested in something, I will give it a like. (...) Step one is watching; step two is liking, but then posting, commenting, or responding to a story, that's a bigger step.

- Francis, male, 24, Belgium

The third pattern of use emerging from the data is *anxious posting*. Participants who show this pattern use the platform actively and besides consuming content, they interact by posting, sharing content, and uploading stories, but at the same time, they feel anxious about what others' reactions might be. Some are afraid of being judged, others feel vulnerable and exposed, and some are afraid that people will not like their content, which may refrain them from posting. Some participants said they would only post if they had something *interesting* to say, implying that other people's opinions about them are important.

I go: "Oh my God, will people like this post?" It's my personal Instagram so, I'm scared in a way, so I'd rather not know, I turn off the notifications, then I go back

and say: “oh, there are these many likes”, and I am less anxious. I’ve sometimes found myself counting in my head, “there are two likes, three likes, four likes”.

- Ali, male, 25, Peru

I try to tell myself, “It’s more for you than for other people,” but having a like is always nice. I’m not going to tell myself: “Oh my God, there are only three likes on my photo, what a shame” I’d rather think, “here there are three people who like my content” (...) Now that I think about it, I don’t know how I would react to a negative comment, I am quite sensitive at this level, this is also why I don’t often post much, because I don’t want to receive any, even in real life outside of social networks. I don’t know how I’d react. Either I would go over and over it in my head, or I would feel touched in a way.

- Jane, female, 26, Belgium

Another use pattern frequently found among both men and women in both countries is *social approval*. It relates to the *pursuit of likes* and covers behaviors such as crafting beautiful posts and stories, embellishing them, and editing them to get likes and reactions from others. Users who show this pattern feel happy, belonging, connected, and accepted when they receive positive reactions and interact with their followers. However, when social feedback is not received, they feel disappointed.

When I upload stories, I don’t just upload them and share them, and that’s it. I put some time into it, so it looks harmonic because it is a part of myself that I will share. So, I try to make it look not too cold, or else people won’t want to see it or read it. So, I use gifs or filters that help an idea pop up or showcase more of what you are sharing, for example.

- Diane, female, 27, Peru

The last pattern found among the participants in the study is *comparison*, whereby watching other peoples’ content makes one feel better or worse. Users who show this pattern realize that comparing themselves to others can be a disservice but cannot help doing so. There is some awareness that others’ content can be fake or staged, yet there is a desire to develop a particular *lifestyle*, which may vary depending on whom is being followed, like a celebrity, an influencer, or a peer. Sometimes users feel envious or inadequate about themselves and have mixed feelings about their platform use.

Comparing oneself is human (...) If I come across the profile, for example, of a friend here, uh, it is true. I follow many Youtubers on Instagram, and I see a lot of traveling, and sometimes I indeed think to myself, "oh well, how come I don't travel so much?". I have a bit of the same thing sometimes with friends who publish many trips, like, a lot of trips, and I'm like "ah well, how come I don't do so many trips? ". It doesn't necessarily last, but it's true that right now, I'm telling myself: "uh it's a shame I can't do them".

- Tami, female, 23, Belgium

3.4 Feelings and emotions associated with Instagram use

Instagram use triggers a vast array of emotions and feelings. Although both positive and negative emotions were reported (see Table 2 for an overview), it was surprising to hear the participants talk about how exposed, vulnerable, or ashamed they felt when posting content on the platform. This was especially true for participants with a public profile and those who try to become influencers or promote their brand and work.

3.5 Perceived consequences of use

According to the study participants, the most often mentioned consequence of using Instagram was an *increased connection to others*. Instagram users consider the possibility of staying in touch with friends as a positive outcome. Although Instagram is not often used to message – other apps are preferred for that purpose – it allows to stay connected with friends through posted content. Shared content can also reach more people, especially when profiles are public.

A second positive effect of Instagram use is the possibility of *meeting new people* who are alike or appealing and whom one would otherwise not meet.

I think I have opened a little more to others. I met people who shared the same passion as me. And I know that they are people who, uh, won't take me for a crazy person as soon as I talk about a book³. Because I know that when I talk about a book, I know that I can be very excited by the book or even by a bookstore or whatever, and there are often people who don't understand why I'm so excited. So, it's people who understand how I feel and all that stuff. I've found a group where I belong to, and it's nice even if it's on social networks.

- Rina, female, 24, Belgium

³ She shares mainly book reviews through her Instagram account. Specifically, literature directed to youths and teenagers.

This verbatim reveals the need of belongingness as a driver for using the platform. Most participants had specific interests (art, books, music, performance, sports, decorating, fashion, lifestyle, etc.), and Instagram allowed them to communicate those interests to others through posts and stories or by interacting with other people's content, thus opening the possibility to connect, feel accepted, and belong.

Many participants mentioned that the content they post became more "*Instagramable*." This means, for example, that a drink with friends becomes an opportunity to take a picture and post it on Instagram, which is something they were not thinking of before. It also refers to the meticulousness with which photos are taken, the number of pictures taken before one can choose *the suitable one*, or the way one dresses for the photos or stages the photoshoot. Some participants think this is fun and consider it part of their lifestyle, but others find it exhausting, meaningless, and contributing to the aura of fakeness and superficiality surrounding the platform. Yet, some see a positive consequence in the fact that their style has improved.

I feel that Instagram has been more helpful to me in, like, (...) taking care of how I dress and how I look. I feel it's an extremely superficial social network (...) but I feel like it's helped me try to look my best, so to speak, or look good for other people.

- Gabo, male, 20, Perú

In terms of negative consequences of Instagram use, the most often mentioned is the impact on *time management*, more specifically time loss and procrastination. The ubiquitous, readily available, and easy to consume content of Instagram reportedly fosters distraction and the loss of the notion of time.

I'm getting in there all the time, so if I'm feeling a little addicted, then I don't like getting in there all the time to distract myself. I'd like to do something else instead of being on Instagram.

- Nala, female, 18, Perú

Another negative consequence is the *compulsive urge* to access the platform, which manifests itself through (a) an inability to focus on tasks because of the urge to constantly open notifications or check for new content on the app; or (b) interrupting actions in the present to record a story or take an Instagram-worthy picture.

I know that when I get bored, I go back there. Or even when I'm in front of the TV, I go back there very easily. I can't focus on my show, but it depends on the show. But I know that when I'm in front of the TV with my parents in the evening, um, I quickly go back to my phone and spend more time on Instagram whatsoever.

- Rina, female, 24, Belgium

Constant comparison also emerged as a potential consequence, both in a positive and negative sense. On the positive side, there is the reassurance of focusing on one's interests when shared by others, creating a sense of belonging and acceptance. On the negative side, participants also see the detrimental effects of unfavorable comparison, especially when they consider their lives less exciting or perfect than those portrayed by other users. Both male and female users reported a loss of self-esteem when comparing their physical appearance or fitness status to others.

Among the negative, I think that when you post and follow people who post similar content, you can compare yourself a lot. So, it affects me because I feel that comparing to others is harmful.

- Vera, female, 24, Perú

4. Discussion and conclusion

Whereas the popularity, rapid evolution, and potentially harmful consequences of Instagram make the use of the platform a relevant topic for research, few studies have thus far focused on Instagram users' experiences to obtain an in-depth understanding of the motives and usage patterns. This study aimed to address this issue through a qualitative approach.

Drawing on the Uses and Gratifications framework, we assumed that Instagram users would engage with the platform to pursue psychological and social needs and gratifications (Katz et al., 1973; Ruggiero, 2000). Our findings confirm that users are very aware of the gratifications and frustrations they can obtain from Instagram use. Moreover, as expert users, they know *how* to make the most out of the platform. However, some non-conscious involvement seems to be reflected in the verbatims portraying mindlessly scrolling and the urge to enter the platform. As such, it seems like there are two different types of engagement: a purposeful one that U&G can explain, and a non-conscious/automatic one which is out of the users' control and can be explained by the way the platform has been designed to

produce engagement (e.g., infinite feeds, rewards through likes, intermittent variable rewards, among others. For a review see Harris, 2016).

Regarding the *motives* to use Instagram, social interaction has been regarded in the literature as the most powerful reason for using SN (Brandtzæg & Heim, 2009), suggesting that Instagram users primarily use the platform to maintain relationships (Hwang & Cho, 2018; Lee et al., 2015). However, in our study, self-expression was the primary motivation to use Instagram, while *connection* emerged only as a fifth most important motive, after *curiosity*, *documenting* and *entertainment*. This is an interesting finding as it highlights that individual motives come before social needs. It confirms previous findings that SN offer endless opportunities for *self-presentation* and that Instagram users obtain gratifications from them (Abbott et al., 2013; Kim & Lee, 2011). By using Instagram, they can expand their identity and show their continuous real-time evolution, their own perceived unique creative skills, and talents, and who they are as individuals, in other words, their uniqueness (Davies, 2020). Overall, the motives found are similar to those reported in the literature (Alhabash & Ma, 2017; Huang & Su, 2018; Lee et al., 2015; Sheldon & Bryant, 2016), yet they emerged with different degrees of importance and have been structured and defined in more detail in this study. For example, *curiosity* and *information* are two separate motives, and a unique motive for *professional use*, including self-promotion, entrepreneurship, and becoming influencers, was found.

Regarding the *patterns of Instagram use*, our study results suggest that these are not necessarily mutually exclusive, i.e., the same person can exhibit more than one pattern depending on his or her motives, the gratifications sought, and other individual and social factors. Interestingly, the first pattern to emerge was the *urge and craving* one, which shares similarities to what has been described in the literature on behavioral addictions, IA, PIU, and problematic use of social media: an urge and a reflex to enter the platform many times a day, accompanied with difficulty controlling the time spent on the platform (D'Hondt et al., 2015; Fineberg et al., 2018; Schimmenti et al., 2021; Spada, 2014). This is worrying as it appears to be widely present and seems to be the norm rather than the exception. Another pattern that had not emerged in previous literature as a pattern but rather as distinctive of specific individuals is *passive use*, in which the user engages in scrolling and watching other people's content but refrains from posting and interacting (Trifiro & Gerson, 2019; Valkenburg et al., 2022). We believe this pattern can be shown by every Instagram user and is likely to be activated depending on the emotional state, the level of consciousness of the behavior, and

the gratification sought. Finally, three distinctive new patterns were found: *anxious posting*, *social approval*, and *comparison*. These three patterns highlight the actions executed on Instagram (creating a post, editing, consuming content) and their immediate consequences, such as feelings of vulnerability, fear of being judged, waiting for likes and reactions, and engaging in comparison. It is important to continue investigating these distinctive patterns and their relationships to well-being outcomes.

The *consequences* of Instagram use found in this study partially confirm those that have already been reported previously, such as time management issues, urge, and constant comparison (Foroughi et al., 2021; Sherlock & Wagstaff, 2018; Van Den Eijnden et al., 2018). A unique finding is that users portray seeking material to post on Instagram as a consequence, and they have incorporated specific words in their language for content that is worth showing on Instagram (i.e., “*Instagram-worthy*” or “*Instagramable*”), while this was something that they were not engaging with before starting to use it. It seems that they are looking for more opportunities to engage in self-presentation through “*Instagramable*” content, reinforcing the idea that *self-branding* is highly important to them (Davies, 2020). Another consequence of Instagram use emerging from our study is the degree of *social comparison* that is experienced. The content to which participants are exposed serves as feedback on who they are and are expected to be. As the literature shows, there are two types of social comparison: upward, which occurs when comparing oneself to superior others who have positive characteristics; and downward, which occurs when comparing oneself with inferior others who have negative characteristics (Vogel et al., 2014; Wills, 1981, Wood, 1989). Although the youths who participated in our study compare themselves in both directions, the result is usually negative with upward comparison. When comparing themselves to others, they feel inadequate, not good enough, or hopeless because their lives will not be as perfect as those portrayed on Instagram, which confirms previous findings that people consider that others have happier and more successful lives than themselves (Chou & Edge, 2012). It will be imperative to continue understanding *comparison* both as a usage pattern and as a consequence and continue looking for avenues to break the comparison cycle on SN, which has proven detrimental to well-being (Faelens et al., 2021).

These findings emphasize a need for self-expression and for knowing how one is perceived by others, while highlighting the importance that is placed on others’ opinions. This leads to creating and sharing curated, engaging content that reflects one’s identity and uniqueness. These aspects are intrinsically related to pressure

and questions about the *self*, *identity*, *authenticity*, *self-presentation*, *self-disclosure*, and *self-consciousness*. The interviews revealed tensions among users between who they are online and offline, who they are and who they want to be, what they should or should not portray about themselves, how they should and should not behave on Instagram, what is or is not expected of them, and how they incorporate what they see on Instagram in their own lives. Previous literature on the subject points toward a feedback model where people's reactions (influence metrics) to the presented self will influence future-self-presentation (Fullwood, 2019) and will have an impact on offline behavior (Brown, 2014; Chester & Bretherton, 2007). The youths in our sample seem to be mimicking some of the influencers' behaviors by emphasizing the need for individuality, uniqueness, aesthetics, charisma, sharing what they think can be of value, and showcasing themselves. Moreover, given their connectedness as digital natives, they are very sensitive to their peers. As such, their self-identity, and in turn, their self-branding, are constructed through what they share, what their friends share, and how other people respond to it (Boyd, 2014; Davies, 2020). Accordingly, they may be tempted to construct a false self-presentation to gain the approval of their peers and reject aspects of their true self that do not meet the demands of their audience (Davies, 2020). As Attrill-Smith (2019) points out, the self is malleable and adaptable, and over time the core self will change; thus, whichever *self* these youths present online could have positive and negative consequences offline.

Another interesting finding is the dual nature of the beliefs regarding Instagram, the motives, the usage patterns, the emotions they report experiencing, and the perceived consequences. They portray both positive and negative experiences with the platform. While a post might reflect creativity and self-expression, there is also the fear of being judged and the feeling of being vulnerable and exposed after posting. While curating a story and filtering it can make a participant doubt their authenticity and question if they are being too fake and what others would think of them, at the same time, the likes, comments, and positive feedback make them feel special. This poses several implications for future research on these topics: (1) motivations and sought gratifications are complex, vary within the same person, and can change constantly; (2) the overall experience in a SN such as Instagram is varied, comprehensive, and not purely positive or negative; (3) there is unresolved dissonance in the beliefs and criticism they hold towards Instagram and their engagement with the platform. A recent study found that *affect experiences* with SN could be organized across four functional dimensions: *relational interactions*, *self-expression*, *exploration*, and *browsing*. All of them had their positive and negative aspects. For example, relational interactions contributed to closeness and

disconnection, self-expression facilitated affirmation and concern about judgment, exploration could lead to inspiration and distress, and browsing could lead to entertainment/admiration, boredom, and envy. These findings indicate that social media is not either positive or negative for specific individuals, but rather *positive and negative affect are distinct dimensions*, called *the see-saw* of social media (Weinstein, 2018). Our findings, although gathered from a sample of emerging adults, share similarities. However, we find dual expressions not only in terms of affect but also across beliefs, motivations, usage, and consequences. Finally, regarding dissonance, one possible explanation is that youths prefer to stay on the platform and keep using it out of *fear of missing out* (Beyens et al., 2016; Weinstein, 2018) and because the needs for acceptance and belongingness (sought gratifications) are higher/more important than the potential costs to their mental health resulting from using the platform.

Despite the heterogeneous group of participants in this study in terms of cultural background, gender, and age (some are considered Millennials, and some are GenZs), there were many similarities in the motivations, usage patterns, feelings, and perceived consequences of use. The only palpable differences relate to the content created, posted, and consumed, reflecting each participant's interests and individualities. The sample for this study was composed of students and young workers who are also dancers, artists, entrepreneurs, and aspiring influencers (in fashion, sports, and book analysis). This was a recurring question in our analysis: why are there so many similarities if the literature points toward assessing and understanding cultural differences? There are two possible explanations for this. One is that regardless of the content seen or generated, which is very personalized and specific to each user, the core motivations and gratifications are the same for everyone, and Instagram is appealing to everyone in the same way because it targets fundamental human needs such as the need for attention, recognition, the need to be seen, the need to belong, etc. (Yau & Reich, 2017). The other is that social media has removed geographical and cultural barriers, and ideas, practices, and entertainment are globally accessible, become viral and increase the pace and intensity of communication and feedback (Davies, 2020), which may mean that youths are experiencing Instagram fundamentally in the same way.

Taken together, these results highlight that while other platforms, such as Facebook, are optimized for social connection, Instagram is optimized for self-presentation (Kim & Kim, 2018), building social capital, and storytelling, which are aspects of the self rather than of relationships with others. It would be interesting to explore how the content produced affects the self and others when

producing it. This phenomenon is called the *expression effect* and occurs when a sender internalizes the behaviors or beliefs they show or disclose, so their self-concept or behavior changes (Vlakenburg & Taylor, 2017). Also, further investigation is required on how this curated representation of the self and the use of Instagram translates into real life (Davies, 2021). Previous research suggests that users' online experiences can mirror their offline strengths and struggles (Geroge & Odgers, 2015). Are these youths taking their *real selves* to the online world, are their *online selves* on Instagram shaping the way they are and behave in real life, or both? The distance between them needs to be further researched through the concept of *authenticity*: what could be a healthy use of the platform where youths share what they feel comfortable sharing authentically?

Interview studies are important because they give Instagram users a voice and focus on their experiences, but they also have limitations. One interview might not have been enough to reveal the full range of experiences that participants have with the platform. Additionally, interviews count on the participants' ability to recall and report their experiences which might not be available or be concealed due to social desirability; thus, other underlying or unconscious motives are left out. Future studies could consider ethnographic designs or further triangulation, including full access to the interviewees' Instagram profiles to reveal other motives. Another limitation was that due to the pandemic and the voluntary nature of the participation, it was not possible to contact the participants for a follow-up interview which would have helped increase the credibility of our findings. Finally, the last limitation concerns the sampling strategy. Although the cases interviewed consisted of typical Instagram users, paying attention to other influences that shape the motivations, sought gratifications, and usage patterns is essential. The sample was composed of educated youths, so it would be necessary to include diverse individuals who could be experiencing Instagram differently. Social factors (exclusion, violence, being part of minorities), developmental factors (contextual age), individual factors (individuals with specific personality characteristics), and context-related factors can also affect how youths select and use media according to U&G and thus, should be investigated further.

To conclude, a unique finding of our study is that beliefs about Instagram, motivations to use it, and usage patterns are complex and unique to each individual and can produce positive and negative emotional experiences and consequences. Although motivations found are similar to those from other studies, five unique usage patterns emerged that should be further investigated. Instagram will continue to evolve and develop exciting and engaging features targeting youth, and they will

continue to use it for self-presentation and building social capital. However, more attention should be paid to the potential harm to the self and identity derived from usage patterns that produce more frustrations and negative emotional experiences than gratifications. Research that considers the multiple changes that the individual experiences with Instagram over time and how emotional experiences and motivations shape the use of the platform should be encouraged. Although individuals engage with multiple platforms simultaneously, understanding their unique contributions to the well-being of youth remains essential.

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Chapter 4. Development, psychometric validation, and cross-cultural comparison of the “Instagram Motives Questionnaire” (IMQ) and the “Instagram Uses and Patterns Questionnaire” (IUPQ)

Abstract

Social network use is widespread, and the study of Instagram seems to have captured more attention in recent years. However, scale development and validation in the field has fallen short of providing sound scales of Instagram motives and usage patterns that consider the uniqueness of Instagram-related behavior. This paper describes the development, psychometric and cross-cultural validation of two new measurement instruments: the “*Instagram Motives Questionnaire*” (IMQ) and the “*Instagram Uses and Patterns Questionnaire*” (IUPQ). A preliminary set of items was developed for each questionnaire based on a previous qualitative interview study on Instagram motives, uses, and consequences. In a first study, the questionnaires were distributed to a sample of 312 participants aged 18-35 years ($M=23.81$; $SD=4.49$), and an exploratory factor analysis was performed. A parsimonious and interpretable 6-factor solution that displayed adequate factor loadings and adequate Omega coefficients for both instruments were found. In a second study, the two instruments and other measures of known social network usage correlates and mental health consequences were administered online to 1418 English-speaking participants aged 18-34 years ($M=21.35$; $SD=3.89$). Both scales showed good psychometric properties and the factor structure identified in study 1 was reproduced through confirmatory factor analysis. Omega reliability coefficients were adequate. Finally, when performing multi-group CFA along with a French ($n=1826$) and a Spanish ($n=3040$) sample, language and gender invariance were supported. Correlations with other relevant measures indicate good convergent validity of both scales. The present research provides psychometrically sound instruments for further investigations on Instagram use behaviors.

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1. Introduction

Social networking sites (SNS) have been gaining popularity over the years. This popularity has grown exponentially during the COVID-19 pandemic, with at least 1.3 million users joining networks in the year 2020 globally (Kemp, 2021). As social distancing measures and quarantines to prevent the spread of the pandemic drastically limited in-person interaction, the use of SNS allowed people, especially youths, to maintain contact with others (Ellis et al., 2020; Pandya & Lodha, 2021). Yet while SNS have been welcomed as a good alternative for traditional social contacts, their usage might become excessive and associated to negative outcomes. Several studies have linked intensive use of SNS to lower well-being and poorer mental health, and some evidence exists of a relationship between SNS use and depression, anxiety, and stress (Faelens et al. 2021; Huang, 2017; Keles et al., 2020; Yoon et al., 2019). Importantly, recent research also cautions to not over-interpret the (often relatively small) relationships found between self-reported SNS use and well-being (Orben et al., 2022; Satchell et al., 2021), and suggests to also consider other variables to account for these links (Aalbers et al., 2019). In particular, it has recently been suggested that the assessment of SNS use needs to be improved from a psychometric perspective (Cataldo et al., 2022; Satchell et al., 2021).

One of the SNS that attracted attention of researchers and clinicians in the last years is Instagram, which is a photo-sharing application and a social network platform that relies uniquely on visuals and image-based content. Currently, it has 1.2 billion active users worldwide, and data from October 2021 reveal that it is the fourth most popular social platform behind Facebook, YouTube, and Whatsapp (Chaffey, 2021; Statista, 2021a). It is particularly popular among younger people, with 63% of its users aged between 18 and 34 years (Statista, 2021b). Consequently, the literature that examines the potential negative effects of Instagram use has been growing steadily. For instance, intensive Instagram use has been linked with social comparison processes, fear of missing out (FoMO), low self-esteem, or feelings of loneliness (Barry et al., 2019; Faelens et al., 2020; Kircaburun & Griffiths, 2018; Mackson et al., 2019; Ponnusamy et al., 2020; Schmuck et al., 2019; Sherlock & Wagstaff, 2019; Yang, 2016; Yurdagül et al., 2019). Recent reviews also found strong evidence for the relationship between Instagram use, negative body image, low self-esteem, and disordered eating (Faelens et al., 2021; Ryding & Kuss, 2020)

One classical explanation that has been used to account for the negative mental health effects of SNS use is the “addictive potential” of technology-mediated behaviors (Alter, 2017; Center for Humane Technology, 2021; Kuss & Griffiths, 2017). This approach typically assumes that symptoms such as loss of control over SNS use or withdrawal-like symptoms (in case of deprivation) reflect a genuine addictive disorder (Andreassen, 2015). This practice, however, has been criticized for merely recycling substance abuse criteria and applying them to SNS use, thus essentially focusing on the potential similarities with addictive disorders and ignoring the unique features of the behavior investigated (Billieux et al., 2015a; Kardefelt-Winther et al., 2017; Starcevic, 2016). Moreover, recent research suggests that several of the criteria that are borrowed from substance use disorders (e.g., tolerance-like phenomena), when applied to online behaviors, fail to distinguish high – but healthy – involvement from problematic use, thus pathologizing normal behavior (Billieux et al., 2019; Castro-Calvo et al., 2021; Cataldo et al., 2022; Flayelle et al., 2022; Satchell et al., 2021). To understand the impact of internet-related behaviors on mental health, these behaviors need to be investigated separately, and their unique features recognized. For instance, Instagram engagement depends on the users’ underlying motives, which define the ways in which the platform is used. Since Instagram has specific functionalities, the effects on the well-being of users may be influenced by specific psychological factors, such as self-comparison, fear of missing out or enhanced self-consciousness. As these factors can differ from those of other SNS (Baker & Algorta, 2016; Faelens et al., 2021), more research is needed to shed light on whether the results of previous research on the mental health impact of other SNS can be extended to Instagram.

The importance of examining individual motives for media use for understanding their potential effects has been recognized by media psychology for a long time. One of the predominant theories of this field is the Uses and Gratifications Theory (U&G; Katz et al., 1973; Rubin, 2009; Ruggiero, 2000). This theory asserts that media use is goal-directed or motivated and mediated by social and psychological factors, that people use media to satisfy their personal needs or desires, and that media use is related to interpersonal communication (Katz et al., 1973; Kircaburun et al., 2018; Rubin, 1993). In the past fifteen years, U&G has been applied to study media consumption behavior in the context of computer-mediated communication (Phua, et al., 2017; Sheldon & Bryant, 2016), resulting in the addition of new types of gratifications to the list of reasons why people use social media. Some of these needs include self-expression, developing and maintaining relationships,

information exchange, recreation, following fashion and trends, expression of affection, personal identity, convenience, opinion expression, and surveillance (Kircaburun et al., 2018; Orchard et al., 2014; Quan-Haase & Young, 2010; Sheldon & Bryant, 2016; Xu et al., 2012). For Instagram in particular, motivations such as entertainment, convenience, self-expression, appeal, interpersonal/social interaction, surveillance, documentation/archiving, coolness, creativity, escapism, and peeking have been identified as important (Alhabash & Ma, 2017; Huang & Su, 2018; Lee et al., 2015; Sheldon & Bryant, 2016).

In the past years, several assessment instruments have been used to conceptualize and assess the motives that underly Instagram use. Based on existing measures of Internet use, SNS use, and blogging, Lee et al. (2015) developed a 28-item scale that measured five motives for Instagram use: social interaction, archiving, self-expression, escapism, and peeking. Sheldon and Bryant (2016) relied on focus group discussions to develop a 20-item scale measuring four distinct motives: surveillance, documentation, coolness, and creativity. Subsequently, subsets of items extracted from this initial version were used along with new ones and subjected to exploratory factor analysis, which led to different instruments (Sheldon et al., 2017; Sheldon & Newman, 2019). Other scholars used motivational scales that had been developed for assessing other social networks (e.g., Alhabash & Ma, 2017) or that had been derived from previous research (e.g., Huang & Su, 2018). While building on concepts or measures developed for other platforms may seem advantageous, these approaches may neglect the unique features of Instagram use (see Cataldo et al., 2022, for a critical approach). As such, there is a need to develop and validate new measurement instruments that assess the unique motivational factors involved in using this specific SNS.

Similarly, with regard to the use of Instagram, research practices also vary significantly across studies. A review by Faelens et al. (2021) revealed that typical measures of Instagram usage include one or two of the following indicators: membership (yes/no), profile characteristics (e.g., number of posts, followers, and followees), frequency and intensity of use (e.g., the number of hours per day spent on Instagram), type of use (e.g., browsing, posting, interacting, liking, selfie taking-behavior), and type of content to which one is exposed. To measure Instagram (over)involvement, some researchers have used questionnaires that were designed to measure Facebook use intensity, Facebook addiction, or Internet addiction (see Cataldo et al., 2022 for a review), such as the Instagram Addiction Scale (Kirkaburun & Griffiths, 2018), which was developed by modifying Young's Internet Addiction Test (1998) by changing the word "Internet" with "Instagram"

for all items, or the Instagram Intensity Scale (Stapleton et al., 2017; Teo & Collinson, 2019), developed from the Facebook Intensity scale (Ellison et al., 2007). Given the specific functionalities of Instagram, and the conceptual problems of using the addiction framework to assess involvement in online behaviors (Flayelle et al., 2022; Satchell et al., 2021), this approach is not the most suited to assess Instagram usage.

In light of this, research on Instagram use would benefit from having valid and reliable measures of specific Instagram motives and usage patterns that can be used consistently across studies and different cultures. To that effect, the present study aimed to develop and validate two scales, one measuring the motives of Instagram use (Instagram Motives Questionnaire – IMQ), and one measuring Instagram usage and engagement patterns (Instagram Uses and Patterns Questionnaire – IUPQ). Both scales were developed following a qualitative inquiry into the motives, usage and consequences of Instagram use among emerging adults (see Romero et al., 2022). Similar approaches have been successfully implemented to develop scales for emerging online problematic behaviors (e.g., binge-watching, see Flayelle et al., 2019; 2020). Two separate studies were conducted. Study 1 describes the development of the scales and the pilot testing of the items, based on exploratory factor analysis conducted in an English-speaking sample. Study 2 further investigates the psychometric properties of the scales by conducting confirmatory factor analysis and exploring measurement invariance in different cultures and across gender in three different language-based samples (English, Spanish and French). In this study, construct validity was also established by analyzing the relationships of the scale scores with established correlates of social network use behavior.

2. Study 1

2.1 Methods

Scale development

A preliminary set of items was developed, drawing on the results from a qualitative study in which participants were interviewed in-depth about their motivations and current Instagram use (Romero et al., 2022). The following motives for Instagram use were extracted from that inquiry: self-expression, curiosity, documenting, entertainment, connection, following trends, coping with emotions, need to be seen, information, professional use, and impact on others. In addition, the following distinctive but inter-related usage patterns were identified: urge and

craving, passive use, anxious posting, social approval, and social comparison. Based on those categories, items reflecting those complex motives and usage patterns were written and thus, two distinct provisional scales were developed to include these dimensions, incorporating the wording that Instagrammers use: the *Instagram Motives Questionnaire* (IMQ), consisting of 53 initial items, and the *Instagram Uses and Patterns Questionnaire* (IUPQ), consisting of 55 initial items. These items reflected all the above-mentioned motives and patterns. Both scales have a 5-point Likert-style response format (IMQ: does not describe me at all – describes me extremely well; IUPQ: never – always). The items were formulated in English and reviewed by four qualified psychologists. The item wording was improved after receiving suggestions, and then a pilot test was conducted with 15 participants. Further minimal improvements were made before the final study was launched.

Procedure

After receiving approval from the IPSY Ethics Committee of the Université catholique de Louvain, both preliminary questionnaires were administered using the *Qualtrics* software. Data collection was conducted online in April 2021 via Prolific Academic allowing for an equal representation of men and women, since men are usually underrepresented in online survey samples. Prior to being invited to complete the survey, participants were asked to state their agreement to take part in the study via an online Informed Consent form. Next, they were presented with a short demographic questionnaire and questions regarding their use of Instagram and other social networks (see Appendix D), followed by the two provisional Instagram questionnaires. A small compensation of €1.40 was given to the participants who finished the survey.

Participants

To be invited to participate in the study, participants had to meet the following criteria: (a) being aged 18-35, (b) having an Instagram profile, (c) having completed high school, and (d) being fluent in English. The inclusion criteria were intentionally broad since the study was exploratory. The sample was composed of 312 participants (50% men, 49% women, 1% non-binary gender). Their mean age was 23.81 years ($SD = 4.49$). Further demographic and Instagram use information can be found in Table 1.

Table 1. Sociodemographic and Instagram use characteristics in the different samples

	Study 1 (<i>n</i> =312)	Study 2 (<i>n</i> =6284)	English sample (<i>n</i> =1418)	French sample (<i>n</i> =1826)	Spanish sample (<i>n</i> =3040)
Age in years, M(SD)	23.81(4.49)	23.03(4.63)	21.35(3.89)	25.08(4.29)	22.59(4.71)
Range	18-35	18-34	18-34	18-34	18-34
Gender <i>n</i> (%)					
Men	156(50)	1521(24.2)	350(24.7)	154(8.4)	1017(33.5)
Women	153(49)	4675(74.4)	1046(73.8)	1654(90.6)	1975(65)
Third gender	3(1)	88(1.4)	22(1.5)	18(1)	48(1.6)
Education level (%)					
High school	21.8	5.1	13	5.8	1
Technical	9.6	6.1	0.8	10.1	6.2
Undergraduate	36.9	67.7	70.4	44.9	80.3
Graduate	31.7	21	15.8	39.2	12.5
Social Networks used other than Instagram (% Yes)					
Facebook	72.1	77.8	76.2	83	75.4
Messenger	64.1	58.4	63	83.5	41.2
Snapchat	28.5	39.9	76.2	62.6	9.4
TikTok	35.9	48	65.4	30	50.6
WhatsApp	69.9	80.9	44.4	80.9	98
Twitter	41.7	41.1	44.9	26.5	48
YouTube	89.1	81.4	81	78.5	83.3
Others	14.4	8	6.8	6.3	9.6
Instagram profile status (%)					
Public	42.9	37.9	40.4	30.1	41.5
Private	57.1	62.1	59.6	69.6	58.5
Years using Instagram (%)					
Less than a year	2.6	0.6	0.5	0.5	0.8
1-2 years	9.6	10.7	4.4	11.5	13.2
2-5 years	37.8	38.6	28.6	29.1	25.3
More than 5 years	50	50.1	66.5	58.9	60.7
Number of profiles (%)					
One	59.9	61.1	55.1	67.6	60.1
More than one	40.1	38.8	44.9	32.4	39.9
Use per day in mins. M(SD)	65.1(56-55)	82.30(72.31)	68.78(68.48)	25.09(4.29)	22.58(4.75)
Range	0-360	0-960	0-960	0-600	0-720
Use for business/self-promotion					
No	77.4	79.2	80.8	82.2	76.6
Yes	22.6	20.8	19.2	17.8	23.4
Time spent since COVID-19 (%)					
Decreased	12.2	8.2	16.2	3.6	7.2
Increased	58	71.3	64.7	70.2	75.1
No change	29.8	20.5	19.1	26.2	17.7

Data analysis

In this study, both IBM SPSS Statistics 24 (IBM Corp, 2015) and RStudio (R Development Core Team, 2013) were used to perform the statistical analyses.

First, descriptive statistics regarding the demographic variables and social networks and Instagram use were conducted. Data were then inspected for missing values and outliers, both univariate and multivariate, by examining box plots and running Kolmogorov-Smirnov tests (Massey, 1951) and Mardia's (1970) test for multivariate normality. The statistical assumptions for performing an exploratory factor analysis (EFA) were checked using the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy (Kaiser, 1970, 1974) and Bartlett's test of sphericity (1951, 1954). As recommended, KMO was considered acceptable if above .70, and Bartlett's test when significant at $p < 0.05$. Each scale's factor structure was examined through exploratory factor analysis (EFA) using the procedures recommended by Fabrigar et al. (1999), Howard (2016), and by Costello and Osborne (2005). The number of factors to retain was determined by performing a parallel analysis (Horn, 1965). Competing solutions with different extraction and rotation methods were executed based on parallel and normality analysis results.

Given the limitations of Cronbach's alpha coefficient as an estimator of reliability (Kelley & Preacher, 2012; Raykov, 1997a, 1997b; Revelle & Zinbarg, 2009; Viladrich et al., 2017) on account of its reliance on assumptions that are hardly ever met in practice, especially tau-equivalence and multivariate normality (Dunn, Baguley & Brunsden, 2014), reliability was calculated using the *Omega coefficient* (McDonald, 1999). To calculate the Omega coefficient and its 95% confidence intervals, we used the MBESS version 4.8 package on R (Kelley, 2020), as suggested by Dunn et al. (2014).

2.2 Results

No missing values were found, nor were there univariate or multivariate outliers. All K-S tests were significant ($p < 0.05$), thus violating the univariate normality assumption. Mardia's (1970) multivariate skewness and kurtosis tests rejected the null hypothesis ($p < 0.05$), suggesting that the data from both the IMQ and the IUPQ did not follow a normal distribution. Consequently, the Principal Axis Factoring (PAF) method, which does not make assumptions on the normality of the data, was used for factor extraction. Moreover, Oblimin oblique rotation was chosen as it was not assumed that the motives or the patterns of use would be orthogonal.

Instagram Motives Questionnaire (IMQ)

For the IMQ, the KMO test was .91, which is well above the recommended value of .70. Bartlett's test was significant ($\chi^2 = 6287.35$, $df=496$, $p<0.01$), suggesting that the data were suitable for factor analysis. Parallel analysis performed in R and the scree plot suggested retaining either 6 or 7 factors. Therefore, two different solutions were computed. Following the suggestion of Howard (2016), items with low communalities ($< .30$), with cross-loadings, or with low factor loadings ($< .40$) were dropped, leading to eliminating 22 items. The final IMQ solution, which was both parsimonious and interpretable, was thus composed of 32 items. The six factors together explained 59.51% of the variance.

The item descriptive statistics, factor loadings and communalities can be found in the Supplementary material (Appendix E in this thesis, Tables S1 and S2).

Factor 1 was labeled *Social Impact Seeking*. It includes nine items that capture the person's motivation to use Instagram to promote themselves, show their skills and creativity and make an impact by inspiring people through their content. This factor explained 32.98% of the variance, and factor loadings were between .59 and .81. The Omega coefficient was .93 [CI (.91, .94)] and item-test correlations varied between .62 and .82.

Factor 2, *Emotional Escape*, explained 10.92% of the variance and consists of seven items with factor loadings between .55 and .73. It concerns the use of Instagram as an escape mechanism for dealing with uncomfortable emotions such as boredom, stress, anxiety, and passing the time between activities doing something interesting. In terms of reliability, the Omega coefficient was .84 with a 95% CI [.82, .87] and item-test correlations varied between .53 and .68.

Factor 3, *Souvenir Keeping*, explained 5.51% of the variance and has four items with factor loadings that ranged between .72 and .90. It captures the use of Instagram as a gallery or tool to keep a visual record of important moments. The reliability of this factor was .89 with a 95% CI [.87, .91], and the item-test correlations varied between .72 and .82.

Factor 4, *Social Connection*, explained 3.90% of the variance and contains four items with factor loadings varying between .66 and .78, capturing the motive to develop, maintain or reactivate relationships with others. The omega reliability value was .84 with a 95% CI [.80, .87] and item-test correlations varied between .61 and .70.

Factor 5, *Attention Seeking*, explained 3.39% of the variance and contains four items measuring the user's need for attention and validation from others via Instagram. The factor loadings ranged between .46 and .64. The omega coefficient is .87 with a 95% CI [.84, .89] with item-test correlations ranging between .64-.78.

Finally, factor 6, named *Information Seeking*, explained 2.80% of the variance and consists of four items with factor loadings between .46 and .74, dealing with the use of Instagram to stay up to date, keep an eye on what the contacts are doing and what is happening in the world. The reliability value was sufficient (.79) with a 95% CI [.74, .83], and item-test correlations varied between .55 and .69.

The correlations among the six factors were positive, moderate to high, and significant ($p < 0.01$), with the highest correlation being noted between Social Impact Seeking and Attention Seeking ($r_s = .682$), Social Impact Seeking and Souvenir Keeping ($r_s = .567$), and Souvenir Keeping and Attention Seeking ($r_s = .538$). The correlations can be found in Table S3.

Instagram Patterns of Use Questionnaire (IUPQ)

For the IUPQ, both the KMO test (.93) and Bartlett's test ($\chi^2 = 7166.65$, $df = 666$, $p < 0.01$) indicated that it was possible to proceed with the EFA. As the parallel analyses performed in R and the scree plot suggested that 5 or 6 factors could be retained, two different solutions were tested. After eliminating the items with either low communalities, cross-loadings, or low factor loadings ($< .40$), 37 items remained with a clear 6-factor structure that explained 56,36% of the variance. In total, 18 items were eliminated. The descriptive statistics for each item are presented in Table S4. The factor loadings and the communalities for the IUPQ are provided in Table S5.

Factor 1, which explained 33.97% of the variance, is named *Loss of Control*. It consists of eleven items that measure behaviors such as the urge to open Instagram, losing track of time when engaged in the behavior, wishing that the time spent on Instagram was better controlled, etc. Their factor loadings varied between .50 and .83. The reliability value was high (.93) with a 95% CI [.91, .94], and item-test correlations varied between .69 and .82.

The second factor, *Anxious Posting*, explained 8.32% of the variance and comprises five items that refer to the experience of feeling vulnerable, insecure, and afraid of being judged when posting or sharing something on Instagram. Their factor loadings varied between .61 and .69. In terms of reliability, the Omega

coefficient was .91 with a 95% CI [.90, .93], and item-test correlations varied between .74 and .83.

The third factor, *Passive Use*, explained 5.98% of the variance and comprises four items that refer to less interactive use of Instagram. Participants with high scores on this factor might check posts and stories but do not post, react, like or comment themselves often. They are spectators more than active users. The factor loadings varied between .45 and .74. The Omega coefficient was .68 with a 95% CI [.64, .72], and item-test correlations varied between .39 and .57.

The fourth factor, named *Social Approval*, explained 3.86% of the variance and comprises six items that evidence the behavior of editing and crafting posts or stories on Instagram and the positive feelings that participants experience when they receive reactions, comments, and likes. The factor loadings vary between .40 and .79. The Omega coefficient was .84 with a 95% CI [.81, .87], and the item-test correlations varied between .62 and .74.

Factor 5 was called *Feelings of Discomfort* and explained 2.41% of the variance. It consists of five items indicating behaviors or consequences of being on Instagram that reflect disappointment, suffering, disconnection, and discomfort. The factor loadings range between .51 and .64, the Omega coefficient was .76 with a 95% CI [.71, .81], and the item-test correlations were between .50 and .55.

Factor 6, *Self-deprecating Comparison*, explained 1.82% of the variance and has six items that convey the feeling of discomfort experienced when one compares his or her life to others they see on Instagram. The factor loadings varied between .43 and .88. The Omega coefficient was .87 with a 95% CI [.85, .89], and the item-test correlations were between .55 and .77.

3. Study 2

3.1 Methods

Procedure

To determine the measurement equivalence of the IMQ and IUPQ in different cultures and across gender, a second study was performed for which both questionnaires were used in three different language-based samples (English, Spanish and French). This study was also conducted to test the construct validity of the two scales developed through an analysis of their links with other scales

measuring established correlates of SNS use. The original English versions of the IMQ and the IUPQ were translated into French and Spanish by two psychologists who were native speakers of the second language, and back translated by an independent translator. Any discrepancies that arose between the back-translated and the original English versions were discussed between the authors until a consensus agreement was reached (for the final versions of the two questionnaires, see Appendix F). Next, the three language versions of the questionnaire were hosted on *Qualtrics*, along with an online Informed Consent form, questions on the demographic characteristics, and a series of questionnaires measuring potential effects of Instagram use (see below: measures), presented in identical order in the three languages. Validated versions of these measures in French and Spanish were available for most of the additional questionnaires. If this was not the case, translations were made by the authors, and reliability was tested in the three subsamples before conducting any analyses.

Measures

To reach the objectives described above, the following questionnaires were included into an online survey.

Instagram Motives Questionnaire (IMQ). The final 32-item version of the questionnaire obtained from Study 1 was used for this study.

Instagram Usage Patterns Questionnaire (IUPQ). The final 37-item version of the questionnaire obtained from Study 1 was used for this study.

Compulsive Internet Use Scale (CIUS-5). The CIUS-5 is a short version of the CIUS (Meerkerk et al., 2009) which assesses critical aspects of Internet Use addiction. This 5-item version, available in eight languages (López-Fernandez et al., 2019), measures addictive and compulsive Internet use through five items reflecting aspects such as loss of control (“Do you find it difficult to stop using the Internet when you are online?”), conflict or negative consequences (“Do you neglect your daily obligations [work, school, or family life] because you prefer to go on the Internet?”), and mood regulation (“Do you go on the Internet when you are feeling down?”). Items are scored on 5-point Likert scales ranging from Never (0) to Very often (4) and then added up to obtain a total score. The Cronbach’s Alpha reliability coefficient for this sample ranged between .73 and .79 for the three language groups.

Self-esteem. A single item to measure self-esteem was used (Robins et al., 2001). This item (“I have a high self-esteem”) measures global self-esteem via a 7-point Likert scale ranging from Not very true of me (1) to Very true of me (7). In that study, evidence of convergent validity with Rosenberg’s scale was found, with correlations ranging between .73 and .80 in three studies with different samples. It has also been used in other studies focusing on problematic online behaviors (e.g., Billieux et al., 2015b).

Revised Self-consciousness Scale (SCS-R, Scheier & Carver, 1985). Following the example of other studies investigating problematic social network use (Lee et al., 2012; Lee-Won et al., 2014), only the seven items of the original 23-item instrument which measure public self-consciousness (an excessive concern about the self as an object) were used (e.g., “I am self-conscious about the way I look,” “I usually worry about making a good impression”). The items were scored using a 4-point Likert-type response format (1 – not like me at all to 4 – a lot like me). The alpha reliability coefficient for this sample ranged between .82 and .85.

Self-reflection and Insight Scale (SRIS, Grant et al., 2002). Of this 20-item scale measuring private self-consciousness in the form of self-reflection and insight, only the Insight dimension (8 items) was used for this study since it has previously performed adequately (DaSilveira et al., 2012; Nakajima et al., 2017). The items (e.g., “I am usually aware of my thoughts”) are scored on a 6-point Likert scale ranging from strongly disagree (1) to strongly agree (6). In this sample, it had an Alpha coefficient ranging from .81 to .82.

Iowa-Netherlands Comparison Orientation Measure (INCOM, Gibbons & Buunk, 1999). This instrument has 11 items that measure the orientation to social comparison or the tendency of people to compare themselves to others in terms of their abilities and opinions (e.g., “I often compare how I am doing socially, e.g., social skills or popularity, with other people”). The items are scored on Likert scales ranging from 1 (totally disagree) to 5 (totally agree). For this study, Cronbach’s alphas ranged from .82 to .86.

Fear of Missing Out Scale (FoMOs scale, Przybylski et al., 2013). Fear of missing out (FoMO) has been defined as a pervasive apprehension that others might be having rewarding experiences from which one is absent. The unidimensional FoMO scale has ten items (e.g., “I get worried when I find out my friends are having fun without me”) to be scored on a 4-point Likert-type response scale (1 - not at all true of me, 4 – very true of me). It has been used in numerous studies

showing a relationship with problematic social network use. In this study, it had Cronbach's Alphas ranging between .79 and .89.

UCLA Loneliness Scale. This unidimensional scale is one of the most often-used measures of the experience of loneliness. The short version (Hays & DiMatteo, 1987) has eight items (e.g., "There is no one I can turn to," "I lack companionship") to be scored on a 4-point Likert scale (1 – never; 4 – always) and has shown to correlate highly with the more elaborate ULS20 and ULS4 ($r = .82$ to $.87$). The alpha reliability coefficient for this sample ranged between .85 and .87.

Depression, Anxiety and Stress Scale (DASS-21, Henry & Crawford, 2005). This short version of a scale measuring stress, anxiety, and depression symptoms has 21 items reflecting the core symptoms of each of the three mental health problems, to be scored on a 4-point Likert scale ranging from 1 - not at all/never to 4 – very much/most of the time. For this study, we found Cronbach's alphas ranging between .82 to .87 for Anxiety, .90 to .92 for Depression, and .86 to .88 for Stress.

Life satisfaction scale (SWLS, Diener et al., 1985) is the most often-used scale to measure global life satisfaction. It has five items to be scored on a 7-point Likert scale ranging from 1- Totally disagree to 7 – Totally agree. In this study, it reached Cronbach's Alphas between .86 and .88.

Data collection

Data were collected by distributing the survey links through social networks and English, French, and Spanish-speaking universities. Each collaborator was responsible for distributing the link through advertisements, emails, university participant pools, and social media. A motivating text accompanied dissemination. Participants could enter a raffle for winning one of ten €15 vouchers (or the equivalent in their local currency). Some partner universities gave credits to students completing the survey as an alternative. Data collection took place between late June and October 2021. Inclusion criteria were the same as for Study 1. Participants were asked to give informed consent prior to participating and were informed that anonymity and confidentiality were guaranteed. No personal data were collected that could potentially identify participants, except for email addresses or student codes when incentives were offered. The study received approval from the IPSY Ethics Committee of the Université Catholique de Louvain and ethical clearance from the Institutional Review Boards of the partner universities in Australia, the United States, and Perú. Only the records of the participants who went past the informed consent and the demographic questions

were recorded on Qualtrics. Of the total 6284 responses received, only those with complete data for the IMQ and the IUPQ were used to analyze psychometric properties. The number of cases used is provided for each statistical analysis.

Participants

The total sample was composed of 6284 participants (24.2% men, 74.4% women, 1.4% non-binary gender). Their mean age was 23.03 years ($SD = 4.63$). In terms of language, $n=1418$ were English-speaking, $n=1826$ French-speaking, and $n=3040$ Spanish-speaking. For the English sample, the most frequent countries of the participants residence were the United States (39.1%), the United Kingdom (19.5%), and Australia (22.1%). For the Spanish sample, most participants were from Perú (85.3%) and Spain (10.8%), and for the French sample, most participants lived in France (71.7%), Belgium (15.8%), and Switzerland (8.7%). All the demographics and Instagram use information are reported in Table 1.

Data analysis

Both SPSS and R were used to perform the statistical analyses, which involved the following packages: *haven*, *tidyverse*, *dplyr*, *lavaan*, *semTools*. First, descriptive statistics were computed for the demographic characteristics. To conduct CFA analyses, the Likert-type response format of the scale scores had to be treated as ordinal. A three-step procedure was applied to analyze ordered categorical variables in the SEM framework: estimate thresholds, estimate the polychoric correlation matrix and then fit them to a hypothesized model using an estimation method. For the latter, the mean and variance-adjusted weighted least squares (WLSMV) estimator was applied, which is the most popular method to address ordinal categorical data (Li, 2016; Mindrila, 2010; Rhemtulla et al., 2012; Savalei & Rhemtulla, 2013; Shi & Maydeu-Olivares, 2020; Xia & Yang, 2019) and recommended over Maximum Likelihood Robust (MLR) analyses. Since chi-square is known to be sensitive to sample size, other goodness of fit measures were used to determine the acceptability of the proposed models, namely the Root Mean Square Error of Approximation (RMSEA), the Standardized Root Mean Square Residual (SRMSR), the Comparative Fit Index (CFI), and the Tucker-Lewis index (TLI). A non-strict approach was taken for the interpretation of these indices, whereby values of $RMSEA < .08$, $RMSEA\ CI < .10$, $SRMR < .09$, CFI , and $TLI > .90$ were considered as acceptable goodness of fit (Chen et al., 2008; Hu & Bentler, 1999; Lai & Green, 2016; Kline, 2010; Rudnev et al., 2018). Scaled fit indices (which are functions of the scaled chi-square statistic used in DWLS) were also obtained and reported for transparency, although we did not find enough

justification for using robust chi-square in calculating the fit indices (Xia & Yang, 2019). The literature suggests using both scaled and non-scaled fit indices with caution, as their value depends on the chosen estimation method. As cutoff points were created to be used with the ML estimator, extending their interpretation to other methods can be problematic (Beauducel & Herzberg, 2006; Li, 2016; Shi & Maydeu-Olivares, 2020; Xia & Yang, 2019). Individual CFAs were conducted first for the English data to assess the construct validity of the original IMQ and the IUPQ, after which CFAs in the other languages and for the whole sample were performed.

As already mentioned, the Cronbach's alpha coefficient is limited as an estimator of reliability. Thus, the reliabilities for the IMQ and the IUPQ were calculated using the Omega coefficient and its 95% CI (McDonald, 1999) using the MBESS version 4.8 package on R (Kelley, 2020), as suggested by Dunn et al. (2014). Omega is a form of composite reliability index (Hayes & Coutts, 2020; Padilla & Divers, 2016). Reliability coefficients between .70 and .79 can be considered acceptable, between .80 and .89 as good, and above .90 as excellent (Hunsley & Mash, 2008). To assess convergent validity, composite reliability and average variance extracted (AVE) were examined together. Composite reliability over .70 and AVE greater than .50 indicate convergent validity (Fornell & Larcker, 1981, Hair, 2009). To assess discriminant validity, the square root of the AVE was contrasted with the correlations between each pair of variables. If it was higher, then discriminant validity is supported (Fornell & Larcker, 1981; Henseler et al., 2015). Spearman correlations were used to assess the correlations between the IMQ and IUPQ scales and the other variables. For their interpretation, Cohen's criteria (1988) were applied, whereby $r \geq 0.10$ represents a "small" effect size, $r \geq 0.30$, a "medium" effect size, and $r \geq 0.50$, a large effect size. Also, the Benjamini-Hochberg procedure (1995) was used to adjust the p values to hold the false discovery rate at 5% for all the correlations.

Finally, to assess gender and language equivalence for the IMQ and the IUPQ and establish construct comparability (Wu et al., 2007), multi-group CFAs were conducted using the WLSMV estimator. Measurement invariance in scale scores means that a person's probability of getting an observed score does not depend on their membership in a specific group (Meredith, 1993). In this case, we hypothesized that the scores in the IMQ and IUPQ would not depend on the language or the gender of the participants. For language equivalence, we considered English, Spanish, and French. For gender invariance, we only considered two groups, men and women, due to the low percentage of respondents

who identified themselves as belonging to the third gender. Measurement invariance is typically tested in four different levels: configural, weak (metric), strong (scalar), and strict (residual). When indicators are ordinal in nature, such as Likert-type response formats, the parameters for invariance testing are the factor loadings, the thresholds, and the residual variance. The levels are the same, but the thresholds are the focus of the scalar invariance test instead of intercepts. There is no consensus in the literature on whether each indicator's loadings and thresholds should be constrained and freed simultaneously since they jointly define item functioning. Metric and scalar invariance are thus tested in a single step (Sass, 2011; Muthén & Muthén, 2012). The adequacy of the models was assessed by computing the difference or the change (Δ) between pairs of nested models in the RMSEA, CFI, TLI, RNI, and SRMR. A $\Delta\text{RMSEA} \geq 0.015$, $\Delta\text{CFI} \geq 0.01$, $\Delta\text{TLI} \geq 0.01$, $\Delta\text{RNI} \geq 0.01$, and $\Delta\text{SRMR} \geq .03$ would indicate a significant decrease in the model fit when testing for measurement invariance according to different authors (Beaujean, 2014; Chen, 2007; Rudnev et al., 2018, Wu et al., 2007).

3.2 Results

Confirmatory factor analysis of the IMQ and the IUPQ

Table S6 shows the descriptive statistics of the study variables for the entire sample and the samples in English, French, and Spanish. Table 2 shows the fit indices for the two proposed models for the IMQ and the IUPQ in the whole sample and the three subsamples. As it was assumed that motivations to use Instagram and usage patterns are not independent, a six-factor model was fitted for each scale, drawing on the EFA results. Both models produced acceptable fit indices for the English sample, thus validating the proposed models. The fit indices for the French and Spanish subsamples and the whole sample proved acceptable. Since modification indices did not show any articulable changes that could significantly increase the model's fit, these are considered the final models. The final versions of the scales in English, Spanish and French language are provided in the supplementary material.

For the IMQ, all items had positive factor loadings in their theoretical dimension, ranging between .58 and .96 (Table 3). Also, Omega reliability values showed adequate internal consistency, ranging from .78 to .91.

Table 2. Fit indices for CFA models of the IMQ and the IUPQ

Model	Sample	<i>n</i>	χ^2	<i>df</i>	<i>p</i>	CFI	CFI scaled	TLI	TLI scaled	NNFI	NNFI scaled	SRMR	RMSEA	RMSEA scaled
IMQ - Six correlated factors	Full sample	6284	21104	449	<.001	.978	.908	.976	.898	.976	.898	.070	.086	.089
	English	1418	5217.57	449	<.001	.980	.910	.979	.901	.979	.901	.069	.087	.091
	French	1826	7664.17	449	<.001	.956	.897	.950	.887	.950	.887	.091	.094	.086
	Spanish	3040	9710.37	449	<.001	.984	.923	.982	.915	.982	.915	.060	.082	.087
IUPQ - Six correlated factors	Full sample	5115	22729.6	614	<.001	.975	.896	.973	.887	.973	.887	.069	.084	.083
	English	1337	7138.61	614	<.001	.970	.887	.970	.878	.976	.878	.074	.089	.089
	French	1406	6605.4	614	<.001	.966	.902	.963	.893	.963	.893	.074	.083	.077
	Spanish	2372	10206.9	614	<.001	.979	.906	.978	.898	.978	.898	.066	.081	.082

Table 3. Factor loadings and Omega coefficients (95% CI) of the IMQ (English sample, n=1418)

#	Items	Stand. Fac. Load.	Omega reliability [CI 95%]
	<i>Social Impact seeking</i>		.90[.89;.91]
1	I share content on Instagram hoping to inspire other people.	.745	
7	I am on Instagram to uplift and make an impact on others.	.822	
13	I share content on Instagram to promote myself.	.826	
16	I use Instagram to engage people to take part in important...	.812	
19	I use Instagram to show how creative I am.	.825	
22	I use Instagram to show others how skillful I am.	.804	
25	I am on Instagram to promote my work/my business.	.687	
30	I share content on Instagram to enlarge my follower base.	.867	
32	I am on Instagram to raise awareness on important matters.	.761	
	<i>Emotional Escape</i>		.86[.85;.87]
2	I use Instagram to escape my responsibilities for a while.	.706	
8	I use Instagram to pass the time in between activities.	.750	
14	Instagram allows me to pass the time in a fun way.	.798	
17	I use Instagram to get away from reality for a little while.	.830	
20	I use Instagram to escape from boredom.	.801	
23	I use Instagram to relieve my negative emotions (stress...	.697	
28	You can always find something interesting happening...	.700	
	<i>Souvenir keeping</i>		.91[.90;.92]
3	I use Instagram as a gallery of the moments that I cherish...	.884	
9	I use Instagram to keep a visual record and remember....	.955	
15	I use Instagram as a tool to keep a visual record and...	.942	
24	I post on Instagram to store my pictures.	.811	
	<i>Social connection</i>		.83[.81;.84]
4	I use Instagram to chat, catch up with people and make plans...	.583	
10	Instagram enables me to develop my relationships with...	.882	
18	Instagram helps me to keep in touch with meaningful people...	.827	
26	Using Instagram has allowed me to reconnect with people...	.800	
	<i>Attention seeking</i>		.87[.86;.88]
6	I enjoy the validation I feel when I get likes, comments...	.844	
11	I enjoy the attention I get on Instagram.	.867	
27	I share content on Instagram to get attention/reactions...	.862	
31	I enjoy Instagram because I can be seen by many people.	.887	
	<i>Information seeking</i>		.78[.76;.80]
5	Instagram allows me to be up to date with what's happening...	.733	
12	I am on Instagram because that way I can stay up to date.	.759	
21	I scroll through the Insta stories to see what people are up to.	.715	
29	I use Instagram to keep an eye on what others are doing.	.797	

Table 4. Factor loadings and Omega coefficient (95% CI) of the IUPQ (English sample, n=1337)

#	Items	Stand. Fac. Load.	Omega reliability [CI 95%]
	<i>Loss of control</i>		.92[.91;.93]
1	I feel like I'm on Instagram more than I should.	.774	
5	I wish I could control the time I spend on Instagram better.	.810	
8	I wish I could spend less time on Instagram and more time living the...	.775	
12	I am procrastinating due to hanging out on Instagram too much.	.785	
15	While being on Instagram, I lose track of time.	.766	
18	I spend time mindlessly scrolling on Instagram.	.695	
22	Opening Instagram and checking stories has become like a reflex...	.776	
25	Instagram is an essential part of my daily life.	.728	
29	I feel a need to enter Instagram and see what is happening.	.785	
32	I open Instagram many times during the day to see what is new.	.765	
35	I open Instagram in between activities automatically.	.785	
	<i>Anxious Posting</i>		.91[.89;.92]
2	I tend to get anxious after posting something on Instagram because I...	.855	
9	When I post something on Instagram, I feel insecure and tense, waiting..	.893	
16	When I post something on Instagram, I am afraid of being judged.	.893	
23	When I share something on Instagram, I tend to feel vulnerable and...	.862	
33	I refrain from posting something others may not like.	.755	
	<i>Passive use</i>		.76[.73;.78]
10	I enjoy checking out content on Instagram but I don't like sharing...	.817	
17	I do not post stuff on Instagram, but I watch other people's content.	.749	
24	I would probably watch stories or posts on Instagram without liking or..	.752	
34	I check stories and posts, but I hardly react, like or comment them.	.715	
	<i>Social approval</i>		.81[.79;.82]
3	I get excited when my posts and stories receive likes and reactions.	.857	
7	When I get likes or comments on a post, I feel happy and uplifted.	.831	
14	I edit my videos and pictures so they look good on Instagram.	.619	
19	If someone comments or reacts to my stories, I will answer them back.	.474	
26	I put a lot of effort into crafting beautiful posts and stories for my...	.730	
30	I feel disappointed when the content I create does not get the reactions...	.927	
	<i>Feelings of discomfort</i>		.77[.74;.79]
4	My relationships are suffering due to my Instagram addiction.	.581	
11	If I am not on Instagram, I feel disconnected from others.	.752	
20	I get annoyed when I can't access Instagram for any reason.	.721	
27	I remove a post or a story when they don't get the reaction I expect.	.737	
37	I check other people's posts and stories to feel better about myself.	.663	
	<i>Self-deprecating comparison</i>		.88[.87;.89]
6	When I see certain posts or stories on Instagram, I feel envious.	.804	
13	Some of the content I see on Instagram makes me feel bad about myself.	.863	
21	I can't help but compare myself to others on Instagram.	.877	
28	I wish I could have the life of some of the people on Instagram.	.759	
31	Being on Instagram gives me mixed feelings.	.715	
36	I believe the bar set by the influencers on Instagram is too high...	.656	

Table 5. Correlations between IMQ and IUPQ dimensions, average variance extracted and discriminant validity (English sample)

	AVE	1	2	3	4	5	6	7	8	9	10	11	12
1. IMQ - Social Impact Seeking	.633	.794†											
2. IMQ - Emotional Escape	.572	.312**	.755†										
3. IMQ - Souvenir Keeping	.809	.480**	.310**	.900†									
4. IMQ - Social Connection	.610	.487**	.404**	.481**	.781†								
5. IMQ - Attention Seeking	.750	.639**	.421**	.479**	.424**	.866†							
6. IMQ - Information Seeking	.564	.352**	.592**	.369**	.518**	.458**	.748†						
7. IUPQ - Loss of Control	.590	.284**	.536**	.217**	.341**	.356**	.453**	.768†					
8. IUPQ - Anxious Posting	.727	.218**	.295**	.149**	.242**	.397**	.333**	.506**	.854†				
9. IUPQ - Passive Use	.571	.252**	.181**	-.219**	-.042	-.214**	.118**	.221**	.219**	.761†			
10. IUPQ - Social Approval	.570	.494**	.358**	.463**	.361**	.692**	.435**	.521**	.604**	-.058*	.754†		
11. IUPQ - Feelings of Discomfort	.481	.430**	.324**	.223**	.327**	.456**	.341**	.609**	.577**	.063*	.555**	.693†	
12. IUPQ - Self-dep. Comparison	.613	.180**	.341**	.173**	.240**	.361**	.367**	.526**	.703**	.240**	.554**	.502**	.781†

** $p < 0.01$, * $p < 0.05$, †The values in the diagonal are the square root of the AVE.

Note. Spearman correlations. P values were adjusted using the false discovery procedure

Only complete cases were used, $n = 1290-1418$

Table 6. Correlations between the IMQ and IUPQ sub-scales and other relevant variables (for the English sample)

	Age	Gend	CIU	SE	SCS	Ins	FoMO	SCO	Lone	Anx	Dep	Stress	LS
IMQ - Social Impact Seeking	-.05	.12**	.15**	.13**	.15**	-.13**	.29**	.06	.08**	.27**	.17**	.24**	.07**
IMQ - Emotional Escape	-.06	.15**	.34**	-.07**	.31**	-.07**	.31**	.31**	.10**	.14**	.15**	.20**	.01
IMQ - Souvenir Keeping	.01	.23**	.07**	.08**	.14**	-.02	.23**	.17**	-.07**	.10**	.02	.12**	.17**
IMQ - Social Connection	-.10**	.13**	.15**	.05	.19**	-.05	.27**	.18**	.01	.15**	.10**	.15**	.07*
IMQ - Attention Seeking	-.01	.13**	.25**	.06*	.29**	-.12**	.42**	.24**	.08**	.17**	.14**	.20**	.06*
IMQ - Information Seeking	-.08**	.15**	.21**	-.04	.33**	-.03	.36**	.30**	.01	.06*	.05	.12**	.12**
IUPQ - Loss of control	.05	.09**	.47**	-.08**	.27**	-.15**	.46**	.33**	.20**	.21**	.26**	.30**	-.06*
IUPQ - Anxious Posting	-.10**	.13**	.38**	-.32**	.46**	-.31**	.54**	.43**	.37**	.36**	.38**	.38**	-.19**
IUPQ - Passive Use	.03	-.02	.19**	-.23**	.12**	-.05	.06*	.20**	.21**	.06*	.16**	.10**	-.11**
IUPQ - Social Approval	.00	.18**	.33**	-.04	.38**	-.13**	.51**	.37**	.16**	.23**	.21**	.28**	.02
IUPQ - Feelings of Discomfort	-.06*	.04	.37**	-.10**	.24**	-.26**	.54**	.23**	.29**	.36**	.32**	.34**	-.10**
IUPQ - Self-Dep. Comparison	-.03	.22**	.40**	-.38**	.45**	-.27**	.58**	.52**	.40**	.35**	.41**	.42**	-.20**

Note: Gend = Gender, CIU= Compulsive internet use, SE= Self-esteem, SCS= Self-consciousness, Ins = Insight, FoMO= Fear of missing out, SCO= self-comparison orientation, Lone= Loneliness, Anx= Anxiety, Dep=Depression, LS= Life Satisfaction.

Only complete cases were used, n =1290-1418

Spearman correlations. p values adjusted using the false discovery procedure.

*p<0.05; **p<0.01

For the IUPQ, all items had positive factor loadings on their theoretical dimensions, ranging between .47 and .93 (Table 4). Omega reliability values showed adequate internal consistency for all the subscales of the IUPQ, ranging from .76 to .92. Significant correlations were observed among the six factors of the IMQ (see Table 5). Effect sizes were medium and large, with the highest ones seen between Social Impact Seeking and Attention Seeking ($r_s=.639$), Emotional Escape and Information Seeking ($r_s=.592$), and Social Connection and Information Seeking ($r_s=.518$). For the IUPQ, the correlations among the six factors were significant, with the highest ones noted between Anxious Posting and Self-deprecating Comparison ($r_s=.703$). Passive Use showed marginal to small effects with the rest of the usage patterns.

Correlations between the IMQ and the IUPQ dimensions

The correlations between the motives for Instagram use and the use patterns are shown in Table 5. Significant correlations between all the IMQ and IUPQ dimensions were found. Most of these were positive and small to medium, with some exceptions worth noting: There was a strong relationship between the Emotional Escape motive and the Loss of Control use pattern ($r_s= .536$) and between the Attention Seeking motive and the Social Approval pattern ($r_s= .692$). Furthermore, three of the six motivations were inversely correlated with the Passive Use pattern, i.e., Social Impact Seeking ($r_s= -.252$), Souvenir Keeping ($r_s= -.219$), and Attention Seeking ($r_s= -.215$), while Emotional Escape and Information Seeking were positively correlated with this use pattern ($r_s= .181$ and $r_s= .118$, respectively).

Convergent and discriminant validity

Table 5 also shows the average variance extracted values, which ranged from .481 to .727 for the IMQ and from .564 to .809 for the IUPQ. Taken together with the composite reliability coefficients (Tables 3 and 4), which range between .78 to .91 for the IMQ and from .76 to .92 for the IUPQ, there was enough support for convergent validity for both scales. With regard to discriminant validity, Table 5 shows the squared root of the AVE for all the dimensions of the IMQ and the IUPQ, which ranged between .693 and .900. All the values in the diagonal were higher than the correlations between the IMQ and the IUPQ and the relationships with other variables (Table 6), which supports the discriminant validity of the scales.

Relationships with other relevant variables

Table 6 shows the correlations between the IMQ and IUPQ and other selected variables for the English sample. Negligible tendencies were found regarding the associations between age and gender and some of the motives and patterns of Instagram use. The relationships between gender and Souvenir Keeping ($r_s=.229$) and gender and Self-deprecating comparison ($r_s=.217$) were low. Compulsive internet use was more strongly associated with the patterns of use than the motives of use, with medium effects of Loss of Control ($r_s=.474$) and Self-deprecating comparison ($r_s=.400$). Self-consciousness showed correlations and small to medium effect sizes with all the motives and usage patterns. Insight showed negative associations with small to medium effect sizes on most use patterns, except Passive use. Fear of missing out showed the largest effect sizes when correlated to the motives and usage patterns. Comparison orientation showed positive associations with most motives and usage patterns and had the largest effect when correlated with the Self-deprecating comparison pattern ($r_s=.522$). When correlating the IMQ and the IUPQ with mental health indicators, the associations were stronger between patterns of use and loneliness, anxiety, depression, and stress, while the effect was negligible for some of the motives. Although relatively small, most usage patterns were inversely correlated with life satisfaction. Supplementary information on the correlations between the IMQ and the IUPQ for the different subsamples in French, Spanish, and the total sample can be found in Table S7.

Measurement Invariance

Table 2 also shows the results of the individual CFAs conducted for the subsamples in the three languages and the total sample for the IMQ and the IUPQ. All the CFAs showed acceptable goodness of fit indices. The results of the multi-group CFAs by language and gender to test measurement invariance are presented in Table 7. For the IMQ, language and gender configural invariance were supported (for language RMSEA CI = [.086-.088], SRMR = .071, CFI = .979, TLI = .977, RNI = .979; for gender RMSEA CI = [.084-.086], SRMR = .068, CFI = .978, TLI = .976, RNI = .978). When estimating models with increasing levels of constraints to test for invariance, changes in the fit indices did not produce a significant reduction of the model fit for language or gender, as indicated by the deltas in the goodness of fit indices and the criteria displayed in the data analysis section ($\Delta\text{RMSEA} < 0.015$, $\Delta\text{CFI/TLI/RNI} < 0.01$, and $\Delta\text{SRMR} < .03$). Similarly, strict invariance was also supported for both language and gender. This was also supported for the IUPQ.

Table 7. Multigroup CFAs for the IMQ and the IUPQ according to language and gender

	χ^2	df	χ^2/df	RMSEA (CI)	CFI	TLI	RNI	SRMR	Comparisons	Δ RMSEA	Δ CFI	Δ TLI	Δ RNI	Δ SRMR
<i>Instagram Motives Questionnaire (IMQ)</i>														
Language Invariance														
Configural	22592.05	1347	16.77	.087(.086-.088)	.979	.977	.979	.071	NA	NA	NA	NA	NA	NA
Weak-Strong	23161.1	1527	15.17	.082(.081-.083)	.978	.979	.978	.071	Conf. vs. WS	-0.005	0.000	0.002	0.000	0.000
Strict	24935.4	1591	15.67	.084(.083-.085)	.977	.978	.977	.073	WS vs. Strict	-0.003	-0.002	-0.001	-0.002	0.002
Gender invariance														
Configural	21128.29	898	23.53	.085(.084-.086)	.978	.976	.978	.068	NA	NA	NA	NA	NA	NA
Weak-Strong	21321.65	988	21.58	.082(.084-.086)	.978	.978	.978	.068	Conf. vs. WS	-0.004	0.000	0.002	0.000	0.000
Strict	21664.23	1020	21.24	.081(.080-.082)	.978	.978	.978	.069	WS vs. Strict	-0.001	0.000	0.000	0.000	0.001
<i>Instagram Uses and Patterns Questionnaire (IUPQ)</i>														
Language Invariance														
Configural	23950.89	1842	13	.084(.083-.085)	.976	.974	.976	.070	NA	NA	NA	NA	NA	NA
Weak-Strong	24816.66	2052	12.09	.081(.080-.082)	.975	.976	.975	.071	Conf. vs. WS	-0.003	-0.001	-0.002	-0.001	0.000
Strict	26564.38	2126	12.49	.082(.072-.074)	.973	.975	.973	.073	WS vs. Strict	0.001	-0.002	-0.001	-0.002	0.002
Gender invariance														
Configural	23064.59	1228	18.78	.084(.083-.085)	.974	.972	.974	.070	NA	NA	NA	NA	NA	NA
Weak-Strong	23276.24	1333	17.46	.081(.080-.082)	.974	.974	.974	.070	Conf. vs. WS	-0.003	0.000	0.002	0.000	0.000
Strict	23910.48	1370	17.45	.081(.080-.082)	.973	.974	.973	.071	WS vs. Strict	0.000	-0.001	0.000	-0.001	0.001

Note. CFA = Confirmatory factor analysis, χ^2 = robust chi-square, df= degrees of freedom, Δ =change in the fit index compared to the previous model. WS=Weak-Strong invariance. All models are significant at $p < 0.001$

Internal consistency

Reliability coefficients for both the IMQ and the IUPQ across languages and AVE are shown in Table 8. Both Cronbach's alpha (α) and McDonald's Omega (ω) and their confidence interval are displayed. For the IMQ, all coefficients were well above the cutoff point of .70. For the IUPQ, most coefficients were above .70, with a few exceptions. The Feelings of Discomfort sub-scale had an $\alpha = .65$ for the French sample but performed well for the other subsamples and the full sample. Passive Use had an $\alpha = .69$ for the Spanish sample and had the lowest reliability range across samples ($\alpha = .72-.75$; $\omega = .72-.76$). For the full sample, IMQ and IUPQ Alpha reliability coefficients ranged from .79 to .90 and from .72 to .91, respectively, and Omega coefficients ranged from .79 to .91 and from .74 to .92. Accordingly, the IMQ and the IUPQ can be considered reliable measures of motives and patterns of Instagram use, respectively. The average variance extracted was satisfactory across languages, except for Feelings of discomfort, which showed specific lower AVE for the French sample.

4. Discussion

Our purpose was to develop and validate the IMQ and the IUPQ to provide sound instruments suitable for research targeting the assessment of Instagram specifically. As such, we address the need for valid and reliable measures of specific Instagram motives and usage patterns that can be used consistently across studies as an alternative to the current ones, which mostly focus on symptoms that parallel those of substance addictions and not include some key features that are unique to Instagram use. Furthermore, we also aimed to test the measurement invariance of both scales in three different languages and across gender in order to promote cross-cultural investigations of Instagram use and misuse.

Regarding the IMQ, the EFA and subsequent CFA analyses resulted in a six correlated and conceptually sound factors that fit the data well. The identified motives were: Social Impact Seeking, Emotional Escape, Souvenir Keeping, Social Connection, Attention Seeking, and Information Seeking. Although most of these motives have been evidenced in one form or another in previous Instagram and SNS studies (Alhabash & Ma, 2017; Huang & Su, 2018; Kircaburun et al., 2018; Lee et al., 2015; Orchard et al., 2014; Quan-Haase & Young, 2010; Sheldon &

Table 8. Reliability coefficients and average variance extracted (AVE) for the IMQ and IUPQ sub-scales across languages

	English			French			Spanish			Total		
	Alpha	Omega	AVE	Alpha	Omega	AVE	Alpha	Omega	AVE	Alpha	Omega	AVE
IMQ - Soc. Imp. Seeking	.90	.90 [.89;.91]	.63	.85	.90 [.89;.90]	.60	.91	.91 [.90;.91]	.64	.90	.90 [.90;.91]	.63
IMQ - Emotional Escape	.86	.86 [.85;.87]	.57	.79	.84 [.84;.85]	.43	.87	.87 [.87;.88]	.57	.84	.84 [.84;.85]	.51
IMQ - Souvenir Keeping	.91	.91 [.90;.92]	.81	.88	.90 [.89;.91]	.76	.90	.90 [.90;.91]	.77	.90	.90 [.90;.91]	.78
IMQ - Social Connection	.83	.83 [.81;.84]	.61	.81	.84 [.83;.85]	.59	.86	.86 [.85;.87]	.67	.84	.84 [.83;.85]	.62
IMQ - Attention Seeking	.88	.87 [.86;.88]	.75	.86	.87 [.86;.87]	.71	.88	.88 [.87;.89]	.75	.86	.87 [.86;.87]	.73
IMQ – Info. Seeking	.78	.78 [.76;.80]	.56	.75	.79 [.78;.80]	.60	.83	.82 [.81;.84]	.64	.79	.79 [.78;.80]	.60
IUPQ - Loss of control	.92	.92 [.91;.93]	.59	.89	.89 [.88;.90]	.51	.91	.91 [.90;.91]	.55	.91	.91 [.90;.91]	.55
IUPQ - Anxious Posting	.90	.91 [.89;.92]	.73	.90	.90 [.89;.91]	.72	.90	.91 [.90;.91]	.74	.90	.90 [.90;.91]	.73
IUPQ - Passive Use	.75	.76 [.73;.78]	.58	.74	.76 [.74;.78]	.60	.69	.72 [.69;.74]	.51	.72	.74 [.73;.75]	.54
IUPQ - Social Approval	.81	.81 [.79;.82]	.57	.79	.79 [.77;.81]	.53	.82	.82 [.80;.83]	.57	.81	.81 [.80;.82]	.56
IUPQ - Feel. of Discomf.	.76	.77 [.74;.79]	.48	.65	.67 [.64;.70]	.40	.77	.77 [.75;.79]	.51	.74	.75 [.73;.76]	.46
IUPQ - Self Dep. Comp.	.87	.88 [.87;.89]	.61	.83	.84 [.83;.85]	.55	.86	.86 [.85;.87]	.58	.86	.86 [.85;.87]	.58

Bryant, 2016; Xu et al., 2012), the IMQ presents an advantage by covering each motive broadly. For instance, the Social Impact Seeking factor, while similar to the *self-promotion* motive found in other U&G studies (Dumas et al., 2017; Sheldon & Bryant, 2016), seems to cover simultaneously a complex motivation reflecting self-promotion, self-expression, a tendency to try inspiring others, and a desire to raise awareness or engaging others in important matters. Also, the Emotional Escape factor portrays a positive form of escapism, in which the platform is used both for its potential exciting and fun content and the possibility to use it to relieve and regulate some negative emotions and evade them (for a discussion of positive forms of escape/escapism in online activities, see Giardina et al., 2022). Our findings also align with the numerous studies having shown that SNS and the Internet can be used as a form of mood management and coping with emotional distress, depression, anxiety, and loneliness (Cauberghe et al., 2021; Greenwood & Long, 2009; Hormes et al., 2014; Kardefelt-Winther, 2014; Kuss et al., 2017; Tang et al., 2014; Whang et al., 2003). Furthermore, there is evidence that diversion accounts for much social media use (Sheldon & Newman, 2019).

Souvenir Keeping is very similar to the *documentation* motive that Sheldon and Bryant (2016) identified as unique to Instagram. While *documentation* refers to the use of Instagram to store images and memories, Souvenir Keeping emphasizes the gallery/visual component and that the memories kept are good, fun, and cherished. Social Connection Seeking refers to using Instagram to keep in touch, reconnect or develop relationships, chat, catch up and make plans with others. This motive is different from Sheldon and Newman's (2019) *social interaction*, which emphasized the *peeking* or *surveillance* aspect. These latter aspects are contained in the Information Seeking motive, which integrates both the need to peek into other people's lives but also to stay up to date with what is happening in the community and the world, thus stay informed more globally, which might serve instrumental, cognitive, and hedonic purposes (Sharot & Sustein, 2020). Finally, the Attention Seeking factor was not frequently reported in other studies but proved to be a strong motive for Instagram use in our qualitative inquiry (Romero et al., 2022); therefore, the items developed focused on the usage of the platform motivated by a need to be seen, validated and to get attention from others in the form of likes, comments, and reactions. This factor is a unique contribution of this study, and the IMQ could be used to investigate further the links between this motive and potentially problematic behaviors such as excessive selfie-taking (e.g., Charoensukmongkol, 2016) or deceptive like-seeking behaviors (such as purchasing likes, see Dumas et al., 2020).

Regarding the IUPQ, a six correlated factor structure was found, and it showed good psychometric properties and fit. The following Instagram usage patterns are covered: Loss of Control, Anxious Posting, Passive Use, Social Approval, Feelings of Discomfort, and Self-Deprecating Comparison. The IUPQ was not developed within an addictive disorder framework or intended to only focus on problematic Instagram usage behaviors (see Flayelle et al., 2020, 2021, for a similar approach related to another emerging technology-mediated problematic behavior). The items were developed drawing from a qualitative inquiry where these behaviors emerged (Romero et al., 2022). However, it is worth noting that out of the six patterns, Loss of Control and Feelings of Discomfort resemble existing scales measuring problematic or addictive forms of SNS or Internet use (e.g., IAT - Young, 1998 or the Bergen Social Networking Addiction Scale - Andreassen et al., 2012). Content-wise, Feelings of Discomfort yields behaviors that could be more detrimental for the individual, cause more suffering, or point toward more problematic usage. It covers distinctive behaviors on Instagram that should be further researched to understand their potentially adverse effects on the individual.

The items proposed for the IUPQ consider both what the users are doing on the platform (in the form of posting or uploading stories) and how they feel when performing those behaviors (e.g., emotional response, thoughts about the displayed behavior). Consequently, Anxious Posting integrates the experience of posting something on Instagram and being afraid of being judged, waiting for the followers' reactions, refraining from posting if the content might not be liked, etc. This unique factor reveals an extended behavioral pattern of Instagram use in youth, which has the potential to become detrimental. Although little is known about anxiety that arises while using social media, a few studies showed that worry and fear around social media posting could be related to negative expectations and anticipation of disapproval, ridicule, or judgment, but the consequences of social media posting anxiety remain unknown (Alkis et al., 2017; Shabahang et al., 2022). In addition, the Social Approval pattern is concerned with behaviors linked with crafting, editing, and filtering the content that the users would share to get reactions in the form of likes and comments. There is evidence that Instagram is optimized for self-presentation, building social capital, storytelling, and highlighting aspects of the self rather than building social connection (Kim & Kim, 2019; Romero et al., 2022). As such, *influence metrics* in the form of likes, comments and reactions serve as markers of popularity, likeability, approval, and acceptance (Davies, 2020; Kim & Lee, 2011; Ross, 2019; Vitak & Ellison, 2013; Vogel et al., 2014). The Social Approval pattern captures all these aspects in a distinctive factor.

Moreover, Self-deprecating Comparison portrays a pattern of Instagram use in which individuals compare themselves to others, generally with adverse outcomes (i.e., feeling envious, feeling bad about themselves), and it is different from the general tendency to compare oneself to others. As shown in different studies on the matter, comparison on SNS typically results in lower subjective well-being with small to medium size effects (Faelens et al., 20121; Liu & Ma, 2020; Verduyn et al., 2020). Therefore, having a measure that addresses how these comparisons occur on Instagram is of value. Finally, to our knowledge, Passive Use has not been typically included in other scales concerning social network use behavior (Trifiro & Gerson, 2019) or has been researched using very heterogeneous operationalizations (Valkenburg et al., 2021). Therefore, the emergence of this distinctive factor is important. Passive use in this study is defined as watching or checking out others' content without liking or reacting to it and refraining from sharing content themselves. Overall, there is a growing consensus that the impact of SNS use on well-being depends on *how* social networks are used (Kross et al., 2021). Accordingly, an advantage of the IUPQ is that it proposes six different patterns of usage that go beyond the dichotomization of active vs. passive use.

Regarding the fit indices of our measures in the CFAs, most were within the optimal recommended thresholds except for RMSEA, which was consistently above .08 across samples. This can be explained because we did not use the modification indices to introduce changes to the proposed models, and therefore, some residuals were left unexplained, which could inflate the Chi-square statistic and, consequently, the RMSEA. Despite some modification indices suggested allowing some items to correlate to two factors, it was decided to keep them charging in their original factors to avoid artificially over-fitting the models. The proposed models are fairly articulate, theoretically sound, and informative. As for reliability, both scales consistently held high reliability coefficients (both Alpha and Omega) across subsamples. Convergent and discriminant validity were also confirmed, which implies that both the IMQ and the IUPQ are psychometrically sound instruments.

Importantly, the IMQ and the IUPQ factors were moderately to strongly correlated among and between each other. This comes as no surprise since we hypothesized that motivations and usage patterns of Instagram use are complex, interrelated, and that the same individual might exhibit a range of motivations to use a social network, use the social network in different ways, and that these may vary widely depending on multiple factors. We particularly note in our results the distinctive correlations that Passive use exhibits with the motives and the rest of the usage

patterns. First, it holds inverse correlations with Social Impact Seeking, Souvenir Keeping, and Attention Seeking motives, and it did not correlate with Social Connection, which seems coherent to what participants told us in our qualitative inquiry. Those motives are more consistent with active usage of the platform in the form of reacting, liking, and posting stories. Conversely, Passive use behavior is more likely exhibited when using the platform to escape negative feelings or seek information (Verduyn et al., 2021), consistent with the small correlations found with those motives.

As for the construct validity evidence, it is interesting to notice negligible statistical trends linking some motives and patterns of Instagram use with age across subsamples. Some claims have been made that younger generations are more heavy social network users and place more value on online interaction while being more sensitive to critique and judgement (Chang et al., 2015; Kuss & Griffiths, 2017; Verduyn et al., 2021). Also, these same trends were found between gender and different motives and patterns of Instagram use, potentially suggesting a differential use of the platform among men and women. This is in line with some previous studies indicating that women tend to engage with social networks more than men, tend to compare themselves with others on the platforms, use them to boost their social connections and social support, and are especially vulnerable to detrimental consequences of SNS use (Hafferkamp et al., 2012; Kuss & Griffiths, 2017; Tifferet, 2020; Verduyn et al., 2021). These results may point towards this, but they could also be spurious since empirical evidence on the role of age and gender on SNS use is mixed or limited, as reported by a recent empirical meta-review (Meier & Reinecke, 2021; Verduyn et al., 2021). More in-depth research about the roles of gender and age in the motives and usage of Instagram is thus required.

Previous studies on problematic internet and social network use have identified various risk factors, such as comparison orientation, fear of missing out, self-esteem, and self-consciousness (Balta et al., 2018; Burnell et al., 2019; Faelens et al., 2020; Kircaburun & Griffiths, 2018; Martinez & Garcia, 2019; Ponnusamy et al., 2020; Stapleton et al., 2017; Verduyn et al. 2017; Yang, 2016). Some of these known correlates were included in our study to demonstrate the construct validity of our scales. For example, the IMQ and IUPQ sub-scales were correlated to a measure of compulsive internet use (CIUS-5), and small to large associations were found. Moreover, the IUPQ's Loss of Control and Feelings of Discomfort displayed the largest correlations with compulsive internet use. As stated before, those usage patterns are consistent with heavier or more problematic internet use

and in line with previous work on addictive and compulsive SNS use, thus supporting the validity of our instruments to assess problematic forms of Instagram involvement. Other factors such as self-consciousness, insight, FoMO, and comparison orientation showed small to large correlations with most motives and usage patterns in the expected direction, which further supports the construct validity of our scales. Out of all the variables measured, FoMO and comparison orientation were the ones that produced the strongest correlations both with motives and with patterns of Instagram use, which is consistent with other literature on SNS use, which suggests that FoMO might be a possible component or significant predictor of problematic SNS use (Faelens et al., 2021; Kuss & Griffiths, 2017) and that comparison orientation is a crucial vulnerability factor and an explanatory mechanism (Verduyn et al., 2021). These results are also consistent with a recent meta-analysis on the effects of FoMO on internet use, which suggest that the effect of FoMO on Instagram use is high, and significantly higher than its effect on Facebook use (Akbari et al., 2021).

Finally, previous studies have found some relationships between social network use, mental health indicators, and life satisfaction (Faelens et al., 2021; Huang, 2017; Keles et al., 2020; Yoon et al., 2019). Our study found stronger associations between loneliness, anxiety, depression, stress, and life satisfaction outcomes with the patterns of use than with the motives. This was expected as motives theoretically precede usage patterns, and it is more likely that these mental health outcomes directly result from SNS (over)use. Notably, the Souvenir Keeping and Social Connection motives show marginal to no correlation with detrimental mental health outcomes, which supports the view that certain motives are related to non-problematic usage patterns, echoing similar findings pertaining to on-demand TV series watching (Flayelle et al., 2019). Also, the highest correlations found were between the Anxious Posting, Feelings of Discomfort, and Self-deprecating Comparison patterns and the mental health outcomes, suggesting possible avenues for future research. These results show that specific Instagram usage patterns could lead to more detrimental health outcomes than others supporting the notion that SNS are not inherently good or bad, but the outcomes depend on *how* they are used (Kross et al., 2021; Verudyn et al., 2021).

Regarding the cross-cultural validation of the IMQ and the IUPQ, our findings support the measurement invariance of the scales according to language and gender, and therefore, construct comparability of the measures is confirmed. This implies that, independently of the language spoken and gender, participants interpreted the items of the IMQ and the IUPQ in a similar manner. Moreover,

these results indicate that potential comparisons that could derive from these scales would express genuine differences in the measured constructs and would not be due to other factors. However, it is uncertain whether using the country of origin instead of the language to perform measurement invariance testing would produce similar results. Culture could play a role when exploring motivations behind SNS use according to U&G. For instance, it could be argued that in individualistic cultures, Information Seeking would be a predominant motive, while in collectivistic cultures, Social Connection could be a stronger motivator (Hsu et al., 2015; Schaffer & Debb, 2020). Future studies should investigate this further.

It is important to note that both samples were composed of young adults (aged 18-34 years) and that the second study sample predominantly included female (73.8%) and well-educated participants. Also, they typically used Instagram in combination with other social networks, and more than 90% of the sample had been using it for at least two years, so they were familiar and habitual users of the platform. It is also worth noting that 65% of the sample reported increased Instagram use since the beginning of the COVID-19 pandemic, which is consistent with other research that was conducted in the same period (e.g., Zarco-Alpuente et al., 2021). As such, it is possible that different findings would have been obtained in samples with different sociodemographic backgrounds, ethnicities, gender, and education, especially for minorities, and that the COVID-19 pandemic may have influenced the results. Therefore, further studies with more varied and representative samples are needed to support the generalizability of our findings.

This study has some further limitations. First, the data are cross-sectional and were collected through self-reported scales, presenting some well-known biases (i.e., social desirability, lack of introspection, memory recall) that could impact the reliability and temporal stability of the findings. Second, the data were not collected using probabilistic methods but involved convenience sampling, which implies that the results cannot be generalized to the broader population. Third, to keep the questionnaire as short as possible, we did not collect sociodemographic or Internet-use-related questions in-depth. Future studies could collect more of these data to provide further insight on correlates of Instagram motives and usage. Overall, future studies should seek to gather representative data and extend data collection to other groups to augment the generalizability of these findings.

In conclusion, these results are promising and emphasize that both the IMQ and the IUPQ have good psychometric properties and are valuable tools for social network use research. They both are valid and reliable enough to assess different Instagram

motives and patterns of usage that are relevant for youth and for an environment where the need for connection and connectedness continues to increase and where consequences are still elusive to research. Moreover, the IUPQ assesses different, but related usage patterns that could discriminate between a more adaptive engagement with Instagram versus behaviors that could potentially become more problematic, which opens potential routes for further investigation of Instagram use behavior and its consequences.

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Chapter 5. Social comparison orientation, fear of missing out (FoMO) and their relationship with motives and patterns of Instagram use

Abstract

Social networks (SNs) have become part of daily life. Besides their potential benefits, using SNs may also have harmful consequences. While research has identified social comparison orientation (SCO) and fear of missing out (FoMO) as potential predisposing factors for negative consequences of SN use, little attention has been given to how these factors are related to the motivations that underly SN use and to specific usage patterns. Using a dataset from an existing survey study, this study examined the explanatory pathways between SCO, FoMO, motives, and patterns of SN use, focusing on Instagram as a specific SN. A large, varied sample of 4673 Instagram users aged 18-34 ($M = 23.03$, $SD=4.65$) completed a series of online questionnaires including two novel measures: the IMQ and the IUPQ. The relationships between SCO, FoMO, motives, and patterns of Instagram use were calculated using SEM, and indirect effects were calculated using bias-corrected bootstrapping methods. The results indicate that most patterns of use are predicted by five specific motives (social impact seeking, emotional scape, souvenir keeping, attention seeking, and information seeking) and that there are both direct and indirect effects of FoMO on the patterns of Instagram use. SCO was strongly related to FoMO and had both direct and mediated effects on the patterns of use through FoMO. Effects of age and gender on the study variables were also found. These results support the hypotheses that SCO and FoMO are drivers of Instagram use, which has important implications for prevention and intervention purposes, as they denote specific vulnerabilities of youth to engage with Instagram in a harmful way.

Keywords: Instagram, social comparison orientation, fear of missing out, motives, usage patterns.

1. Introduction

The ever-growing availability of Internet applications and the ubiquitous use of smartphones in contemporary society has brought many benefits to users, including better access to information, improved services and more possibilities to develop and maintain social relationships. However, they have also given rise to concerns about their effect on well-being. Phenomena such as Internet addiction and problematic use of social networking sites (SNSs) continue to be recognized and extensively debated (Guedes et al., 2016; Wegmann & Brand, 2019). Since browsing social network platforms has become a standard activity, scholars become increasingly concerned about the potentially harmful consequences of augmented use (Faelens et al., 2021; Foroughi et al., 2021; Tanega & Downs, 2020; Wegmann & Brand, 2019). As a technological medium through which individuals seek to fulfill certain needs, smartphones are not addictive or problematic per se, but they can become problematic when users engage in behavior that can lead to potential negative consequences.

As SNSs as well as their use and potential impact on users differ (Kuss & Griffiths, 2017; Longobardi et al., 2020), observations resulting from studies looking at one SNS may not be generalized to others. Thus, research should take the specificities of particular platforms and behaviors into account (Wong et al., 2019). In that regard, Instagram deserves special attention. Instagram is a photo-based SNS launched in 2010 which rapidly became very popular amongst young adults. At present, it represents the fourth most prominent social networking platform worldwide (Statista, 2022). Yet, it may also be the most dangerous one for well-being (Fuciu, 2019; Royal Society for Public Health, 2017), as it exclusively relies on visual content and capitalizes on the use of idealized images, and users mostly share the highlights and embellished versions of their lives. The platform was the first social media to introduce filters as a built-in feature permitting the manipulation and modification of photos to make them more visually appealing (Longobardi et al., 2020). As a result, an apology for perfection and aestheticism dominates on the platform (Hwang, 2019). Instagram was also the first to introduce *stories*, and new functionalities and features continue to be added regularly to keep up with competing, existing, or emerging social media. These functions make users return to the app more quickly and keep them engaged for longer once they go on the platform (Moore & Craciun, 2021). So, whereas other SNSs focus mainly on building and maintaining social connections, Instagram emphasizes personal identity, the implementation of self-presentation, and self-promoting behaviors (Dumas et al., 2017; Romero et al., 2022a; 2022b). Instagram thus becomes a

facilitator for comparison, since users share many of their daily activities and social experiences on Instagram and expose themselves to a continuous flow of information shared by others, which can trigger comparison processes in individuals with high *social comparison orientation* (Lee, 2020; Vogel et al., 2015). This tendency to compare could potentially lead to specific usage patterns and consequently, to undesired consequences.

Social comparison theory suggests that humans demonstrate a fundamental need to evaluate themselves as a way to reduce uncertainty. In the absence of objective criteria, they fulfill this need by comparing themselves to others (Festinger, 1954). This process is spontaneous, effortless, unintentional, and relatively automatic (Gilbert et al., 1995). As it is associated with uncertainty, periods of stress, novelty, change, performance, and competition can exacerbate it (Gibbons & Buunk, 1999). However, not everyone engages equally in such comparisons, and individuals differ in how they are impacted by them (Gilbert et al., 1995; Gomez et al., 2021). For instance, individuals with low self-esteem, whose self-concepts and mood states are particularly unstable or uncertain could be especially interested in social comparison (Campbell, 1990; Gibbons & Buunk, 1999). This difference in comparison engagement is captured by the concept of *social comparison orientation* (SCO), which refers to an individual's overall tendency to compare opinions and abilities with others and to seek information from others to increase self-understanding (Buunk & Gibbons, 2007; Gibbons & Buunk, 1999; Reer et al., 2019).

As Instagram provides users with endless targets for comparison (Sherlock & Wagstaff, 2019; Vogel et al., 2015), it is possible that individuals with a high social comparison orientation are more drawn to Instagram. In an experimental study, de Vries and colleagues (2018) showed that depending on the participants' SCO tendency, viewing positive Instagram posts from strangers could reduce or increase positive affect. Viewing strangers' positive Instagram posts decreased positive affect among individuals with high SCO but that was not the case in individuals with low SCO, supporting the idea that the effects of exposure to SNSs depend on individual characteristics. In another study, Wang and colleagues (2017) found that the connection between involvement in SNSs and upward social comparison was only significant for participants presenting a high SCO, while users with a low or moderate SCO were less prone to engage in social comparisons when using SNSs. Other studies have found that participants with higher SCO also report more negative feelings resulting from social comparison in SNSs (de Vries et al., 2018; Reer et al., 2019). Interestingly, it has also been reported that individuals with high

levels of SCO process social information obtained from social media in a different way than those with lower SCO and that they used Facebook with increased intensity, reported more frequent social comparison and more negative feelings stemming from that comparison (Lee, 2014). In another experiment among girls aged 14-18, SCO was shown to moderate the reactions to strangers' idealized Instagram posts: when photos were retouched, they reported lower body satisfaction than when photos were not modified, and these negative effects on body image were stronger among the girls who reported higher SCO (Kleemans et al., 2016). This suggests that the levels of SCO could have an effect on why and how people choose to engage with Instagram, thus leading to different potential consequences.

Another concept, closely related to SCO, that is believed to be a predisposing characteristic for developing problematic SNSs use is *fear of missing out* (FoMO) (Billieux et al., 2015; Blackwell et al., 2017; Franchina et al., 2018; Przybylski et al., 2013). This phenomenon has been defined as *"a pervasive apprehension that others might be having rewarding experiences from which one is absent"* (Przybylski et al., 2013, p.1841), and is thought to derive from the individual's need for interpersonal attachment (Franchina et al., 2018). FoMO is associated with a strong urge to stay informed about what others are doing, which can be easily achieved through SNSs use. It is believed that people with higher levels of FoMO turn to social networks for satisfying their need for connection (Przybylski et al., 2013). Although the direction of the relationship between SNSs use and FoMO has not been clearly established, some authors have suggested that it is likely reciprocal, with individuals' initial levels of FoMO driving SNSs use, and SNSs use fuelling FoMO in return (Buglass et al., 2017). This reciprocal relationship concurs with the distinction between trait FoMO and a more situational or context-related FoMO that can be exacerbated by social networks (Oberst et al., 2017): Trait FoMO may draw individuals towards using Instagram, while situational or context-related FoMO may be triggered by content consumption, or be a result of the overall Instagram experience.

A number of studies have demonstrated a robust positive association between FoMO and increased and compulsive use of Instagram (Balta et al., 2020; Moore & Craciun, 2021). In a recent paper, Sun (2022) reported that FoMO mediates the relationship between certain motives of Instagram use (i.e., surveillance, documentation, and coolness) and the problematic use of the app. However, the relationship between SCO and FoMO has received surprisingly scarce scientific attention. Since FoMO is concerned with the cognitive evaluation of one's own

experiences, it implies social comparison processes and is, therefore, by definition associated with social comparison orientation (Reer et al., 2019).

In addition to *social comparison orientation* and *fear of missing out*, people's *motives* for the use of SNSs have also been proposed as predictors of engagement in problematic social network use (Stockdale & Coyne, 2020; Wong et al., 2019). While most studies of problematic SNS use have looked at relationships between the general use of SN platforms and indicators of psychosocial functioning, without much theoretical foundation (Blackwell et al., 2017; Foroughi et al., 2019; Reer et al., 2019), the role of motivations is more grounded in psychological theory. It is also supported by empirical evidence indicating that motivations for use are better predictors of psychosocial outcomes of SNSs than the frequency of use (Oh et al., 2014, cited by Wong et al., 2019). Yet, thus far the role of motivations and their effect on patterns of use have remained somewhat overlooked for Instagram use (Stockdale & Coyne, 2020). Moreover, the few studies that investigated motives and patterns of Instagram use looked at multiple SNSs at once without considering the specificities of the social network involved and used questionnaires with limited conceptual validity. For instance, they either simply consisted of lists of motives derived from previous literature or were mere adaptations of questionnaires that had been developed for other SNSs or Internet addiction (Alhabash & Ma, 2017; Huang & Su, 2018). In the case of *Instagram use patterns*, it is quite common to understand use as membership, *time spent on the platform*, type of content exposed to, or to make a distinction between *active* and *passive use*, without considering the actual behaviors taking place in the SN (Cataldo et al., 2022; Faelens et al., 2021). To overcome some of these limitations, Romero et al., (2022a) developed two questionnaires: the Instagram Motives Questionnaire (IMQ) which covers six distinctive Instagram motives, and the Instagram Uses and Patterns Questionnaire (IUPQ), which measures six distinctive usage patterns. These instruments make it possible to study the relationships between the motives and the patterns of Instagram use, and to explore their associations with SCO and FoMO as potential predisposing factors of social network engagement.

Drawing on the theoretical concepts outlined above, three hypotheses have been outlined to undercover possible mechanisms that explain Instagram use patterns. First, the reasons why people use Instagram can be strong predictors of actual use behavior. In this particular case, we hypothesize that distinctive motives will predict distinctive usage patterns. Consequently :

H1: Motives of Instagram use explain the patterns of Instagram use.

Secondly, trait FoMO may attract individuals to use Instagram to answer their need to connect with others. It can thus be assumed that trait FoMO will relate to the motives of use, and that individuals with high FoMO will exhibit specific motives for engaging with the platform.

H2: Fear of missing out (FoMO) explains the patterns of Instagram use through a direct effect and an indirect effect mediated through the motives of Instagram use.

Finally, social comparison orientation, or the tendency to compare oneself to others, may induce an affective experience whereby users feel that their lived experiences are not as valuable as others'. This may trigger trait FoMO, which can, in turn, induce specific motives and usage patterns. Consequently :

H3: Social comparison orientation predicts the patterns of Instagram use through three mechanisms: a direct effect, an indirect effect mediated by FoMO, and a further indirect effect mediated by the motives of Instagram use.

The hypothetical model for this study is shown in Figure 1, where both the direct and mediated effects have been delineated.

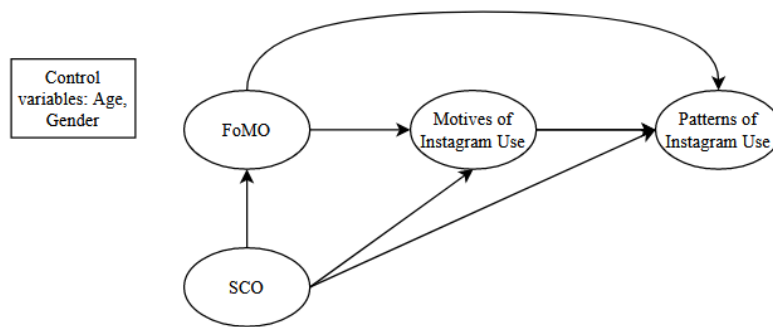


Figure 1. Investigated model on the relationships between SCO, FoMo, motives and patterns of Instagram use.

2. Methods

The dataset analyzed in this paper is a subset of the data collected for the study on the development of the IMQ and IUPQ, described in Chapter 4. The analyses presented in this chapter are different and present a more in-depth analysis of the variables under study. Only complete data of all the measures indicated in the Instruments section were considered for the analyses.

2.1 Participants

The total sample comprised 4673 participants (23.9% men and 76.1% women). Their mean age was 23.03 years ($SD = 4.65$). Most of the sample was educated: 67.5% were undergraduate students, and 21.2% were pursuing graduate studies. The sample was varied, with participants answering the questionnaires in English (26.6%), French (27.8%), and Spanish (45.5%). All the demographics and Instagram use information are reported in Table 1.

2.2 Instruments

Iowa-Netherlands Comparison Orientation Measure (INCOM, Gibbons & Buunk, 1999). This instrument contains 11 items that measure the tendency of people to compare themselves to others in terms of their abilities and opinions (e.g., “I often compare how I am doing socially, e.g., social skills or popularity, with other people”). The items are scored on a Likert scale ranging from 1-5 (totally disagree-totally agree). Nothing in their wording suggests that they account only for experiences happening online or in social networks. The authors explain that although a two-factor structure emerged across multiple samples, a single-factor structure fits the data fairly well, thus measuring the same underlying construct and they advise using the complete scale. For this study, it was taken as a single measure and Cronbach’s alphas ranged from .82 to .86.

Fear of Missing Out Scale (FoMOs scale, Przybylski et al., 2013). The unidimensional FoMO scale has ten items (e.g., “I get worried when I find out my friends are having fun without me”) to be scored on a 4-point Likert-type response scale (1- not at all true of me, 4- very true of me). The scale has been used in numerous studies and has shown a relationship with problematic social network use. In this study, its reliability was good (Cronbach $\alpha = .79$ to .89).

Table 1. Sociodemographics and Instagram use information

	<i>n</i> =4673
Age in years, M(SD)	23.03(4.65)
Range	18-34
Gender <i>n</i> (%)	
Men	1116(23.9)
Women	3557(76.1)
Language (%)	
English	1245(26.6)
French	1300(27.8)
Spanish	2128(45.5)
Education level (%)	
High school	5.5
Technical	5.9
Undegraduate	67.5
Graduate	21.2
Social Networks Used other than Instagram (% Yes)	
Facebook	78
Messenger	59.2
Snapchat	41.5
TikTok	48.8
Whatsapp	78.9
Twitter	41
YouTube	81.6
Others	8
Instagram Profile status (%)	
Public	38.4
Private	61.6
Years Using Instagram (%)	
Less than a year	.7
1-2 years	10.5
2-5 years	37.4
More than 5 years	51.4
Number of Instagram profiles (%)	
One	60.8
More than one	39.2
Time of Instagram use per day M(SD)	88.3(196.9)
Range	0-960
Use for business or self-promotion	
No	79.3
Yes	20.7
Time spent since COVID-19 outbreak (%)	
Decreased	8.6
Increased	70.4
No change	21

Instagram Motives Questionnaire (IMQ, Romero et al., 2022a). This instrument consists of 32 items measuring six different motives for using Instagram, i.e.: Social Impact Seeking (SIS), Emotional Escape (EE), Souvenir Keeping (SK), Social Connection (SC), Attention Seeking (AS), and Information Seeking (IS). The items are scored on a Likert scale ranging from 1 (does not describe me at all) to 5 (describes me extremely well). This questionnaire has proven valid and reliable for its use in English, Spanish, and French (Cronbach $\alpha = .79$ to $.90$.)

Instagram Usage Patterns Questionnaire (IUPQ, Romero et al., 2022a). This instrument has 37 items and measures six distinctive but related patterns of Instagram use: Loss of Control (LC), Anxious Posting (APO), Passive Use (PU), Social Approval (SAP), Feelings of Discomfort (FD), and Self-Deprecating Comparison (SDC). The items are scored on a Likert scale ranging from 1 (never) to 5 (always). This questionnaire has shown good validity and reliability for its use in English, Spanish and French (Cronbach $\alpha = .72$ to $.91$.)

2.3 Procedure

Data collection was conducted online between June and October 2021. Links to the survey hosted on Qualtrics and containing the abovementioned questionnaires as well as questions on the demographic characteristics in three languages (English, French and Spanish) were distributed by collaborators from English, French, and Spanish-speaking universities through advertisements, emails, university participant pools, and social media. A motivating text accompanied dissemination. To be allowed to participate in the study, participants had to (a) be aged 18-35, (b) have an Instagram profile, (c) have completed high school, and (d) be fluent in English, French or Spanish. Participants were asked to give informed consent prior to participating and were informed that anonymity and confidentiality were guaranteed. Participants could enter a raffle for winning one of ten €15 vouchers (or the equivalent in their local currency). Some partner universities gave credits to students completing the survey as an alternative. No personal data were collected that could potentially identify them, except for email addresses or student codes when incentives were offered. Further information on the data collection procedure and other measures used is given in Chapter 4. The study received approval from the IPSY Ethics Committee of the Université catholique de Louvain and ethical clearance from the Institutional Review Boards of the partner universities in Australia, the United States, and Perú.

2.4 Data analysis

Structural equation modeling (SEM) was used to test the research hypotheses. Analyses were run on the *lavaan* package (Rosseel, 2012) in R (R core team, 2013). Since the scale scores were obtained from a Likert-type response format, data were treated as ordinal, using the mean and variance-adjusted weighted least squares estimator (WLSMV) to address ordinal categorical data in the SEM methodology (Li, 2016; Mindrila, 2010; Rhemtulla et al., 2012; Savalei & Rhemtulla, 2013; Shi & Maydeu-Olivares, 2020; Xia & Yang, 2019). Since chi-square is known to be sensitive to sample size, alternative goodness of fit indices were used to assess model fit, namely the Root Mean Square Error of Approximation (RMSEA), the Standardized Root Mean Square Residual (SRMSR), the Comparative Fit Index (CFI), and the Tucker-Lewis index (TLI). A non-strict approach was taken for the interpretation of these indices, whereby values of RMSEA <.08, RMSEA CI <.10, SRMR <.09, CFI, and TLI >.90 were considered acceptable (Chen et al., 2008; Hu & Bentler, 1999; Lai & Green, 2016; Kline, 2010; Rudnev et al., 2018). Scaled fit indices were also obtained and reported for transparency (Xia & Yang, 2019). The literature suggests using scaled and non-scaled fit indices with caution, as their value depends on the chosen estimation method. As cutoff points were created to be used with the ML estimator, extending their interpretation to other methods can be problematic (Beauducel & Herzberg, 2006; Li, 2016; Shi & Maydeu-Olivares, 2020; Xia & Yang, 2019). The analyses were performed on the 4673 complete responses as SEM requires complete data (Carter, 2006). Missing cases were thus excluded from analyses using listwise deletion.

Since the research questions are concerned with understanding the mechanisms underlying the different patterns of Instagram use, three complementary models were run to address all three hypotheses. The models were generated following the guidelines of Baron & Kenny (1986). The first model (Model 1) was concerned with finding the direct effects of motives, FoMO, and social comparison orientation on Instagram use patterns. The second model (Model 2) dealt with finding the effects of FoMO and social comparison on motives of Instagram use. The third model (Model 3) dealt with the effects of social comparison on FoMO. Each model had to be run separately to estimate the parameters correctly. To estimate the effects behind the mechanisms, each model had to include all the variables that could be presumed to bias (confound) the parameter estimates (e.g., for the first model, not including FoMO and SCO latent variables could bias the parameter estimates of the motives, as our hypothesis contemplates these variables

mediate in some way the effects of the motives on the patterns). The three models were tested, and then the first two were adjusted, leaving out the variables that did not show significant effects, thus pursuing more restrictive models where the parameters are adjusted to zero, Model 1r and Model 2r, respectively. These adjusted models are thus more parsimonious. Finally, to test the significance of the indirect (mediating) effects, a bootstrapping method with 1000 bootstrap samples was used, and 95% bias-corrected confidence intervals were found (Efron, 1987; Efron & Tibshirani, 1993; Templ, 2016).

All models were controlled for age and gender, assuming that these variables could be confounders of the effects of interest. Specifically, it was assumed that younger people and women would exhibit more SCO and FoMO and different motivations or distinctive patterns of Instagram use than men and older people (Beyens et al., 2016; Kuss & Griffiths, 2017; Ozimek & Bierhoff, 2016; Przybylski et al., 2013; Tifferet, 2020; Verduyn et al., 2021; Yau & Reich, 2018). Age was specified as the observed age value minus the minimum age value observed in the sample (18 years old), while the reference category for the gender variable was “male.” This was done to ease the interpretation of the parameters and to avoid extrapolating effects beyond the range of any of the variables.

A graph integrating the results of the three models and explaining the nature of the relationships for each included variable is presented in the results. Only the most relevant estimates will be shown based on the MAGIC criteria (Abelson, 2012) and statistical significance (Cohen, 1988; Sawilowsky, 2009).

3. Results

Table 2 shows the mean and standard deviations of all the study variables and the correlations between the motives of Instagram use, patterns of use, FoMO and SCO obtained in the sample. It is worth noticing that most of the correlations between the motives and the patterns of use are moderate to high, and that PU correlated inversely with most motives (SIS, SK, SC, AS) and positively with others (EE, IS). Importantly, FoMO and SCO held moderate to high correlations with the AS and IS motives, and high correlations with the LC, APO, SAP, FD, and SDC usage patterns. Finally, FoMO and SCO had a high correlation ($r = .70$).

Table 2. Descriptives and correlations between the study variables

	Mean (SD)	2	3	4	5	6	7	8	9	10	11	12	13	14
1. SIS	1.94(.87)	.35	.57	.65	.84	.42	.21	.35	-.46	.61	.50	.26	.29	.11
2. EE	3.13(.85)	-	.35	.51	.45	.78	.63	.39	.27	.41	.47	.44	.43	.39
3. SK	2.72(1.17)		-	.63	.60	.43	.26	.27	-.40	.49	.37	.25	.29	.17
4. SC	2.59(1.01)			-	.64	.64	.37	.37	-.19	.51	.49	.33	.37	.25
5. AS	2.33(1.02)				-	.58	.42	.58	-.35	.88	.71	.53	.56	.43
6. IS	3.12(.93)					-	.62	.47	.18	.54	.57	.50	.53	.44
7. LC	2.95(.86)						-	.55	.28	.55	.78	.65	.57	.46
8. APO	2.38(1.06)							-	.18	.80	.83	.83	.69	.62
9. PU	3.33(.88)								-	-.17	.05	.24	.09	.23
10. SAP	2.77(.87)									-	.80	.70	.65	.52
11. FD	1.79(.68)										-	.82	.79	.54
12. SDC	2.61(.93)											-	.78	.73
13. FoMO	2.37(.80)												-	.70
14. SCO	3.26(.72)													-

Note: Correlations at latent variable level, all significant at $p < 0.001$

Motives: Social impact seeking (SIS), Emotional Escape (EE), Souvenir Keeping (SK), Social Connection (SC), Attention Seeking (AS), Information Seeking (IS).

Patterns of use: Loss of control (LC), Anxious Posting (APO), Passive Use (PU), Social Approval (SAP), Feelings of discomfort (FD), Self-deprecating comparison (SDC). FoMO: Fear of missing out; SCO: Social comparison orientation.

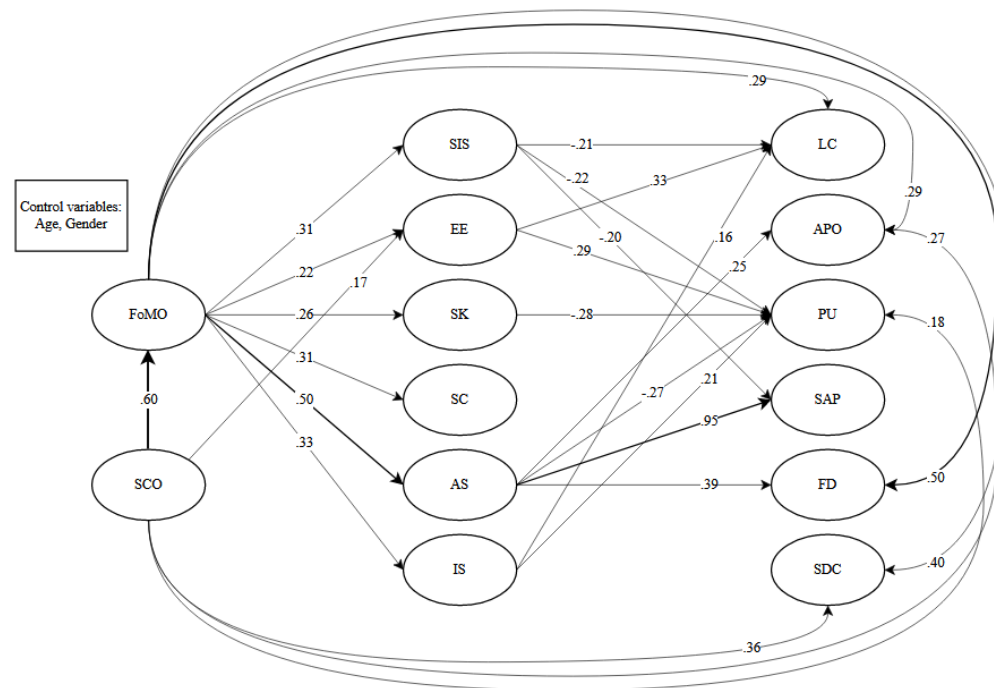


Figure 2. Estimated relationships for SCO, FoMO, Motives, and Patterns of Instagram use. Lines indicate relevant effects based on statistical significance and MAGIC criteria, and thickness indicates their magnitude. All effects are significant at $p < 0.001$.

Table 3. Statistics and fit indices for the investigated models

<i>Models</i>	<i>n</i>	χ^2	<i>df</i>	<i>p</i>	CFI	CFI scaled	TLI	TLI scaled	NNFI	NNFI scaled	SRMR	RMSEA	RMSEA scaled
Model 1	4673	64530.17	3902	<0.001	.961	.846	.961	.845	.961	.846	.064	.070	.058
Model 1(r)	4673	64235.47	3928	<0.001	.960	.847	.960	.847	.960	.847	.065	.071	.057
Model 2	4673	30851.70	1338	<0.001	.961	.879	.962	.881	.962	.881	.069	.077	.069
Model 2(r)	4673	30031.19	1341	<0.001	.961	.883	.962	.884	.962	.884	.069	.077	.069
Model 3	4673	8534.67	207	<0.001	.958	.889	.962	.898	.962	.898	.074	.080	.093

Table 3 shows the chi-square statistic, degrees of freedom, and fit indices for the three proposed models. All models produced acceptable fit indices. The restricted models (Model 1r and 2r) showed equally good fit indices as the full models. Importantly, residuals graphs and modification indices did not show any relevant information that could justify introducing further adjustments to the models to increase the model's fit. Therefore, the restricted models are considered the final models, as they are equally good as the full models in terms of fit, yet they are more parsimonious.

Relationships between motives and patterns of Instagram use

Figure 2 graphically represents the estimated relationships between motives and patterns of Instagram use, SCO and FoMO. The figure shows that different motives are related to various patterns of Instagram use, which confirms our first hypothesis according to which different motives would be associated to different usage patterns. Specifically, while SC is not significantly related to any of the usage patterns, and SK is only negatively related to PU ($\beta = -.28, p < .001$), EE is related to LC ($\beta = .33, p < .001$) and PU ($\beta = .29, p < .001$), and IS to LC ($\beta = .16, p < .001$) and PU ($\beta = .21, p < .001$). SIS is negatively related to LC ($\beta = -.21, p < .001$), PU ($\beta = -.22, p < .001$), and SAP ($\beta = -.20, p < .001$). Finally, AS is moderately related to four usage patterns, and has a large influence on SAP ($\beta = .95, p < .001$).

Effect of Fear of Missing Out

Concerning hypothesis 2, regarding the effect of FoMO on the motives and Instagram use patterns, both direct and indirect significant paths are observed (Figure 2). Specifically, FoMO is directly related to four of the six use patterns, with small effects on LC ($\beta = .29, p < .001$) and APO ($\beta = .29, p < .001$), and medium-size effects on FD ($\beta = .50, p < .001$) and SDC ($\beta = .40, p < .001$). In contrast, FoMO does not directly influence PU or SAP in a significant way. In terms of indirect effects, some mediating effects on the relationship between FoMO and use patterns are found for the AS motive, with the largest indirect effects being on FD ($\beta = .20, p < .001, 95\% \text{ CI } [.18, .22]$) and SAP ($\beta = .48, p < .001, 95\% \text{ CI } [.42, .54]$). No other significant mediating effects are noted. Thus, it can be concluded that most of the effects of FoMO on the use patterns follow a direct path rather than mediating ones through motives, except for the AS motive.

Effect of Social Comparison Orientation

Our last hypothesis stated that *social comparison orientation* (SCO) would have an effect on the patterns of Instagram use both directly and indirectly, via mediation through FoMO and the motives of Instagram use. The data provided partial support for all three of these predictions. Firstly, a small direct effect is observed of SCO on three usage patterns: APO ($\beta = .27$, $p < .001$), PU ($\beta = .18$, $p < .001$), and SDC ($\beta = .36$, $p < .001$). Secondly, indirect effects are found of SCO on use patterns mediated by the EE motive, the largest of which is the mediated effect on LC ($\beta = .06$, $p < .001$). These effects are very small and as such do not contribute much to explaining the influence of SCO on use patterns. In contrast, there is a significant mediating effect of FoMO: the latter is significantly predicted by SCO ($\beta = .60$, $p < .001$), while SCO significantly influences some of the Instagram use patterns through FoMO, although with relatively small effects: LC ($\beta = .17$, $p < .001$, 95% CI [.15, .19]), APO ($\beta = .17$, $p < .001$, 95% CI [.15, .19]), FD ($\beta = .30$, $p < .001$, 95% CI [.27, .32]) and SDC ($\beta = .24$, $p < .001$, 95% CI [.22, .26]). However, although the effects from SCO to FoMO and from FoMO to motives are moderate to strong, they lose their strength when the full mediating effects are considered. Taking the path SCO $\rightarrow$ FoMO $\rightarrow$ SIS $\rightarrow$ LC as an example, the full mediation is $\beta = .60 \times .31 \times -.21 = -.04$, which is too weak for drawing useful conclusions. The only paths that show interpretable mediation effects are SCO $\rightarrow$ FoMO $\rightarrow$ AS $\rightarrow$ SAP ($.60 \times .50 \times .95 = .29$, $p < .001$, 95% CI [.25, .32]) and SCO $\rightarrow$ FoMO $\rightarrow$ AS $\rightarrow$ FD ($.60 \times .50 \times .39 = .12$, $p < .001$, 95% CI [.11, .13]). It is, therefore, safe to conclude that the effect of SCO on Instagram use patterns either follows a direct path or an indirect path mediated by FoMO.

Effect of gender and age

When controlling for gender, the data show differences between men and women for FoMO, motives, and usage patterns, although these differences are small. Women show a tendency to use Instagram more often for souvenir keeping ($\beta = .14$, $p < .001$) and more often the LC ($\beta = .18$, $p < .001$), APO ($\beta = .15$, $p < .001$), SAP ($\beta = .15$, $p < .001$) and SDC patterns ($\beta = .22$, $p < .001$) than their male counterparts. In terms of age, for each unit of change above the age of 18 years, a lower score is observed for FoMO ($\beta = -.18$, $p < .001$), EES ($\beta = -.16$, $p < .001$), SC ($\beta = -.17$, $p < .001$), IS ($\beta = -.18$, $p < .001$), APO ($\beta = -.22$, $p < .001$), FD ($\beta = -.19$, $p < .001$) and SDC ($\beta = -.16$, $p < .001$).

4. Discussion

As the use of social networking sites (SNSs) can become problematic and produce negative consequences, there is a need to identify the factors that may predispose problematic SNS use through empirical research that is grounded in relevant theory and that takes the specific characteristics of particular platforms into account. This study aimed to provide a deeper understanding of the mechanisms underlying Instagram use by testing the relationships between *social comparison orientation* (SCO), *fear of missing out* (FoMO) with the motives for Instagram use, and particular patterns of use (measured by two novel instruments, the IMQ and the IUPQ). Although these aspects have all been highlighted in the literature as potentially important factors in predicting problematic SN use, their interactive effects and the pathways through which they operate have thus far not been established.

The first finding emerging from the study is that different patterns of Instagram use are explained by different motives of use. For instance, *passive use of Instagram* is positively related to emotional escape and information-seeking motives, and negatively to attention seeking, souvenir keeping, and social impact seeking. This is not surprising, as emotional escape and information seeking can be fulfilled by scrolling or watching content without actively interacting, while attention seeking, souvenir keeping and social impact seeking motives might need an active use of the platform to get fulfilled (posting, uploading stories, liking, commenting). Another pattern of Instagram use, *loss of control*, is explained by three motives: (a) emotional escape seeking, whereby users connect to Instagram to cope with painful or negative affective states; (b) information seeking, where they wish to see what is happening in other people's lives, or in the world, and possibly use that information to compare themselves; and (c) social impact seeking. Emotional escape and information seeking have a strong emotional component, which may explain the positive relationship with loss of control, as users driven by these motives are likely to stay on the platform for longer than they intend to. Social impact seeking is negatively related to loss of control, meaning that the more a user engages with Instagram to make a positive impact, inspire and raise awareness among others, the less they will exhibit loss of control. This could be explained by the fact that this motive entails a more purposeful use of the platform and targeted actions. Social impact seeking is also negatively related to *passive use* and *social approval*, which suggests that this motive is more characteristic of individuals who have more conscious or aware use of the platform, and have a clear purpose or a controlled use.

Finally, *anxious posting*, *social approval*, and *feelings of discomfort* are all related to a common motive: attention seeking (AS). Seeking social approval on Instagram, in particular, seems to be very strongly motivated by attention seeking. This concurs with other studies that demonstrated that people seek to fulfill the basic human needs of recognition, validation, approval, belongingness, and uniqueness by creating favorable online self-presentations (Dumas et al., 2020; Franchina et al., 2018; Yau & Reich, 2018). Several studies have shown that young people are very aware that how others perceive them varies depending on what they post (Boyd, 2014; Yau & Reich, 2018), and that selecting good images, crafting posts and stories, uploading them at the right time, and monitoring likes and reactions is important to be successful on Instagram (Ross, 2019). This is what these use patterns portray.

Self-deprecating comparison is a specific Instagram usage pattern in which the user engages in upward social comparison, resulting in a negative comparison. It is noted that this pattern is not explained by any of the six motives for Instagram use considered in our study. Instead, it is mainly defined by the person's *social comparison orientation*, both directly and through mediation by *fear of missing out*. While the role of social comparison and fear of missing out were expected, the fact that this use pattern is not related to any motives may be because the IMQ does not cover all potential motives, only the most common ones. It may thus be that other motives explain this pattern. Another possible explanation is that SCO, FoMO and *self-deprecating comparison* are relatively automatic and internalized. So, comparing oneself on Instagram is independent of one's motives, and mostly driven by individual predisposing factors. However, more research is needed to test for these explanations.

It is also worth noting that the *social connection* motive, which refers to using Instagram to satisfy a need for connection and to maintain social relationships, does not predict any use patterns. While participants may recognize that they use Instagram to fulfill social connection needs (see Romero et al., 2022b), and while it may be the main stated purpose of these social networks, it is possible that their actual Instagram usage fulfills more individualistic needs and focuses on self-presentation, leading users to turn to other SNs to satisfy their need for connection and relatedness (Kim & Kim, 2019; Yau & Reich, 2018). Future research should further investigate this difference between what participants report as their motives, and their actual use of the platform.

In addition to the Instagram users' motives, our study also considered the role of *fear of missing out* (FoMO) in relation to use patterns. The findings show that this factor is directly related to all of the motives and four of the six use patterns. This is not surprising, as Instagram provides a continuous stream of information regarding other people's activities and experiences (Przybylski et al., 2013; Reer et al., 2019), making individuals with high trait FoMO more drawn to it. It is also interesting to note that the relationship between trait FoMO and two of the use patterns (social approval seeking and feelings of discomfort) is mediated by the attention-seeking motive. These direct and indirect effects of FoMO on the usage patterns highlight its importance as a predisposing factor for social media use and, specifically, Instagram use (Baker et al., 2016; Blackwell et al., 2017; Przybylski et al., 2013; Whillans et al., 2017). It has been claimed that negative affect is an important component of FoMO, and that it may be strongly associated with lower global self-worth and self-perceived social acceptance (Burnell et al., 2019). As argued by other researchers (Franchina et al., 2018) a possible explanation for this finding is that trait FoMO can trigger behaviors on Instagram such as heavily editing pictures and stories, or removing a post when it does not reach the desired reaction as an attempt to gather or confirm information about the self.

Another predisposing factor for Instagram use is *social comparison orientation* (SCO). In our sample, this factor has a direct effect on three of the use patterns (self-deprecating comparison, anxious posting, and passive use), but most of its effects are mediated by FoMO. This makes theoretical sense, as FoMO, which relies on a comparison process, is preceded by SCO. Our findings also align with those emerging from the few studies that have examined the connection between trait FoMO and SCO (Reer et al., 2019; Gomez et al., 2021). Thus, we can assume that individuals with higher comparison orientation tendencies will be more afraid of missing out on exciting experiences and more drawn to Instagram which offers endless comparison targets (Fox & Moreland, 2015; Sherlock & Wagstaff, 2019). They will also expose themselves to other people's information on Instagram, regardless of whether it is positively biased, edited, or filtered, which, in turn, will result in distinctive use patterns. One mechanism that is particularly worth noting in this regard is the pathway SCO → FoMO → AS → SAP: individuals with a high tendency to compare themselves to others are more likely to be afraid of missing out, need attention drawn to themselves, and as such will be more likely to engage in a social approval pattern in which they purposefully seek likes and reactions by crafting beautiful stories and posts. This pathway nicely illustrates the intricate interplay between predisposing factors, specific motives, and Instagram usage patterns.

In our study, attention was paid to gender and age as potential confounding factors and added to the model to account for that possibility. Some small significant effects were noted. Women seem to have a higher tendency to use Instagram for *souvenir keeping* than men and tend to exhibit more *loss of control*, *anxious posting*, *social approval*, and *self-deprecating comparison* use patterns than men. This is consistent with previous studies suggesting that women are more involved in SNs than men and that they have a higher tendency to compare themselves to others, both generally and specifically in terms of physical appearance (Bue, 2020; Sheldon & Bryant, 2016; Jablonska & Zajdel, 2020; Tiggerman et al., 2018; Yurdagul et al., 2019). Future research with the IUPQ should further investigate these differences and explore to what extent there is indeed a differential use in both genders. Regarding age, it is noted that with every additional year of age (starting from the baseline age of 18 years), individuals present lower levels of FoMO, as has also been reported elsewhere (Ozimek and Bierhoff, 2016; Przybylski et al., 2013). Also, with increasing age, individuals exhibited lower *emotional escape-seeking*, *social connection-seeking*, and *information-seeking* motivations, and exhibit less *anxious posting*, *feelings of discomfort* and *self-deprecating comparison* usage patterns. As age is a proxy for life stage, it can be assumed that after late adolescence and once the individual enters adult life, other developmental tasks take place and that the motives and patterns of Instagram use change accordingly. This assumption, however, needs to be further investigated, preferably through longitudinal research.

The finding that SCO and FoMO have an effect on the motives and patterns of Instagram has important implications for future research. Future studies should investigate these associations in a more detailed way and extend the knowledge by including other potential predisposing factors. For intervention purposes, the relationship between SCO, FoMO, motives, and Instagram use patterns is also relevant since it points out a specific vulnerability of some individuals at risk of engaging with Instagram in a harmful way. Extending these findings could inform targeted interventions to address these vulnerabilities. Furthermore, other models should be tested, using measures of situational or context-related FoMO, changing the place of FoMO in the hypothesized models, and testing if the relationships are reciprocal, as the literature suggests.

This study has several limitations. First, although the study's sample was quite large and composed of the core group of Instagram users, it was not representative, and differences in use might not have been captured accurately. With 76% of the study sample, women were overrepresented, and 88% of the participants were

educated, either pursuing a university degree or higher, which is not the case for the general population. Internet samples tend to be biased in favor of those who are more educated and who can access the internet (Gosling & Mason, 2015), which reduces the possibility to generalize from study findings. Also, they engaged in several SNs besides Instagram, such as Facebook, YouTube, and Whatsapp, and the majority (88%) had been using Instagram for more than two years, and their continued and varied use of platforms could have impacted the results. On the other hand, the composition of the sample guaranteed that the participants are habitual SNs and Instagram users, have a good knowledge of how they work, and how they affect them. As such, the results are likely to paint an adequate but incomplete picture of the mechanisms explaining Instagram use.

A second limitation is that the study's design was cross-sectional and therefore does not allow to test for causality, as would have been possible with a longitudinal study. This limitation is important as the objective of the study was to analyze the mechanisms behind Instagram use patterns. While trait FoMO can be considered a *predisposing* factor for problematic Instagram use, situational FoMO could be considered a potential *maintaining* factor of the behavior. Using longitudinal studies, and particularly experience sampling, could serve to disentangle the complex relationship between trait and situational FoMO and its impact on problematic use. Thirdly, the study only contains self-reported data, which makes it subject to social desirability and recall bias. Using self-reported data also implies that only consciously available characteristics can be examined. Since many Instagram motives and uses are automatic, participants may not be aware of what drives their use. As such, the self-reports could be inaccurate.

Despite these limitations, this study succeeded in obtaining novel information and describing interesting relationships between different predisposing factors and the motives and patterns of Instagram use. To our knowledge, these interactions have not previously been tested before, thus the findings of this study are of value. Importantly, by using the IMQ and IUPQ, the study made use of well-validated instruments to measure motives and patterns of Instagram use, going beyond the measurement of Instagram use in terms of membership, time spent, and considering active and passive use of the platform only, to consider specific usage patterns as outcome behaviors.

To conclude, this study adds to the literature on problematic Instagram use by being the first to empirically examine the connections between SCO, FoMO, and specific motives and patterns of Instagram use. This provides a better

understanding of the pathways to Instagram use and supports the claim that social network use needs to be investigated thoroughly. After all, what matters is not if, but *why* and *how* individuals use these novel platforms.

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Chapter 6. Patterns of Instagram use and their effect on mental health outcomes

Abstract

Social networks (SNs) are omnipresent in daily life, yet besides the potential benefits of social media use, there is also a growing awareness of their potentially harmful consequences on well-being. Despite the growing number of empirical studies, systematic reviews, and meta-analyses on these consequences, results are consistently inconclusive. One explanation for this is the heterogeneity and lack of specificity in the definitions and measurement of SNs use patterns. Using a dataset from an existing online survey, this study attempts to overcome this problem by examining potential pathways of the relationship between Instagram use, measured using a validated questionnaire (IUPQ) measuring six specific Instagram use patterns (loss of control, anxious posting, passive use, social approval, feelings of discomfort, and self-deprecating comparison) and symptoms of psychological burden (depression, anxiety, and stress) considering loneliness as a mediator. A large, varied sample of 4637 Instagram users aged 18-34 ($M = 23.05$, $SD=4.64$) completed the IUPQ, the Depression, Anxiety and Stress (DASS-21) Scale, and the UCLA Loneliness scale. The results indicate that four patterns of use have articulable, significant, distinctive small effects on depression, stress, and anxiety. Additionally, loneliness mediates these paths with similar small effects. These findings support the hypotheses that different uses of Instagram may lead to different outcomes and suggest that loneliness is a key psychological state to target in efforts to buffer the negative impact of Instagram use on psychological health.

Keywords: Instagram, usage patterns, psychological burden, depression, stress, anxiety, loneliness

1. Introduction

Since their emergence a few decades ago, social networking sites (SNS) have attracted billions of users worldwide and have become omnipresent in contemporary society (Chaffey, 2022; Rozgonjuk et al., 2020). Although SNS offer numerous advantages such as social connectivity, entertainment, accessibility of information, creative expression, and exchange of opinions and ideas (Longobardi et al., 2020), the scientific literature has warned against the potentially harmful consequences that may result from their use (Faelens et al., 2021; Foroughi et al., 2021; Tanega & Downs, 2020; Wegmann & Brand, 2019). Consequently, research into the impact of SNS use on well-being has accumulated rapidly (Valkenburg et al., 2022).

Instagram is a photo-sharing social networking site (SNS) launched in 2010 that now represents the fourth most important SNS behind Facebook, YouTube, and Whatsapp (Statista, 2022a). It is particularly popular amongst younger generations as over 70% of users are less than 34 years old (Statista, 2022b). Instagram use, as measured by Instagram membership, daily time of use, or content exposed to, does not systematically produce adverse outcomes, as there is no conclusive evidence for a direct association between its use and poor mental health (Faelens et al., 2021; Rozgonjuk et al., 2020). In fact, an opposite relationship could just as well be assumed since poor mental health has also been found as a predisposing factor for problematic SNS use (Brand et al., 2019; Wegmann & Brand, 2019).

Moreover, accumulated research on the relationship between social media use and well-being has proven to be complex, leading to conflicting results and reporting both positive and negative as well as non-significant relationships (Karsay et al., 2022; Orben, 2020; Orben et al., 2022; Schemer et al., 2021). Recent umbrella reviews (i.e. reviews of reviews and meta-analyses) have ratified that the reported associations of SNS with well-being are inconclusive (Appel et al., 2020; Meier & Reinecke, 2021; Valkenburg et al., 2022), leading to questions on how to advance in the field and provide nuance and agreement to research (Valkenburg et al., 2022). Since previous studies have been quite heterogeneous in their approaches, both methodologically and in terms of the instruments used to assess the variables of interest, some scholars call for caution in over-interpreting the links between self-report SNS use and well-being (Orben et al., 2022; Satchell et al., 2021; Valkenburg et al., 2022), while others suggest defining more specific types of social media use and to hypothesize how and why certain patterns of use could affect mental health. The present study builds on the latter recommendation by examining specific Instagram use patterns, measured with a new instrument, the

IUPQ (Romero et al., 2022), to investigate how these patterns are related to mental health outcomes. It also tests whether loneliness acts as a mediator between specific usage patterns and mental health outcomes. Since not every kind of Instagram use is problematic, we theorize that when users are more invested in their posting (i.e., when they make a large effort to craft beautiful and aesthetically attractive posts) and expect recognition and validation through likes and comments, or when they engage in upward social comparison, they are more vulnerable to negative consequences such as experiencing loneliness, depressive symptoms, or stress.

1.1 Instagram usage patterns and their measurement

A growing body of research sustains that the harmful effects of Instagram use mainly results from *problematic* patterns of use (Frison & Eggermont, 2017; Sherlock & Wagstaff, 2019). However, to date, it is unclear where to draw the line between “normal” and problematic use of social networks. A lack of consensus regarding the definition and diagnostic criteria for problematic use of SNs persists (Baggio et al., 2018; Sepas et al., in press; Starcevic & Billieux, 2017; Wegmann & Brand, 2019). This also holds true for the conceptualization and measurement of *problematic use* of Instagram, which varies significantly across studies (Faelens et al., 2021, Romero et al., 2022). For instance, maladaptive use of the platform has been evaluated using a range of different indicators, such as the frequency and intensity of use (measured by the time per day spent on Instagram) or the presence of symptoms related to addiction (Cataldo et al., 2022; Faelens et al., 2021; Foroughi et al., 2021; Sherlock & Wagstaff, 2019; Yurdagül et al., 2019). In addition, available research exploring the relationships between problematic Instagram use and mental health outcomes has operationalized use with scales that were initially developed for other SNs or that measure symptoms of addiction (Faelens et al., 2021; Romero et al., 2022). Given the specific functionalities of Instagram, and the limitations of using the addiction framework to assess involvement in online behaviors (e.g., Flayelle et al., 2022; Satchell et al., 2021), this approach is not well suited to conceptualize and assess Instagram usage.

Research with regard to this subject would therefore benefit from using instruments that were specifically developed for Instagram use, that consider what users actually do on the social network, and that are well-validated. One such instrument is the Instagram Patterns of Use Questionnaire (IUPQ, Romero et. al., 2022), which measures six distinctive patterns of Instagram use, defined as “*the regular ways users engage with the platform and what they do in it*”. These patterns are: Loss of Control (LC), Anxious Posting (APO), Passive Use (PU), Social Approval (SAP),

Feelings of Discomfort (FD), and Self-deprecating Comparison (SDC). Detailed information about the exact meaning of each pattern can be found elsewhere (Romero et al., 2022). An assumption behind the development of this questionnaire is that usage patterns can coexist, in the way that a person can exhibit different patterns and switch between them depending on different contextual and individual factors. This assumption departs from the tradition to classify users as *active* or *passive*, and acknowledges that the same user can exhibit different types of behavior (such as content creation and content consumption). The IUPQ is also the first to integrate *passive use* among its dimensions. This pattern is usually not included in other scales of social network use (Trifiro & Gerson, 2019). Conceptually, the measure builds on the Uses and Gratifications Theory (Katz et al., 1973), which posits that users choose the media they engage with purposefully and experience gratification of certain needs via the use of Internet or specific applications, producing repeated use (Wegmann & Brand, 2019).

1.2 Instagram use and its relationship to well-being

Research on the relationship between Instagram use and mental health has used a wide range of psychosocial indicators to measure mental health. One way of doing so is by examining psychopathological symptoms, usually measured with the Depression Anxiety Stress Scale (DASS, Lovibond & Lovibond, 1995), a well-known clinical instrument widely used in the scientific literature (Ng et al, 2007; Ronk et al., 2013). The DASS subscale scores represent the individuals' general affective states on the broad syndromes of depression, anxiety, and stress based on a dimensional conception of them (Yeung et al., 2020). Although mental health and well-being are complex concepts that involve much more than the absence of psychopathological symptoms, measuring the latter can help determine their links to Instagram usage patterns by (a) adding to the existing literature and shedding light on these relationships; and (b) by identifying if specific usage patterns lead to specific symptoms.

For instance, in the literature regarding the relationship between Instagram use and *depressive symptomatology*, a positive association has consistently been reported when Instagram use was measured with an adapted version of the Bergen Facebook Addiction Scale (Foroughi et al., 2021; Yurdagül et al., 2019). Other studies have found that frequency of use, engagement, and browsing on Instagram were associated with increased depressive symptomatology (Frison & Eggermont, 2017; Lup et al., 2015; Sherlock & Wagstaff, 2019). Another study, which used hierarchical multiple regression models, found that *emotional investing* in Instagram, operationalized as the feeling of connectedness and integration of the

platform into daily life, significantly predicted depression (Lowe-Calverley et al., 2019). One longitudinal study over a six-month period with adolescents concluded that browsing the platform at T1 significantly predicted depressed mood at T2 suggesting a causal relationship between these variables and supporting the assumption that engagement in maladaptive use of Instagram contributes to the emergence of depressive symptoms and not the other way around (Frison & Eggermont, 2017). Also, systematic reviews and meta-analyses reveal small and positive correlations between problematic use of Instagram and depression in most of the studies reviewed (Faelens et al., 2021; Sepas et al., in press).

With respect to *anxiety symptoms*, some studies have found that problematic use of Instagram and intensity of use are positively related to social anxiety, general anxiety, physical appearance anxiety, and trait anxiety (Foroughi et al., 2021; Sherlock & Wagstaff, 2019; Yurdagül et al., 2019). These findings were corroborated by a meta-analysis revealing a moderate association between problematic Instagram use and different types of anxiety (Sepas et al., in press). However, another systematic review concluded that the evidence is still scarce and that initial experimental studies failed to find evidence for the impact of Instagram manipulations on self-reported anxiety (Faelens et al., 2021). Theoretically, over-involvement in Instagram may be connected to a unique form of anxiety that occurs when social judgment on social media arises (Lowe-Calverley et al., 2019), but more evidence on this is needed.

Concerning *stress*, very few studies have associated it with Instagram use. Positive associations have been found between the intensity of Instagram use - measured with an adaptation of the multidimensional Facebook Intensity Scale - and stress (Keyte et al., 2021) and also, between emotional investment in Instagram and stress (Lowe-Calverley et al., 2019). In addition, an indirect relationship has been found between overuse of the platform and *instastress*, an Instagram-specific technostress (i.e., the deleterious consequences on individuals' attitudes, thoughts, and/or behaviors that are derived from technology use), that was partially mediated by addiction to the platform (Sanz-Blas et al., 2019).

An ongoing debate in the literature is concerned with the relevance of examining different indicators of psychological well-being instead of one overall indicator of psychological burden (Ali & Green, 2019). While studies supporting the original structure of the DASS report high correlations between the three factors and several items presenting cross-loading (Norton, 2007; Teo et al., 2019), there is evidence that a single-factor solution, rather than the proposed three-factor

structure, could represent the best fit for the DASS-21 (Ali & Green, 2019). A recent meta-analysis encompassing 78 articles comprising 117 factor analyses found that a bi-factor structure with one general factor and three group factors was optimal and fits the data best (Yeung et al., 2020); thus, supporting the theoretical construct of general distress or psychological burden factor underlying depression, stress and anxiety symptoms. In this study we will consider both models: one that considers one psychological burden factor, and another that considers three specific dimensions of psychological symptoms.

1.3 The mediating effect of loneliness between usage patterns and mental health outcomes

In addition to the direct effects of certain Instagram use patterns on psychological well-being, it is also important to consider potential mediators. One possible mediator of the effect of Instagram use patterns on depression, anxiety and stress could be loneliness.

Loneliness results from an assessment of one's social relationships, where there is a discrepancy between one's desired and perceived levels of social connectedness (Heinrich & Gullone, 2006). While loneliness occurs in all age groups, it has been argued that in societies and among age groups that use SNs widely, people experience the highest loneliness levels (Jetse et al., 2020; Pittman & Reich, 2016). However, this relationship has yet to be fully understood (O'Day & Heimberg, 2021). One possible explanation for this is that in a world of hyperconnectivity, more people may feel detached from society in a maladaptive way (Caba-Machado et al., 2022). Another possibility is that in a society of other-directed individuals, who want and need to be liked by others, the prevalence of loneliness indicates that they do not think that others like them (Pittman & Reich, 2016).

When trying to understand the relationship between SNs use and loneliness, there are different possibilities to consider: (a) that lonely individuals turn to SNs to feel less lonely or compensate for poor social skills (Brand et al., 2019; Wegmann & Brand, 2019); (b) that certain types of SN use and engagement help individuals feel less lonely; or (c) that certain types of SN use and engagement increase loneliness. This study is concerned with the latter two possibilities. Specifically, it seeks to understand how using Instagram in specific ways has an impact on loneliness and psychological burden. While some studies have reported that SN use facilitates connection, satisfies the need for relatedness, and provides intimacy and closeness, which can decrease loneliness (Ahn & Shin, 2013, Caba-Machado et al., 2022; Pittman & Reich, 2016), others have found that it may exacerbate experiences of

social isolation and loneliness among youth who uses them most (O'Day & Heimberg, 2021), since they create an environment that increases social comparison.

Studies that are specifically concerned with associations between problematic Instagram use and loneliness are very recent and few in number (Foroughi et al., 2021; Ponnusamy et al., 2020; Yurdagül et al., 2019). Yang (2016) helped clarify this relationship by showing that broadcasting, compared to browsing and interacting with others on Instagram, was related to increased loneliness when users did not receive the support they were seeking from their followers, suggesting that the impact of Instagram use on loneliness depends on *how* the platform is used. An experimental study by Hunt et al. (2018) showed that limiting the daily use of SNSs, including Instagram, led to a significant decline in experienced loneliness. Previous research on Facebook also highlighted that loneliness mediated the relationship between Facebook addiction and subjective well-being (Satici, 2019).

It is hypothesized that Instagram users may feel more or less lonely depending on how they use the platform and that loneliness may also impact their levels of depression, anxiety and stress. It is believed that loneliness can partly explain how the problematic use of Instagram can bring about psychological distress and why research examining the direct effect of SNSs use on various indicators of mental health has produced mixed results. It is indeed possible that engagement in maladaptive patterns of SNSs use increases feelings of loneliness which, in turn, predicts the subjective experience of well-being through the negative relationships between loneliness and several indicators of psychological health (Satici, 2019).

1.4 The present study

Considering the abovementioned theoretical and empirical underpinnings, this study aimed to clarify if the patterns of Instagram use, as measured by the IUPQ, are related to a psychological burden, and more specifically, depression, anxiety, and stress, while considering loneliness as a mediator of these relationships. Therefore, three hypotheses were generated:

- H1: Distinctive patterns of Instagram use will have a direct effect on loneliness.
- H2: Distinctive patterns of Instagram use will have a direct effect on psychological burden (depression, anxiety, stress).

- H3: Loneliness will mediate the relationship between psychological burden (depression, anxiety, stress) and the patterns of Instagram use.

The hypothetical model for our study is shown in Figure 1:

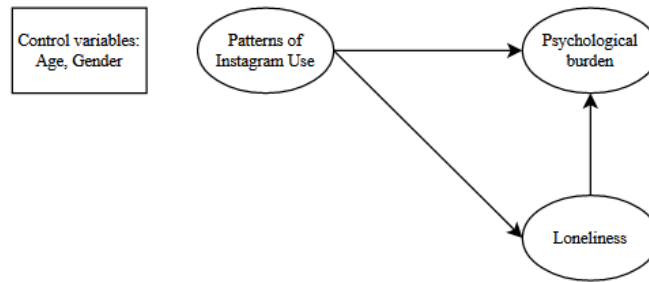


Figure 1. Investigated model on the relationships between Patterns of Instagram Use Loneliness and psychological burden

2. Methods

The dataset analyzed for the purpose of this paper was obtained from a larger one that was collected in a more encompassing study on the development of the IMQ and IUPQ, which was described in Chapter 4. This study aims to provide a more in-depth analysis of the relationships between the proposed variables. Only complete data of all the measures that were mentioned in the Instruments section were considered for the analyses.

2.1 Participants

To test these hypotheses, an online survey was held among young adults recruited via different universities through advertisements, emails, and social media. The total sample comprised 4637 participants (23.7% men and 76.3% women). Their mean age was 23.05 years ($SD = 4.64$). Most of the sample was educated: 67.2% were undergraduate students, and 21.4% were pursuing graduate studies. The sample was varied, with participants answering the questionnaires in English (26.6%), French (28.2%), and Spanish (45.2%). All the demographics and Instagram use information are reported in Table 1.

Table 1. Sociodemographics and Instagram use information

	<i>n</i> =4637
Age in years, M(SD)	23.05(4.64)
Range	18-34
Gender <i>n</i> (%)	
Men	1101(23.7)
Women	3536(76.3)
Language (%)	
English	1235(26.6)
French	1308(28.2)
Spanish	2094(45.2)
Education level (%)	
High school	5.5
Technical	5.8
Undegraduate	67.2
Graduate	21.4
Social Networks Used other than Instagram (% Yes)	
Facebook	77.9
Messenger	59.4
Snapchat	41.8
TikTok	48.6
Whatsapp	78.7
Twitter	41.2
YouTube	81.6
Others	8.2
Instagram Profile status (%)	
Public	38.4
Private	61.6
Years Using Instagram (%)	
Less than a year	.6
1-2 years	10.4
2-5 years	37.5
More than 5 years	51.5
Number of Instagram profiles (%)	
One	60.9
More than one	39.1
Time of Instagram use per day M(SD)	82.02(70.90)
Range	0-960
Use for business or self-promotion	
No	79.3
Yes	20.7
Time spent since COVID-19 outbreak (%)	
Decreased	8.4
Increased	70.7
No change	20.9

2.1 Instruments

Instagram Usage Patterns Questionnaire (IUPQ, Romero et al., 2022). This instrument has 37 items and measures six distinctive but related patterns of Instagram use: Loss of Control (LC), Anxious Posting (APO), Passive Use (PU), Social Approval (SAP), Feelings of Discomfort (FD), and Self-Deprecating Comparison (SDC). The items are scored on a Likert scale ranging from 1-5 (never- always). This questionnaire has proven valid and reliable for its use in English, Spanish and French and for this study, Cronbach's alphas ranged from .72 to .91.

UCLA Loneliness Scale. This unidimensional scale is one of the most often-used measures of the experience of loneliness. The short version (Hays & DiMatteo, 1987) has eight items (e.g., "There is no one I can turn to," "I lack companionship"), and it is scored on a 4-point Likert scale (1 – never; 4 – always). It correlates highly with the more elaborate ULS20 and the ULS4 ($r = .82$ to $.87$); thus, it was regarded as appropriate for this study. The alpha reliability coefficients for this sample ranged between .85 and .87.

Depression, Anxiety and Stress Scale (DASS-21, Henry & Crawford, 2005). This short version of a scale measuring stress, anxiety, and depression symptoms has 21 items reflecting the core symptoms of each of the three conditions, and it is scored on a 4-point Likert scale ranging from 1 - not at all/never to 4 – very much/most of the time. For this study, we found Cronbach's alphas ranging between .82 to .87 for anxiety, .90 to .92 for depression, and .86 to .88 for stress. Since some studies are challenging the scale's factor structure as stated above, the results will be presented considering one dimension of psychological burden and the three different syndromes (depression, anxiety, and stress). Thus, confirmatory factor analyses were carried out for both models. The one-factor model obtained good fit indices, $\chi^2(186) = 5299.406$, $p < 0.001$, $\chi^2/df = 28.49$, CFI = 0.988, TLI = 0.986, RMSEA = 0.08, and SRMR = 0.06. Similarly, the three-factor model obtained good fit indices, specifically: $\chi^2(186) = 5299.406$, $p < 0.001$, $\chi^2/df = 28.49$, CFI = 0.99, TLI = 0.99, RMSEA = 0.05, and SRMR = 0.04.

2.2 Procedure

Data collection was conducted online between June and October 2021. Links to the survey hosted on Qualtrics containing the abovementioned questionnaires as well as questions on the demographic characteristics in three languages (English, French, and Spanish) were distributed by collaborators from different universities

through advertisements, emails, and social media. A motivating text accompanied dissemination. To be allowed to participate in the study, participants had to (a) be aged 18-35, (b) have an Instagram profile, (c) have completed high school, and (d) be fluent in English, French, or Spanish. Participants were asked to give informed consent before participating and were informed that anonymity and confidentiality were guaranteed. Participants could enter a raffle for winning one of ten €15 vouchers (or the equivalent in their local currency). Some partner universities gave credits to students completing the survey as an alternative. No personal data were collected that could potentially identify them, except for email addresses or student codes when incentives were offered. Further information on the data collection procedure is given in Romero et al. (2022a). The study received approval from the IPSY Ethics Committee of the Université catholique de Louvain and ethical clearance from the Institutional Review Boards of the partner universities in Australia, the United States, and Perú.

2.3 Data analysis

Structural equation modeling (SEM) methodology was used to test the study hypotheses. The analysis was run in R (R core team, 2013) using the *lavaan* package (Rosseel, 2012). Data were treated as ordinal since the response scale of the questionnaire items is Likert. Therefore, the mean and variance-adjusted weighted least squares estimator (WLSMV) was used, which serves to address ordinal categorical data in the SEM methodology (Li, 2016; Mindrila, 2010; Rhemtulla et al., 2012; Savalei & Rhemtulla, 2013; Shi & Maydeu-Olivares, 2020; Xia & Yang, 2019). The analyses were carried out using the 4637 complete responses as SEM requires complete data (Carter, 2006); thus, incomplete cases were dealt with using listwise deletion. To assess the fit of the models, and since chi-square is known to be sensitive to sample size, alternative goodness of fit indices were used, namely the Root Mean Square Error of Approximation (RMSEA), the Standardized Root Mean Square Residual (SRMSR), the Comparative Fit Index (CFI), and the Tucker-Lewis index (TLI). A non-strict approach was taken for the interpretation of these indices, whereby values of RMSEA <.08, RMSEA CI <.10, SRMR <.09, CFI, and TLI >.90 were considered acceptable (Chen et al., 2008; Hu & Bentler, 1999; Kline, 2010; Lai & Green, 2016; Rudnev et al., 2018). Scaled fit indices were also obtained and reported for transparency (Xia & Yang, 2019). As cutoff points were created to be used with the ML estimator, extending their interpretation to other methods can be problematic (Beauducel & Herzberg, 2006; Li, 2016; Shi & Maydeu-Olivares, 2020; Xia &

Yang, 2019). Thus, the literature suggests using scaled and non-scaled fit indices with caution.

Since the research questions are concerned with understanding how Instagram use patterns related to mental health outcomes, two models were generated using the guidelines of Baron & Kenny (1986). The first model was concerned with estimating the parameters of the effects of the use patterns on loneliness and psychological burden. The second model was generated by estimating the effects of the patterns of Instagram use and Loneliness on stress, anxiety, and depression as specific domains of psychological burden. Finally, to obtain the significance of the indirect (mediating) effects, a bootstrapping method was used with 1000 bootstrap samples, from which 95% bias-corrected confidence intervals were found (Efron, 1987; Efron & Tibshirani, 1993; Templ, 2016).

All models were controlled by age and gender, assuming that these variables could be confounders of the effects of interest. More specifically, it was assumed that younger people and women would exhibit distinctive Instagram use patterns (Kuss & Griffiths, 2017; Tifferet, 2020; Verduyn et al., 2021; Yau & Reich, 2018). Lastly, it is essential to mention that age was specified as the observed age value minus the minimum age value observed in the sample (18 years old), while the reference category for the gender variable was “male.” This was done to ease the interpretation of the parameters and to avoid extrapolating effects beyond the range of any of the variables. Graphs integrating the results of the models and explaining the nature of the relationships for each included variable are presented in the results. Only the most relevant estimates will be shown based on two criteria: MAGIC criteria (Abelson, 2012) and statistical significance (Cohen, 1988; Sawilowsky, 2009).

3. Results

In the following section, the results concerning the relationships between Instagram usage patterns, loneliness and psychological burden, and more specifically, depression, anxiety, and stress are shown. Table 2 shows the means, standard deviations and correlations between the study variables at latent variable level. There are some points worth noting. Firstly, PU, LC, and SDC are the usage patterns with the highest scores, while out of the four mental health outcomes, stress has the highest mean score. Secondly, there are medium to high correlations between most of the Instagram usage patterns and mental health outcomes, except for PU, which shows only small correlations with mental health. The bigger associations of use patterns are seen for the *self-deprecating comparison* pattern

(all above .50). Thirdly, anxiety, depression and stress are very highly intercorrelated and also correlate highly with the single factor of psychological burden. This can point to a certain overlap between these constructs, as has been previously acknowledged for the DASS and DASS-21. Finally, correlations between .61 to .75 are found between loneliness and psychopathological burden, depression, anxiety and stress, which means that these mental health outcomes are related to each other.

Table 2. Descriptives and correlations between the study variables

	Mean (SD)	2	3	4	5	6	7	8	9	10	11
1. LC	2.95(.86)	.54	.30	.54	.80	.65	.28	.32	.43	.33	.26
2. APO	2.37(1.07)	-	.20	.81	.84	.83	.46	.45	.44	.46	.50
3. PU	3.34(.88)		-	-.13	.08	.26	.16	.21	.19	.20	.23
4. SAP	2.77(.87)			-	.81	.70	.29	.26	.30	.29	.31
5. FD	1.79(.68)				-	.84	.49	.47	.47	.49	.49
6. SDC	2.61(.93)					-	.50	.53	.50	.53	.56
7. Anxiety	1.73(.68)						-	.88	.94	.88	.63
8. Depression	1.87(.78)							-	.91	.91	.75
9. Stress	2.10(.72)								-	.93	.61
10. Psych. Burden	1.97(.61)									-	.70
11. Loneliness	1.90(.66)										-

Note: Correlations at latent variable level, all are significant at $p < 0.001$. Patterns of use: Loss of control (LC), Anxious Posting (APO), Passive Use (PU), Social Approval (SAP), Feelings of discomfort (FD), Self-deprecating comparison (SDC).

Regarding the fit of the proposed models, table 3 shows the chi-square statistic, degrees of freedom, and fit indices for two models: the first one where the outcome is a general psychological burden factor; and the second one, in which each Instagram use pattern and loneliness are related to depression, anxiety, and stress. Fit indices were satisfactory in both, and the residuals graphs and modification indices did not show any relevant information that could justify introducing further adjustments to increase the model's fit. Therefore, these are the final models.

Regarding the first hypothesis, which was that the patterns of Instagram use have an influence on loneliness, as shown in figure 2, four patterns predict loneliness. APO and PU did not have an effect on loneliness, LC and SAP predicted it negatively with small effects ($\beta = -.29$ and $-.23$, $p < .001$, respectively) and FD and

SDC predicted loneliness positively with moderate effects ($\beta = .45$ and $.36$, $p < .001$, respectively).

As for the second hypothesis the only patterns that predict psychological burden directly and significantly with small effect, were SDC ($\beta = .13$, $p < .001$) and FD ($\beta = .12$, $p < .001$). Conversely, SAP predicted it negatively ($\beta = -.13$, $p < .001$). However, when checking for more specific effects, as shown in figure 3, it was found that depression was predicted directly and with small effects by two patterns: SAP ($\beta = .14$, $p < .001$) and SDC ($\beta = .17$, $p < .001$). Anxiety was predicted by three Instagram usage patterns. FD predicted it directly and with a moderate effect ($\beta = .38$, $p < .001$) and both LC and SAP predicted it negatively with small effects ($\beta = -.13$ and $-.17$, $p < .001$, respectively). Finally, stress was predicted by two patterns with small effects: LC ($\beta = .10$, $p < .001$) and SDC ($\beta = .14$, $p < .001$).

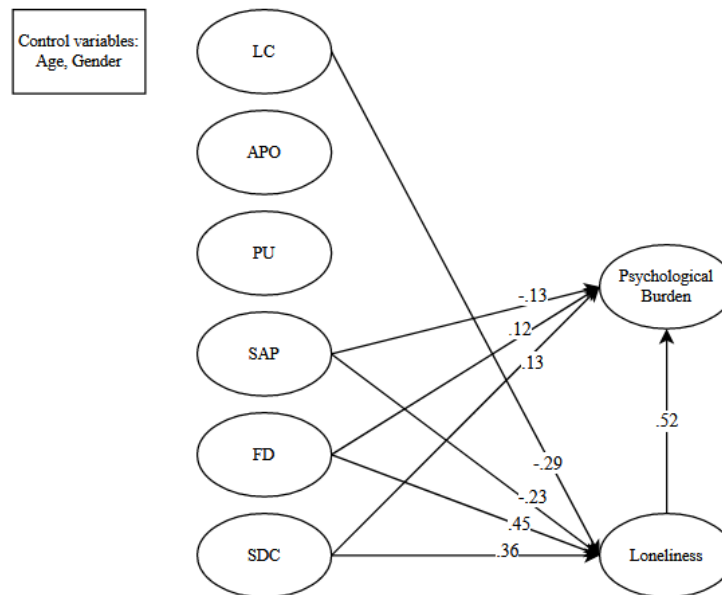


Figure 2. Estimated relationships for Instagram usage patterns, loneliness, and psychological burden. Solid lines indicate relevant effects based on statistical significance and MAGIC criteria. All effects are significant at $p < 0.001$

Table 3. Statistics and fit indices for the investigated models

<i>Models</i>	<i>n</i>	χ^2	<i>df</i>	<i>p</i>	CFI	CFI scaled	TLI	TLI scaled	NNFI	NNFI scaled	SRMR	RMSEA	RMSEA scaled
PB model	4637	31487.90	2179	<0.001	.974	.904	.975	.906	.975	.906	.055	.063	.054
Depression, Anxiety and Stress model	4637	29190.44	2158	<0.001	.978	.912	.978	.912	.978	.912	.052	.060	.052

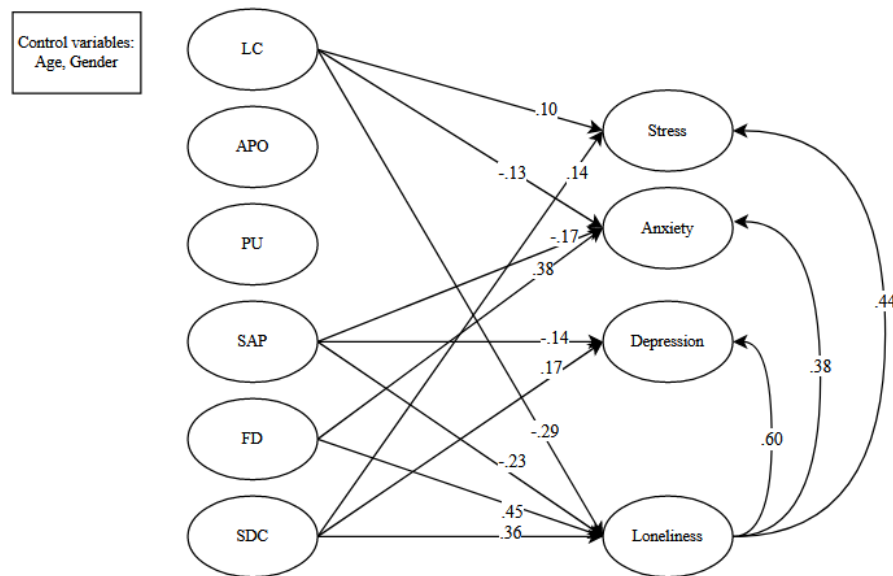


Figure 3. Estimated relationships for Instagram usage patterns, loneliness, and psychological burden. Solid lines indicate relevant effects based on statistical significance and MAGIC criteria. All effects are significant at $p < 0.001$

Finally, regarding the last hypothesis that loneliness mediates the relationship between psychological burden and the patterns of Instagram use, partial evidence of this was found. Loneliness predicts psychological burden with a large effect ($\beta = .52$, $p < .001$). In turn, when calculating the indirect effects of the patterns of Instagram use on PB through loneliness, four paths are articulable: two indirect paths through LC ($\beta = -.15$, $p < .001$, 95% CI $[-.19, -.11]$) and SAP ($\beta = -.12$, $p < .001$, 95% CI $[-.16, -.09]$), and two direct paths through FD ($\beta = .23$, $p < .001$, 95% CI $[.17, .31]$) and SDC ($\beta = .19$, $p < .001$, 95% CI $[.15, .23]$) respectively.

More specifically, loneliness predicted depression, anxiety, and stress with moderate to large effects ($\beta = .60$, $.38$ and $.44$, $p < .001$, respectively), and some indirect paths were articulable too. In the case of depression, there is an indirect effect of the FD ($\beta = .27$, $p < .001$, 95% CI $[.19, .36]$), SDC ($\beta = .22$, $p < .001$, 95% CI $[.18, .26]$), and LC ($\beta = -.17$, $p < .001$, 95% CI $[-.23, -.11]$), usage patterns running through loneliness. What is interesting, is that these indirect paths are higher in magnitude than the direct paths described above with the SAP and SDC patterns.

With regard to anxiety, small indirect effects of FD ($\beta = .17$, $p < .001$, 95% CI [.12, .22]) and SDC ($\beta = .14$, $p < .001$, 95% CI [.11, .17]) running through loneliness were found. These patterns did not have a significant direct effect on anxiety, but the indirect pathways through loneliness are significant and articulable. Finally, for stress, FD predicts it indirectly through loneliness ($\beta = .19$, $p < .001$, 95% CI [.14, .26]) although it had no significant direct pathway. As for SDC, it predicts stress through loneliness with a small effect ($\beta = .16$, $p < .001$, 95% CI [.13, .19]), comparable to the direct effect shown in figure 3.

Although it was not a primary goal of this study to investigate the effects of gender and age on these variables, they were included as control variables. Gender did not show any significant effects. But in terms of age, for each unit of change above the age of 18 years, a lower score in loneliness ($\beta = -.22$, $p < .001$) and anxiety ($\beta = -.16$, $p < .001$) were observed, but the effects were small.

4. Discussion

In an effort to address contradictory and inconclusive research findings concerning the relationship between Instagram use and well-being, the present study aimed to provide a deeper understanding of the mechanisms that shape this relationship by relating six specific and *interrelated* patterns of Instagram use, measured by a validated instrument, to users' depression, anxiety, and stress symptoms. It also investigated the role of loneliness as a potentially important mediator.

The study results confirm the importance of measuring outcomes at a more specific level, as different findings emerge when psychological burden is considered as a unitary outcome as opposed to when depression, anxiety, and stress are measured separately. Taken as an example, the *social approval* (SAP) pattern has a small negative effect on psychological burden, but when looking at the specific forms of psychological burden, it has a small *negative* effect on anxiety symptoms and a small *positive* effect on depressive symptoms. Importantly, the *indirect* effect of SAP on depression through loneliness has the same magnitude, but it is negative in direction. These seemingly contradictory findings can be explained. Since, as revealed by the study presented in Chapter 5, the SAP pattern of generating carefully crafted content with the hope to receive likes, reactions, and comments from followers is strongly influenced by the *attention-seeking motive*, using Instagram can have a positive effect if the user actually receives the positive feedback sought for and feels connected to and supported by others (Cauberghe et al., 2021; O'Reilly et al., 2019; Vanucci & McCauley, 2019; Yang, 2016).

On the other hand, the direct link to depressive symptoms may refer to the possibility that the person's efforts to craft those posts and stories do not have the expected effect and can make one feel inauthentic or unsupported and isolated (Yang, 2016) *as if they don't belong*. Thus, while these explanations should be further investigated, the results suggest possible pathways through which the mental health effects of Instagram use can be understood. Since these are conditional relations, the interpretations depend on how the other factors and pathways are accounted for. Yet overall, it seems that the SAP pattern does not lead systematically to detrimental effects.

Another interesting finding is that the LC pattern shows a small positive effect on stress, a small negative effect on anxiety, and a moderate negative effect on loneliness. *Loss of control* involves mindlessly scrolling, opening the app in between activities, and staying in the app more than intended. Our results indicate that while prolonged use of the platform can induce time waste and procrastination which can lead to momentary stress (Sanz-Blas et al., 2019), once these other conditional relationships are accounted for it can also *reduce* loneliness and anxiety. This may be explained by the content that the person is exposed to when scrolling through the app. If that content facilitates connectedness or uplifts one's spirit, browsing or scrolling through Instagram can also help people feel reassured, supported, or closer to others who are like them or going through the same experiences (Tifferet, 2020). This may have been particularly the case during the Covid-19 pandemic, which is when the study took place. Another possibility is that other usage patterns harm mental health, but not loss of control. It is plausible that once social comparison has been accounted for, loss of control does not produce ill health effects. This would be in line with the results of an experimental study suggesting that seeing strangers' positive posts can make social media users experience more positive emotions, through *emotional contagion*, provided they do not compare themselves to them (de Vries et al., 2018). To test and explore if these are plausible explanations, it would be interesting to include the type of content the individual is exposed to in subsequent models. An intermediate conclusion stemming from these findings is that SAP and LC are usage patterns that are not only always detrimental, but could also be beneficial.

Conversely, the *feelings of discomfort* (FD) pattern is related to psychological burden showing a small positive effect. This pattern refers to behaviors such as getting upset when a post does not get the expected reaction, erasing content, or feeling disconnected from others when one cannot access the platform. When examined closely, this pattern is significantly and directly related to anxiety. It also

shows a relationship with loneliness, but the mediated path to anxiety through loneliness is smaller than the direct effect. As such, FD represents a maladaptive pattern of use. The specific anxiety that results from it has also been reported in other studies and has been assumed to arise when a user feels judged by other platform users (Lowe-Calverley et al., 2019). Having to present one's own version of perfect content puts someone under pressure, and while being watched and being under scrutiny by others can be expected on social media, users following this pattern may anticipate that others will judge their content, leading to *anticipatory dread* and the *fear of getting it wrong* (Gill, 2021). Understandably, this sustained pressure can lead to discomfort, which can make a person feel anxious, and can have ill effects on their mental health through loneliness.

Self-deprecating comparison (SDC), or the pattern of engaging in upward comparison on Instagram, shows a moderate effect on loneliness and a small effect on psychological burden and stress, as well as significant small effects on depression, anxiety and stress through loneliness. While assessing actual social comparison on Instagram with the IUPQ is novel, there is ample evidence that engaging in upward social comparison can foster feelings of inadequacy and envy (Fox & Moreland, 2015; Sherlock & Wagstaff, 2019; Verduyn et al., 2016). It has been reported earlier that comparing oneself to strangers' positive posts can decrease positive affect, especially for individuals who are high in social comparison orientation (de Vries et al., 2018). Our findings confirm this finding, and add that social comparison orientation has both a direct effect on self-deprecating comparison as well as a mediated effect through FoMO. This is in line with the findings from other scholars that the effects of media content depend on how a person processes that content (de Vries et al., 2018; Valkenburg et al., 2022). It appears, then, that after accounting for other usage patterns, comparing oneself to others on Instagram may lead to anxiety, depression and stress symptoms mediated by loneliness. Since Instagram is oriented towards presenting one's aspiration, performance, status and perfection, it is possible that cumulative unrealistic social comparison on Instagram may make youths feel too distant and too different from others, and negatively impact their sense of self, competence, belongingness, and connectedness, making them feel estranged and lonely. A second intermediate conclusion is that FD and SDC can harm youth when other usage patterns have been accounted for. Further research may investigate this process to better understand if the enhanced experience of loneliness is internal or if it also translates into real-life social isolation.

Finally, it is noted that *passive use* (PU), defined here as scrolling but abstaining from posting, interacting, or commenting, is not significantly related to any of the outcomes. This contradicts the assertion that passive use could lead to negative effects as well (Verduyn et al., 2016; Yang, 2016). Our findings were not that there are no positive or negative effects at all, but they are negligible. This aligns with findings from other research (Romero et al., 2022) that PU is predicted by *emotional escape-seeking* and *information-seeking motives*. It can thus be hypothesized that users who are not engaging actively in the platform may be comfortable with just being “spectators”. If one uses the platform to relax or remain informed without engaging in any type of comparison, no detrimental effects on well-being are to be expected. Or, as Yang (2016) asserted, browsing may not be as passive as it seems, and “content consumption” could be a more accurate word to describe the behavior.

Overall, the finding that *loneliness* is a strong mediator of the relationship between Instagram use patterns and mental health outcomes has important implications for theory, research and practice. A comprehensive study of loneliness as both an outcome and a determinant of Instagram use is needed since research has not yet been able to determine the direction of these associations. In fact, feedback loops are also plausible, whereby users with high levels of loneliness are more strongly drawn toward Instagram, and depending on how they use the platform, feel lonelier in return. Studying Instagram use in individuals with a high level of loneliness could bring more clarity with regard to causality. Moreover, it is also important to investigate whether loneliness as a consequence of Instagram use is a momentary affective state or a persistent experience, and if it translates into isolation or lack of contact with others. Experience sampling designs could help understand the within-subjects effects, since ideographic approaches may better account for these individual differences than nomothetic approaches.

Future studies should extend the knowledge by including other usage patterns, and other potential mediators or moderators. For instance, accounting for the type of content that is consumed, the number of followers, and their relative importance to the individual, or considering perceived social support from followers, could help gain more insight into these relationships. In terms of intervention, it is important to continue spreading the message and acknowledging that *it is using Instagram in a specific way*, such as browsing and then engaging in self-deprecating comparison or feeling discomfort when Instagram does not work the way it is expected, that can lead to loneliness, anxiety, and depressive symptoms. Thus, changing the way a young person engages with the platform can protect them from undesired effects.

Not all usage patterns have the same effects, and thus the problematic ones have to be addressed, as it is unrealistic to expect young people to forego SNs entirely. Preventive interventions should raise awareness of possible detrimental patterns and help the user recognize their own.

This study has several limitations. It is cross-sectional in nature and thus does not allow making inferences about the direction of causal relationships. This is an important limitation given that the purpose of the study was to analyze the mechanisms relating Instagram use patterns to undesired outcomes. The results portrayed here are a picture of a specific moment in time, but with SNs constantly changing, new features being added, prolonged use over years, habitual or automatic use of the platforms, ideographic responses to specific content, and the quality and quantity of feedback received (likes, comments, reactions) it is reasonable to propose that individuals vary largely in their usage patterns and thus potential consequences can be different. Experience sampling methods could help overcome some of these issues by providing behavioral data and repeated observations (see Beyens et al., 2020; Valkenburg et. al., 2022 for further suggestions).

Moreover, women and educated people were overrepresented in the sample, since virtual samples tend to be biased in favor of the most educated people who have access to the Internet. This reduces the possibility of generalizing the findings. Future studies should make use of more diverse and inclusive samples, and include minorities. It is also important to emphasize that the sample used in this study was presumed to be “normal”, and that other outcomes may be found if working with clinical samples. Finally, self-reported data are subject to well-known biases like social desirability and recall bias, so behavioral data should be obtained if possible to confirm these results.

Despite these limitations, this study contributes to the existing literature by providing new light on the relationships between specific Instagram usage patterns, loneliness, and psychological burden. Since nuanced views on the effects of Instagram usage are rarely discussed in the literature, our findings illustrate that *specifying the types of use* within a specific platform can shed better light on the complex relationship between SNs use and well-being.

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Chapter 7. Focusing the attention on what really matters. Instagram use, its negative consequences, and some suggestions for prevention

Young people spend much of their time on digital devices and social networks such as Facebook, Instagram, TikTok, Snapchat, or Twitter. The growing popularity of these platforms fuels the debate and concerns regarding the potential negative consequences of their use. While social networks are not inherently good or bad and can have potential benefits (Pinker, 2018), their intensive use has been associated with negative consequences for both individuals and society (Lanier, 2018; Twenge, 2017). Both positive and negative outcomes of social media use have been supported by scientific inquiries, which makes it difficult to collect the evidence without cherry-picking what fits the narrative (Appel et al., 2019).

Instagram is a social network that relies on image-based content to produce user engagement. As such, it has been suspected to be an apology to perfection, fueled by individuals' tendencies to compare themselves to others and by fear of missing out (as outlined in Chapter 5). The question remains, however, what makes Instagram so enticing for users, and what can be done to prevent potential negative effects and promote a healthier use of the platform. This chapter provides an overview of some of the characteristics of the platform and individual correlates of problematic Instagram use, based on the evidence provided in the studies presented in this thesis. The chapter ends with some recommendations for the prevention and promotion of healthier Instagram use.

1. Why is Instagram so pervasive and so engaging at the same time?

To understand the behavior of social media users, it is important to consider the design and the interface of the platforms they use. Although, *in theory*, users should have the capacity to decide how they engage with a particular platform, the design and interface of these platforms reveal how the creators of websites and social media *want* them to behave (Friz & Gehl, 2016; Zulli, 2018). Social networks such as Instagram work by fostering an *attention economy* (Davenport & Beck, 2001), which relies on the users' attention as a source of revenue (Bhargava & Velasquez, 2021; Williams, 2018). The longer the user is active and engaged in

the platform, the higher the likelihood of being exposed to advertisements that can lead to consumption, and the higher the profits for the company (Lanier, 2018).

Applications such as Instagram have integrated findings from behavioral psychology in their design to increase the time people spend on them, in order to boost their revenues (Abbott, 2017; Cash et al., 2012; Eyal, 2014). Examples of features that increase the time spent on a site are the infinite scroll feature, video autoplay, push notifications and reminders, and variable rewards in the form of likes and shares (Cash, 2012; Ertemel & Aydin, 2018; Harris, 2016). In addition, new functionalities and features are regularly introduced to keep up with competing, existing, or emerging social media. For Instagram, the latest features that have been added are a *like* button to the stories, a map functionality to search for local businesses, and Reels templates (Bojkov, 2022). Many of these features perpetuate *habit loops*. As proposed by the *hook model* (Eyal, 2014), individuals will engage with platforms in “auto-pilot” mode in response to triggers (e.g., notifications) and rewards (e.g. likes, recognition). It is therefore *undeniable* that the design elements that are embedded in social media platforms play a role in engaging their users and can thus lead to problematic patterns of use (Alter, 2017; Price, 2018).

One powerful Instagram feature that differentiates it from other social networks, and which is very attractive to young people, is that it *houses specific tools to manipulate aesthetics*. Users have the option to add filters to enhance the quality of the images they produce and make them look more sophisticated and professional. As a result, ordinary-looking pictures of everyday objects or situations, such as a cup of coffee, a landscape, or a meal in a restaurant become symbols of aspiration and desire, of status and lifestyle (Zulli, 2018). While these correcting features and filters can boost creativity in individuals and content creators, they can also contribute to presenting a curated and highly edited version of reality that no longer represents what most individuals experience. They allow greater control over self-disclosure (Sedera & Lokuge, 2020) and stimulate enhanced self-presentation and impression management (Kim & Kim, 2018, Romero et al., 2022b). In this way, the platform becomes a way for users to gain instant and convenient popularity (Casaló et al., 2018).

This has consequences for content creators and content consumers or followers. An individual who creates content on Instagram may feel more pressured to comply with the high aesthetic expectations and standards that will provide him or her with more attention and recognition. As such, the difference between real life and an

ideal self-image created online gets confused, which leads to perfectionism, especially concerning the person's physical appearance, status and lifestyle (Griffiths & Balakrishnan, 2018; Hellmann, 2016; McComb & Mills, 2021). Perfectionistic self-promotion on social media has been associated with greater stress and anxiety (Harren et al., 2021; Hellman, 2016). At the same time, followers are at risk of engaging in *upward comparisons* with the content they consume, which can lead to frustration and envy, as well as fatigue resulting from overexposure to a continuous stream of content and publicity and constant attempts to live up to the idealized presentation by others (Cramer et al., 2016; Harren et al., 2021; Latif et al., 2020; Liu & Ma, 2018).

So, it appears that Instagram is not developed to optimize social connection as it claims, but to optimize self-presentation and obtaining social recognition (Kim & Kim, 2018, Romero et al., 2022a). As being watched and getting attention on Instagram is just as valuable as watching and giving attention (Andrejevic, 2009), a successful Instagram user is one whose activities generate the attention of followers and networks (Zulli, 2018). As such, Instagram encourages self-disclosure and continuous surveillance, which in turn, fosters the attention economy.

2. What are the negative consequences of Instagram use?

There is a growing body of academic literature attesting to the fact that the use of Internet, social networks, and Instagram is associated with various consequences, including decreased mental and physical health and well-being (Faelens et al., 2021; Foroughi et al., 2021; Tanega & Downs, 2020; Valkenburg et al., 2022; Wegmann & Brand, 2019). However, not all Instagram users will develop negative consequences from their use. Whether negative consequences occur depends on the use of the platform, which is defined by the design and the features of the platform, but also on genetic, environmental, cultural, and individual factors (Browne et al., 2019; Kim & Hodgins, 2018; Verduyn et al., 2017; Wegmann & Brand, 2019).

Some of the potential consequences that have been reported for Instagram use, in particular, are:

- Mental health troubles like anxiety, stress, depression, loneliness, envy, lower self-esteem, and poor sleep quality (Andreassen, 2015; Dumas et al., 2020; Frison & Eggermont, 2017; Lup et al., 2015; Yang, 2016).
- Difficulties resisting the urge to enter the platform, controlling the time spent there, or stopping use (Romero et al., 2022a, 2022b).

- Procrastination, time waste, lower productivity, and interference with daily important activities (Closson & Bond, 2019; Rozgonjuk, et al., 2022).
- Excessive or reckless selfie-taking (Chen et al., 2019; Mills et al., 2018; Pounders et al., 2016; Weiler et al., 2021).
- Deceptive like-seeking behaviors to enhance influence metrics (e.g., purchasing likes, Dumas et al., 2017; 2020).
- In some very specific cases, cyberbullying, harassment, stalking, exposure to inappropriate content, and grooming (Drenten et al., 2020; Hosseinmardi et al., 2015; Moreno et al., 2016; Vitak et al., 2017).
- Exposure to misinformation, polarization, curated views of reality, unrealistic beauty standards, lifestyle enclaves, echo-chambers, etc. (Boyd, 2017; DellaPosta et al., 2015; Feltman & Szymanski, 2018).

Throughout this thesis, we have asserted that Instagram use is potentially harmful depending on *how* it is used. In Chapter 6, we presented the results of a study on the relationships between Instagram use patterns as measured by the IUPQ, and mental health outcomes such as loneliness, depression, anxiety, and stress symptoms. We found that not all use of Instagram leads to negative outcomes. In some instances, the use of the platform even has positive effects. For instance, spending more time than intended on Instagram, mindlessly scrolling, or crafting beautiful posts to get likes and validation from followers (the LC and SAP patterns) actually appears to *reduce* feelings of loneliness, when the effect of discomfort and self-deprecating comparison were taken into account. In contrast, the latter patterns of use can actually *increase* loneliness and have an effect on depressive, anxious, and stress symptoms mediated by loneliness. Although some of these effects were small, what they imply is that Instagram use can be an enjoyable experience as long as the person does not compare him- or herself to others on Instagram or experience reactions from followers that are different from what they expect.

It is important to note that many of the reported negative consequences of Instagram have been found through *cross-sectional studies*. That means that the causality and directionality of the effects are not clear (Appel et al., 2020; Meier & Reinecke, 2021; Valkenburg et al., 2022). More specifically, there is no certainty whether the use of Instagram *causes* these problems, if some of these phenomena precede Instagram use, or if the relationship is reciprocal and causes feedback loops. It is possible, for instance, that poor sleep quality draws people to check their Instagram at night, or that lonely individuals are more prone to use Instagram, which may enhance their feelings of loneliness and lead to depression.

Moreover, the research on the negative consequences of social network use suffers from several methodological weaknesses including conceptualization difficulties, the use of inaccurate or non-valid measures, measures that over-rely on the addiction framework, misinterpretation of statistical effects (which are sometimes too small or non-existent), and the use of convenience samples which make findings not generalizable to the general population (Cataldo et al., 2022; Flayelle et al., 2022; Orben, 2020; Romero et al., 2022b; Satchell et al., 2021; Valkenburg, 2021). These flaws make it difficult to draw firm conclusions that could inform prevention and intervention programs.

3. Who is most vulnerable to developing problematic Instagram use?

If social media use is not problematic per se, but only leads to negative consequences when some conditions are present, prevention efforts should take these conditions into account. As suggested by Green and Kreuter (1999), these conditions can be either *predisposing, reinforcing, or enabling*.

Concerning *predisposing factors*, some psychosocial characteristics have been highlighted in the literature as potential predictors of problematic use of social networks, as outlined in Chapter 1. They include, amongst others, interpersonal sensitivity, social anxiety, shyness, loneliness, perceived social support, need to belong, narcissism, social comparison orientation, and fear of missing out (Brailovskaia et al., 2019; Burnell et al., 2019; Casale & Fioravanti, 2018; Elhai et al., 2016; 2019; Eralsan-Capan, 2015; Roberts et al., 2015; Romero et al., 2022a; Satici, 2019; Wang et al., 2017; Wegmann & Brand, 2016). In Chapter 5, we have investigated two of these predisposing factors, *social comparison orientation* and *fear of missing out*, in relationships to the motives and patterns of Instagram use. Several direct and mediated relationships were found, confirming the importance of SCO and FoMO and suggesting that individuals who show these two tendencies engage with Instagram in a particular way. Specifically, they engage more in self-deprecating comparison, show more feelings of discomfort, and seek social approval through the attention-seeking motive.

It is also worth noting that, although small, some effects of *gender and age* were found concerning Instagram motives and usage patterns. It appears that *women* exhibit more loss of control, anxious posting, social, approval, and self-deprecating comparison use patterns than men, and *older people* show less emotional escape

seeking, social connection, and information seeking, and less anxious posting, discomfort, and self-deprecating comparison than younger people.

Other predisposing factors accounted for in this thesis are the *motives for using a social network*. As documented throughout this thesis, particularly in Chapters 3 and 4, Instagram use can be explained by a large range of motivations, including *the need for self-expression, curiosity, documenting, entertainment, connection, following trends, coping with emotions, wanting to be seen, gathering information, professional use, and making an impact on others*. Of these, six motives were included in a new measure that was developed and validated for the purpose of this thesis, the IMQ. The use of this measure in the study reported in Chapter 5 led to the finding that the use of Instagram is more motivated by the wish to make oneself visible, likable, and attractive, and to draw attention to the self, than by maintaining interpersonal relationships. This has also been reported in other studies (Kim & Kim, 2018; Yau & Reich, 2018). A novel finding from our study, however, is that these 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. Moreover, these motives also interact with other predisposing factors such as SCO and FoMO.

Together with the empirical findings documented in the scientific literature, the results of the studies presented in this thesis can inform prevention. To prevent the potential negative effects of problematic social network use, it makes sense to identify (groups of) people with specific motives, use patterns, and predisposing factors and develop tailored preventive interventions for them. This form of *selective or indicated* prevention has the additional advantage of being more cost-effective than universal prevention aimed at the entire population (Mrazek & Hagerly, 1994). Thus, we propose to target younger persons in the population who show increased tendencies to compare themselves to others and have a high fear of missing out. These individuals' identities are likely other-oriented, meaning that they tend to seek external information to define themselves. They also tend to actively seek attention and confirmation of belonging by posting and comparing themselves on social media. Preventive efforts can then try to make them aware of their usage patterns, and explore what motivates this type of usage and how it shapes their identity. The negative effects of Instagram use can be mitigated by explaining to these users that what is shown on Instagram is not the reality, and by helping them to build their identities and self-concept from within, without excessively relying on others' posts and reactions.

With regard to the *reinforcing factors* related to the problematic use of social media, one should consider the processes that foster, maintain and reinforce problematic use. For that purpose, use can be made of existing process models that have been outlined in the literature. Specifically, the I-PACE model (Brand et al., 2019) proposes that the use of social networks relies on the complex interaction of conditioned learning processes and reinforcement mechanisms, resulting in gratification or compensation of use (Brand et al., 2019; Wegmann & Brand, 2019). These affective and cognitive processes can interact with specific motives, psychosocial characteristics, limited social competences and reductions in inhibitory control and executive functions, which in certain situations may result in problematic use. For instance, situational FoMO experienced while browsing Instagram can be a reinforcing factor. While this factor was not explicitly addressed in this thesis - we focused on trait FoMO as a predisposing factor - it is a concept that merits further attention. It is conceivable that users' perception that they can't keep up with the massive and endless exposure to varied content on Instagram make them feel that they are missing out on things, which will reinforce their use of the platform. This may be further exacerbated by upward comparison that can make them feel that they are not enough, don't belong, etc. The qualitative study presented in Chapter 3 revealed that young people acknowledge that Instagram is a showcase, that they can't trust the content to which they are exposed to be real, but that they nevertheless feel the need to keep entering the platform, driven by a sense of urgency and immediacy and fear of missing out on important things. These ongoing reinforcing mechanisms and feedback loops should be further assessed and addressed to develop tailor-made interventions to break these cycles through self-regulation.

Enabling factors are defined as “skills, resources, or barriers that can help or hinder the desired behavioral changes as well as environmental changes”. One can view them as vehicles or barriers, created mainly by societal forces or systems (Green & Kreuter, 2005, p. 15). Although we have not directly addressed these factors in this thesis, perceived social support from significant others and having a rich and nurturing life outside social networks can be assumed to have a protective function. The findings of this thesis can help to identify some of the *barriers* to a healthier use of Instagram. For instance, FoMO, and the urge and craving are some of them. It would be very difficult for a young person whose identity and shared reality have been built around social networks to stop using them or changing their usage patterns. Youths organize and maintain their social lives around social networks. Also, the urge and craving to enter the platform, fostered by

notifications, is difficult to regulate. As such, the context itself in which youth are embedded becomes a powerful barrier to desired change.

While the complexity of these processes makes prevention of problematic Instagram use difficult, indicated prevention could capitalize on existing literature on *digital detoxes* to develop tailor-made prevention programs. The literature concerning the emerging concepts of *digital well-being* and *digital disconnection* (Abeelee et al., 2022; Syversten & Enli, 2020) proposes to take intrinsically motivated “breaks” from social media, as a way to raise awareness of media consumption habits and to reduce the stress resulting from overload. While this approach could be promising, a recent systematic review found inconclusive results regarding the effects of disconnecting on subjective well-being (Radtke et al., 2022). This may be because the interventions comprised in this review were varied, ranging from very short to multi-week *digital detoxes*, and included diverse strategies such as disabling notifications, setting daily screen time limits, etc. This makes it difficult to summarize the evidence. It is still unclear which mechanisms these interventions are trying to target and how they approach overuse (Abeelee et al., 2022). Nevertheless, some answers may be provided through qualitative research. A study following young people aged 19-29 during 14 days of disconnection from Instagram through journaling and focus groups (Scheppé & Seiffen, 2022) found that disconnecting felt more like a *journey*, and while strong motivations to disconnect were present at the beginning, negative feelings and experiences such as feeling disoriented, uninspired, bored, craving, using other media as substitutes, feeling disconnected and experiencing FoMO increased. But ultimately, the detox was followed by a more conscious consumption of the platform. Although these types of interventions are new and still very intuitive, the question of how to achieve sustained change and how to help young people build better habits for the use of social networks is relevant and worthy of pursuing.

4. Some policy options to prevent problematic use of Instagram in youth

Mental health is not simply the absence of mental illness; it implies a state of well-being that allows individuals to realize their potential, cope with daily life stresses, work productively and fruitfully and make a contribution to their communities (WHO, 2022). *Promotion* refers to the necessary actions that will create the environments that can provide people with skills to maintain healthy lifestyles while *prevention* refers to the strategies that are designed to reduce the incidence, prevalence, and recurrence of mental disorders (WHO, 2016). Often these efforts to

reshape determinants of mental health require multi-sectorial collaboration and coordination (WHO, 2022), and preventing ill outcomes and promoting healthy ones is of uttermost importance, as intervening on time can protect adolescent and youth mental health.

Problematic use of the Internet, which includes social networks and Instagram is high on the public health agenda. An international meeting on the public health implications of excessive use of the Internet organized by the World Health Organization (2015) called for intensifying research to address current knowledge gaps and document and evaluate policies, strategies, and interventions to prevent and reduce health risks associated with problematic Internet use. The systematic review that was detailed in Chapter 2, found that evidence concerning the most effective ways to prevent problematic use of the Internet is not conclusive yet.

Specifically, it was found that primary prevention programs that have been developed and published are quite heterogeneous in their theoretical approaches, design proposals, outcome measures, and the assessment of their effectiveness, making it difficult to draw solid conclusions. This review recommended that any efforts to prevent problematic internet use should be carefully designed and theory-informed, use evidence-based strategies to address the identified risk and protective factors, and involve relevant stakeholders in the implementation, following the prevention guidelines established for the field of psychology (American Psychological Association, 2014). Moreover, that careful attention should be placed on the conceptualization and selection of the behaviors and assessment tools that are used to measure the outcomes, as they are crucial to guide interventions and measuring their effectiveness. The use of planning models such as the PRECEDE-PROCEDE (Gielen et al., 2008; Green, 1974; Green & Kreuter, 2005) or RE-AIM (Glasgow, 2006; Glasgow et al., 1999; 2004), which outline the steps for analyzing the problem, the behavioral and contextual determinants, the strategies to change these determinants and planning the intervention and its evaluation, can significantly contribute to the development and implementation of effective interventions within the field.

Given the lack of consensus and clarity with regard to the conceptualization, measurement, and effective interventions, informing policies to address problematic use of social networks and Instagram remains a challenge. However, building on the available theoretical and empirical evidence, including the findings of the studies reported in this thesis, three strands of recommendations can be outlined, targeting different groups of stakeholders: (1) to promote the adoption of

ethical social network designs; (2) to promote responsible use of Instagram and (3) to promote applied research on responsible internet use and prevention.

4.1 Promoting the adoption of ethical social network design

This policy option addresses social network developers and the technology companies behind them, but also governments and regulators. The current business model of profit for social networks capitalizes on users' attention in an exploitative way. Therefore, it should be reassessed and changed, and the well-being of the population should be put first. Governments and users themselves should encourage change. Many policy options have been put forward and should continue to be encouraged, discussed, and spread (for extensive resources, see Algorithm Justice League, 2020; Bhargava & Velasquez, 2021; Center for Humane Technology, 2022). However, some key points targeting designers and companies that can be specifically helpful for reducing the risk of problematic Instagram use are:

- *Ensuring transparency of information and a symmetric relationship with users.* Users should know and understand how the platforms work, how they were designed, for what purposes, and what are the potential risks of using them. Special attention should be placed on how the data gathered from them is used. 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. Companies could share this information, in a clear, simple, understandable way, particularly if it can empower the user to make informed decisions on matters that affect them.
- *Companies should actively seek consent from users.* Users must be asked to give their consent and their data should only be used for what it was consented to, and that information should be presented to them timely and clearly, in an understandable language. Moreover, not consenting should not be penalized by any means with denial of access to platforms or services as a result. Consent should also be obtained fairly, and options to accept or decline should use an equal layout (in size, color, and shape) so the user is not nudged to accept.
- *Continuous monitoring, auditing, and accountability.* Policymakers should create robust mechanisms to protect people from harm by auditing algorithms systematically, monitoring companies, and holding them accountable when harm occurs.

- *Companies should promote agency and freedom to choose.* Instagram uses an algorithmic timeline that allows machine learning to decide which posts individuals will see first. Adopting an ethical design would enable the user to define and decide the type of relationship they want to establish with the platform by, for instance, deciding to have a chronological timeline if preferred, deciding if they want or not to see suggested content or tailored product recommendations, and what sort of notifications they want to receive from the platform.
- *Banning the infinite scroll feature.* The infinite scroll eradicates the stopping cues that can allow an individual to move on to something else instead of staying on the platform longer than intended. Instead, a person can continue scrolling *ad infinitum* in absence of a cue. Eliminating natural stopping points, promoting autoplay, automatic loading, and displaying additional content that was not requested should be banned. Instead, users should be prompted, asked for their consent, and/or alerted after some time scrolling.
- *Actively promoting time limits.* All social network platforms should have integrated options to limit time spent daily and weekly and provide users with statistics that allow them to track their use. Regular pop-ups informing the time spent in a day, or reminders to take a break from use, could be implemented. This will allow users to keep better track of their time and make conscious choices on how they want to spend their allocated time. Pop-ups informing that the allocated time is over should have the option to close the platform since currently they don't. New users should be requested to establish those limits, and be reminded to do so if they haven't.

4.2 Promote responsible use of Instagram

To prevent the negative effects of problematic social network use, *selective or indicated* prevention (Mrazek & Hagerty, 1994) could be the most fruitful strategy. Since not all use of social media is problematic, but certain patterns of use and particular predisposing factors can be discerned, targeting populations who are at increased risk and designing tailored preventive interventions to reach them is more cost-effective than aiming at the entire population. This applies to problematic Instagram users, but it is quite likely that it also extends to other social network users, since many of the risk factors, correlates and consequences of problematic Instagram use are common to other Internet-related behaviors. These recommendations should be implemented by clinical psychologists,

psychotherapists, clinicians, and other relevant actors (such as teachers and parents) who could be trained to implement them. Some of these recommendations were also proposed by a multidisciplinary and multinational group of experts in a consensus report to prevent problematic use of the Internet during the COVID-19 pandemic (Király et al., 2020).

Preventive and intervention actions that can be introduced at this level have been categorized into four types: addressing specific predisposing variables, self-regulation, habit formation and habit breaking, and life-skills development. These recommendations are complementary, and when possible, prevention programs should address more than one at a time.

Addressing specific predisposing variables

Throughout this thesis, we have signaled the importance of *social comparison orientation* and *fear of missing out* as predisposing variables of problematic Instagram use. The following strategies can be used to help reduce their impact on Instagram users.

- *Strategies to address self-comparison orientation.* One way of addressing self-comparison orientation this is to make youths aware that: (1) comparing to others is a natural human mechanism that can be useful in many situations, but (2) it is unfair to compare oneself to others on social media and especially on Instagram, where positive content is shared more than negative content, and where it is more likely that others will portray themselves in over-flattering ways and images are heavily edited and curated; (3) when comparing oneself on Instagram, there will always be a way of losing in the comparison, and that will lead to frustration, feelings of inadequacy, sadness, and loneliness; (4) nobody is perfect or lives a perfect life, and we all have insecurities, as we are all human beings; (5) accepting ourselves and others as we are is important and necessary. Besides these messages, encouraging youth to ask themselves whether they tend to compare to others and developing psychoeducational material and specific guidelines on how to compare less is of absolute importance.
- *Strategies to address FoMO.* One way to address FoMO is to make young people aware that: (1) content on the Internet is massive and it is impossible to absorb and process it all, one does not always need to be on top of everything; (2) we are all different and have different personalities, habits, interests, and so, not everything that appeals to others will appeal to us, and that is ok; (3) it is ok not to be aware or participate in everything that is going on online and in real life. Another way to address this is to

help youth realize that FoMO puts the focus outside. Youth with high levels of FoMO place so much of their attention on what others are doing or what is “better” outside, that they lose track of what is happening inside, within themselves. Strategies that can help individuals allocate their attention where it really matters, inward, and appreciate the real world, what they already have and what they are capable of doing are important. Training them to practice gratitude and self-compassion are key elements to consider when creating this strategy.

Habit formation and habit breaking

Healthy Instagram consumption habits will most likely imply breaking patterns of use that are not helpful or that are perceived by the users as unhealthy. However, it is not simple or easy to break automatic patterns of use, especially if Instagram encourages and rewards staying on the platform longer. In any case, developing awareness of how these social networks work and of their consumption and habits can be helpful. Some specific helpful guidelines are:

- *Developing awareness.* Challenging youth to reflect on their use of the Internet, social networks, and Instagram is crucial. Firstly, it is important to challenge them to reflect on how platforms are designed to generate revenue by keeping the users' attention through targeted advertisements, push notifications, and so on. This can help them reflect on whether they want to continue using them or not. Understanding if use is aligned with one's values and views of life, and if using Instagram is beneficial in valuable ways can also help regain control of how and when to use it. Secondly, it is also crucial to engage them in self-reflection over what motivates them to use the platform, how they are using it, and what effects it has on them (in terms of thoughts and emotions, or other consequences). This can help them to tell if that use is problematic and needs to be regulated. For instance, if the person discovers they use Instagram to peek at what other people are doing and actively engage in self-deprecating upward comparison that triggers sadness and failure, thus lowering self-esteem, and this is found repeatedly, then actions can be taken to correct this, such as working on the tendency to self-compare and use different strategies to regulate the behavior.
- *Encouraging breaking automatic patterns.* It is crucial to help youth to acknowledge when they feel uncomfortable or overwhelmed with their Instagram use. The key message to be conveyed is that the person is *responsible and accountable* for their use, and should be able to self-

regulate that use, rather than remain hooked mindlessly. However, it is also important to help them understand that breaking the habit is a journey and that it can be difficult at first. A major step in this process is to identify triggers by promoting self-awareness (e.g., when experiencing FoMO, when being alone at home, when a notification is received, at night during the weekend, etc.). Once a trigger is identified, it can be addressed depending on its nature (e.g., turning off notifications, scheduling a digital detox, or replacing Instagram use with other activities). Working on *presence* and *mindfulness* can be helpful to pursue this recommendation.

- *Encouraging youth to take one step at a time if needed.* If changing habits seems too difficult, or barriers are too hard to overcome, simple steps can go a long way, and recognizing any minimal action that can be taken toward a better, more mindful use of social networks can already make a difference. Some of these small actions could involve: setting a time limit for the day, tracking time of use, using software to limit access, disabling automatic login, using analog tools (e.g., alarm clock) to prevent checking notifications, and finding alternative ways of entertainment if the use is fueled by boredom.
- *Promoting positive, mindful, and intentional use of the platform.* Youths must be aware of their motives to use Instagram, why they use it and what they are seeking to achieve with that use, so they exercise an intentional use that is beneficial. *Mindful* usage routines should be encouraged, such as avoiding scrolling first thing in the morning or just before bed, and instead promoting healthier ways of starting and ending the day (e.g., journaling, meditation, practicing gratitude, starting the day slowly, etc.). During the day, it can be beneficial to establish a specific moment to check social networks, scroll and actively communicate and interact with profiles they care about if they wish to do so. Some intentional *network hygiene* should be encouraged by promoting unfollowing profiles that don't add value and being careful and mindful of the profiles followed, and the likes, comments, and shares given as they feed Instagram's algorithm. Lastly, mindful use of the platform also involves being aware of what and why they share something on the platform. Living to meet others' standards has proven exhausting, thus, connecting genuinely and authentically is far more beneficial than portraying a life, a body, or a lifestyle that is not real.

Self-regulation

The previous suggestions can be more effective if one increases one's ability to self-regulate. Self-regulation is the ability to control one's thoughts, emotions, and

behaviors when pursuing long-term goals (Gilebbart, 2018). Previous research has shown the importance of self-regulation to maintain healthy behaviors and good mental health (Hofmann et al., 2014). For Instagram use on particular, learning self-regulation strategies can help individuals cope with specific situations that may arise while using it.

- *Developing emotional-regulation strategies.* Youth need more psychoeducation and training concerning emotions and effective emotional regulation strategies since they have reported using Instagram to cope with emotions. These will also help them navigate unpleasant situations while using the platform (e.g. fear of being judged, negative reactions to their content, etc.). The key message to be conveyed is that emotions are not good or bad inherently, they alert us of something that is moving in our bodies that needs to be observed, named, and addressed. For instance, using Instagram to cope with negative affective states might not solve the issue behind its use, it will just cover it up for some time.
- *Developing self-control strategies.* Some commonly employed self-control strategies concerning SN used by young adults include self-talk, straightforward self-control, modifying a feature on the device, and building a safe context with no direct access to social media (Brevers & Turel, 2019). However, for youth, exerting self-control can be difficult. These strategies could be further developed by boosting impulse-control processes to diminish the difficulty to undertake them.
- *Developing cognitive reappraisal.* Cognitive reappraisal or *reframing* can be used to help improve self-regulation. It involves reinterpreting a situation to change the emotional response that stems from it. For instance, if a person does not receive the likes they expected on an Instagram post and automatically thinks “*nobody cares about me*”, cognitive reappraisal can help them to give a different, more realistic, or nuanced meaning to that situation.

Life-skills development

Life skills is a term that describes a set of basic skills that can be acquired through training, learning, or accumulated life experiences that enable individuals to effectively handle themselves through different life challenges (WHO, 2020). Life skills education programs are a promising psychosocial intervention for promoting the mental health of youth and helping them strengthen their coping strategies, resilience, and emotional intelligence (Nasheeda et al., 2019). Some life skills that

could be developed and promoted in youth that could help manage their Instagram use are:

- *Digital literacy.* Although the majority of Instagram users are young people who grew up using these platforms, many of them still lack the knowledge and understanding of the technology behind the tools they use, of the algorithms that they are based on, how they collect and user data, and what the potential risks are of their use. This understanding should be enhanced through education, to enable better-informed decisions on their use.
- *Critical thinking.* Critical thinking is a key skill to assess information and evaluate its credibility. As youth are continuously exposed to a massive amount of content, some of which is incomplete or incorrect, it is essential to promote their skills to discern what is credible, real, valuable information. Promoting critical thinking will make it easier for youth to understand that the content they are exposed to on Instagram often portrays bite-sized, hyper-condensed, partial, idealized, exaggerated, and unrealistic ideas, standards, ideals, and lifestyles.
- *Social skills.* Social skills include the ability to communicate thoughts and feelings, and interact with others, verbally and non-verbally, in different settings, to varying degrees. Developing *empathy* is a key component of this set of skills. The relationships youth maintain with others in real life are vital to feeling connected, creating community, a sense of belonging, and a satisfactory life. When apart, social networks make it easier to stay in touch and maintain those real-life connections. For people with less developed social skills, social networks allow them to connect with others in a low-stakes environment. However, online interactions do not replace face-to-face interactions, and parasocial relationships established with influencers or celebrities are only starting to be researched. Therefore, continuing to help youth develop their social skills and practicing them in real-life settings is key to their well-being.
- *Healthy lifestyles.* Any activities that contribute to healthy lifestyles can be key to relying less on social networks for entertainment or managing emotions and influence integral health, such as sleeping regularly and enough, eating varied and well, and drinking regularly and enough, learning relaxation and stress-reduction techniques, going for walks, connecting with nature, journaling, engaging with artistic activities, etc.
- *Promoting seeking professional help if needed.* Youth experiencing significant difficulties or interpersonal problems due to their social

network use, or Instagram use should be encouraged to seek professional support as seeking help in the early stages can effectively help reduce symptoms and develop healthy ways of coping with it. Psychoeducation can help destigmatize seeking professional help

4.3 Promoting applied research on responsible Internet use and prevention

This policy option is addressed to governments, companies, academic institutions, and researchers, since constructing better research and translating the results into principles, best practices, and actionable recommendations are key to preventing harm and promoting a healthier use of Instagram, social networks, and internet use in general. These recommendations have been inspired by the works of Orben (2020), Valkenburg (2021), and Verduyn et al. (2017):

- *Promoting continued research by providing enough funding.* Social networking sites are continuously changing, as new affordances and improvements are added that could impact research results. Research often is unable to keep up with these changes, and the validity of the theories, assumptions, and methods used for research can be questioned. The only way to perform high-quality research that can produce timely results and can be robust and informative enough for taking concrete action is to allocate enough resources for researchers to get proper training and plan long-term research.
- *Promoting better research.* Although variety in research methods is normally appreciated in the field, some methods are more informative for policy than others. Providing consistent operationalizations and measurements can reduce discrepancies and allow combining effects in future reviews, meta-analyses, and umbrella reviews. When possible, longitudinal methods should be preferred over cross-sectional ones, and behavioral data should be preferred to self-reported ones. Experience sampling methods can help distinguish the within-subjects effects, which seem to be more and more relevant for research on social network use patterns, as individual differences matter. Extending findings beyond the usual samples (youth, undergraduate students) and making samples more representative is key to better understanding risk factors and general and specific vulnerabilities. Extending research to different and specific social networks should be promoted as each social network provides a unique context for interaction and has specific affordances. Being careful when

analyzing statistical significance and avoiding over-reporting negligible effects is also a better research practice that should be encouraged.

- *Promoting research on responsible Internet use and prevention.* While substantial efforts have been made to understand the mechanisms behind the problematic use of social networks, less research has been done to investigate how responsible Internet use can be promoted and negative outcomes prevented. With enough funding and willingness, more of this research should be encouraged. Since future generations will depend on technology and use it extensively, this research can have a profound impact on the mental health burden of the future.
- *Promoting collaborations between researchers and companies.* Researchers can collaborate with social networking sites to help make them more ethical, by identifying the features and affordances that undermine and those that support well-being. Companies should be more transparent and share the data they have collected on users with researchers so they can perform objective and independent assessments of social network usage. The gathered information is abundant, and with this information, improvements can be made to ensure that users are benefiting from the platform.

5. Conclusion

This thesis aimed to identify the different interrelated factors that impact Instagram use and that could serve to develop effective prevention of problematic Instagram use. Apart from the characteristics that are inherent to the design of Instagram's interface, individual and social predisposing, reinforcing and enabling factors were listed and discussed, considering also the current state of the evidence.

Based on those findings, some recommendations for the prevention of negative consequences and the promotion of healthier use were given at different levels for companies and governments, researchers, and users. Although there is still much work to be done at various levels in terms of the ethical design of social networks, research, and policy implementation, and while it is acknowledged that it is unrealistic to think that that context will change any time soon, some steps can be taken at the individual level. 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 *agency* over their behaviors. Pursuing a selective approach to prevention by targetting 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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Chapter 8. Main findings, general discussion and conclusions

Concerns regarding the potential adverse effects of digital technology use by young people have risen considerably in the last two decades (Billieux et al., 2015a; Greenfield, 2014; Kuss et al., 2014; Orben, 2019), to the effect that problematic use of Internet is now recognized as a public health concern (WHO, 2014). While the individual and societal costs of mental health problems that may be associated with problematic internet use are still debated (Ioannidis et al 2018; Fineberg et al., 2018), research on these issues has only continued to increase. However, the lack of consensus concerning the conceptualization of problematic internet use and the absence of validated theories to explain these behaviors and their effects on well-being make it difficult for clinicians, policymakers, and other stakeholders to prevent or remedy these problems.

The studies that were presented in the preceding chapters aimed to address some of these issues. Through these studies, we sought to better understand the motives and patterns of Instagram use and the factors and processes that can lead to this behavior, with a view to inform preventive efforts. In this final chapter, first the assumptions and the context in which this thesis was written are described. Secondly, the main findings of the studies that make up the core of this thesis are summarized and discussed. Finally, the main conclusions and recommendations emerging from these studies are given. The chapter ends with a brief summary and conclusion of the thesis.

1. Main findings and discussion

1.1 On the main assumptions of this thesis

The initial purpose of this thesis was to bring more understanding regarding problematic Internet use in order to inform preventive efforts. To achieve this, it was considered important to examine the available evidence on existing programs targeting problematic Internet use, through a systematic review. This review showed that it was necessary to narrow the focus of the thesis to target a specific behavior and that the field is relatively young and rapidly evolving, like its object of study. The decision was then made to focus on Instagram use, since not much scientific literature on the topic had been produced yet, with most of the interest on social networks being focused on Facebook.

As shown in Figure 1, the number of publications with “Instagram” in the title and abstract across relevant fields such as communication and culture, media studies, health sciences, and human society has been growing fast in the past five years, with a turning point in the years 2020 and 2021.

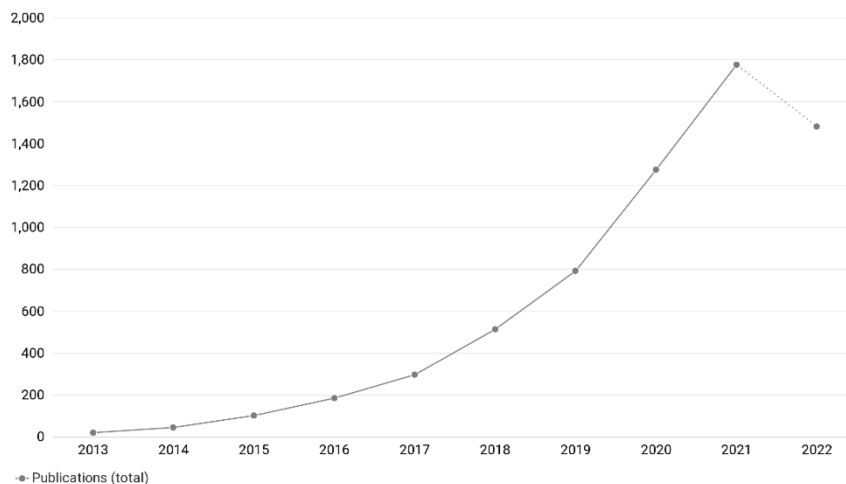


Figure 1. Number of publications containing “Instagram” in the title and abstract in the last 10 years. Source: <https://app.dimensions.ai>

Importantly, a tendency of young people to leave Facebook and migrate to Instagram was noted in 2018 (Perrin, 2018) which also supported the decision to focus on Instagram. Yet while the research and interest in Instagram use are accumulating, there is not much scientific consensus to guide preventive efforts.

Against this background, three working premises have been the base of this research: (1) young people both enjoy *and* suffer from using social networks and Instagram in particular; (2) however, not every behavior should be considered an addiction or be pathologized without extensive and profound evidence; (3) the bigger context should not be foreseen: Instagram is one of many applications that youth use through smartphones connected to the Internet. Consequently, Chapter 1 was an attempt to summarize the relevant available evidence concerning Internet use, smartphone use, social network use, and Instagram use while stating the double-sided nature of it and the challenges of an evolving field where reaching consensus is difficult. Particularly, the section covering the theoretical stance of the thesis allowed for narrowing down and clarifying its focus without losing sight of the broader picture.

1.2 On primary prevention programs for problematic Internet use

Chapter 2 presented a systematic review of published articles on primary prevention programs for problematic internet use among youth, paying attention to the definitions used, the risk and protective factors addressed, the characteristics of the interventions reported, and the evidence of their effectiveness (Romero et al., 2021). Out of 1288 publications, only five fulfilled all inclusion criteria and were retained for a narrative review and meta-analysis. This indicated that most of the literature is concerned with treatment and secondary prevention and only a small number of studies provide information about their effectiveness. Also, most of the literature found was published after 2014, which shows that this is an emerging area of study.

Most of these studies portrayed problematic Internet use from an *addiction framework* perspective, as reflected by the definitions given and the instruments used to assess the outcome variables, such as the Internet Addiction Test (Young, 1998) and measures of screen time per day or per week. All the programs focused on adolescents and university students and were conducted in a school or university setting. They were mostly based on the Social Cognitive Theory and used a variety of techniques and strategies to achieve a change in identified risk factors for problematic Internet use, such as active discussion, reflection, and role modeling besides knowledge exchange and education. As for the results of the meta-analysis, depending on the estimator used, the pooled effect sizes suggested an effect of the intervention as compared to no intervention but showed no significant combined effect, and heterogeneity levels were very high. Due to the small number of studies no further analyses could be performed, which constitutes the main limitation of this meta-analysis, along with not having included gray literature or studies in other languages.

The findings of the review study testify to the need and willingness to invest in interventions to reduce or prevent the problematic effects of Internet use on youth. But they also reflect the main shortcomings of research on problematic use of Internet has over the past decades, which disregards the controversial nature of the phenomenon and relies too much on the *addiction model* to understand the problem and develop preventive interventions (Billieux et al., 2015b; 2015c; Kuss & Billieux, 2016; Perales et al., 2020). Although researchers and clinicians use the best available evidence to develop their programs and use high-quality methods to evaluate their effects, there is not enough evidence yet about the specific risk or protective factors these programs should address, how to measure them, how to diagnose the problematic behavior, and whether the programs are truly effective.

Based on these findings, several methodological concerns could be raised and addressed to increase the quality of systematic reviews and meta-analyses in this area in the future. One concern involved the *appropriateness of conducting a meta-analysis in a limited number of studies*, in this case, five. Although the studies found were of very high quality and had enough similarity to have their effects combined in a meta-analysis, this decision was bold. It was a good exercise to perform the analyses using different methods for summarizing the data, but still, the results proved inconclusive.

Future studies should abstain from combining data from a small number of studies and focus on the narrative review itself. In this particular study, focusing more on problematizing the issues concerning the conceptualization and diagnosis of Internet addiction and the suitability of conducting primary prevention programs would have been of value. After all, since the distinction between secondary prevention and treatment is not always clear-cut and the diagnostic criteria for IA are still under scrutiny, perhaps referring to universal, selected, or indicated prevention for these types of behaviors could be better suited. Another concern is *the need to measure effectiveness*. Concerning the state of the field at this point, it is likely that in the search for effective interventions that could inform new preventive efforts, good interventions in grey literature might have been overlooked since they normally don't report on effectiveness. Systematic reviews in the future should prioritize the inclusion of interventions that have a solid theoretical or conceptual background and rationale and use a combination of strategies that can be replicable and pay less attention to effectiveness given the issues with measurement and diagnostic criteria.

Some extra recommendations can be made to help clinicians and researchers develop better prevention programs in the future. Firstly, *it is not recommended to apply the biomedical model* of behavioral addiction when conceptualizing the targeted behavior. This model reduces the complexity of the processes involved in problematic internet use, and as such does not sufficiently inform the choice of strategies to reduce or change the behaviors of people who suffer from dysregulated patterns of use (Flayelle et al., 2022). A second recommendation is to not rely on *reported screen time* as a generic outcome measure of the effectiveness of preventive interventions. As stated throughout the thesis, screen time does not inform of the specific behaviors taking place in specific platforms, and as such, it does not give much information related to the desired change taking place. Importantly, we are not suggesting not considering establishing time limits as a strategy to produce change or to measure changes in time spent to account for monitoring use. What is being suggested is that using self-reported time of use as the only outcome measure is not informative enough. Instead, choosing specific instruments that are not symptom-based or measuring behaviors directly, as is

suggested in recent reviews and studies could be more valuable (Satchell et al., 2021; Valkenburg et al., 2022). Finally, the last recommendation is to avoid trying to prevent *Internet addiction* in general as measured and conceptualized with the IAT. In any case, problematic Internet use should be preferred, as it is an umbrella term that is used to indicate a number of different but interrelated conditions (Starcevic & Billieux, 2017). However, an important condition for effectively intervening would be to clearly define *each targeted problematic behavior* separately and to identify their unique and common risk and protective factors, and the mechanisms that elicit or facilitate them when designing an intervention.

1.3 On problematic use of Instagram

The second study that was performed for this thesis (Romero et al., 2022a), presented in Chapter 3, was a qualitative study involving in-depth interviews with nineteen young people, to gain a better understanding of what Instagram means for youth, what their motives are for using the platform, what patterns of use they develop, and which consequences they experience of using it. The analysis of the interviews using a grounded theory approach and drawing on the Uses and Gratifications Theory (Katz et al., 1973) produced several interesting findings.

Regarding the meanings assigned to Instagram, most participants acknowledged that Instagram is like a *showcase*, a place where the search for perfection, superficiality, and the pursuit of likes are ubiquitous. They also acknowledge that it is difficult to distinguish between what is real and what is fake on the platform. However, they also felt a need to constantly return to it, partly because of a sense of urgency and immediacy fostered by the affordances of the platform, and partly because they did not want to miss out on important things.

Concerning the motives for Instagram use, a range of interconnected and often complex motivations were found, including self-expression, information seeking, curiosity, documenting, seeking entertainment, seeking connection, following trends, coping with emotions, wanting to be seen, professional use, and impacting others. Interestingly, motivations varied both within and between individuals, depending on the circumstances and other individual factors.

These findings confirm that using a theoretical model like the Uses & Gratifications Theory can help to identify specific gratifications and frustrations that drive people to use specific media or social networks, in this case, Instagram (Wegmann & Brand, 2019). They also suggest that the motives that drive Instagram use are mainly concerned with self-expression, curiosity, documenting, and entertainment, so they are mainly centered on presenting oneself, and not as

much on maintaining interpersonal relationships: making connections with others only happened afterward – a finding that has also been reported by others (Kim & Kim, 2018; Yau & Reich, 2018). This shows that Instagram serves more individual gratifications and purposes and does not privilege connection and communication (Abbott et al., 2013; Davies, 2020; Kim & Lee, 2011).

In terms of using the platform, five distinctive and interrelated usage patterns were identified:

- *Urge and craving* refers to a need to enter the platform, which happens daily and is generally accompanied by difficulties in controlling the time spent online and stopping its use.
- *Passive use* refers to moderate use in which the user engages in scrolling and consuming content without reacting or posting content themselves.
- *Anxious posting* is a pattern whereby the person actively uses the platform but feels anxious, vulnerable, and exposed, and is afraid of being judged by what he or she posts.
- *Social approval* refers to a usage pattern where the user takes time to craft posts and stories using filters and to edit content to get more likes and reactions.
- *Social comparison* refers to the use of Instagram whereby the user engages in upward or downward comparison, triggering feelings of relief or envy depending on the result of the comparison.

It is important to note that these usage patterns are not mutually exclusive. People use the platform in different ways and can exhibit more than one pattern, depending on their motives, the type of gratifications sought, and other individual and social factors. *Urge and craving* is the pattern that resembles Internet addiction symptoms the most, but it is not the only way in which people use Instagram. The same users may also exhibit the *passive use* pattern, which is normally attributed to specific users with specific individual characteristics (Trifiro & Gerson, 2019; Valkenburg et al., 2022). As such, the results point towards the possibility of a person shifting from a more active, interactive use, to a more passive, scrolling type of use, thus highlighting the need for a more individualized approach to understanding the use of social networks (Flayelle et al., 2022). Moreover, with *anxious posting*, *social approval*, and *social comparison* the qualitative study also revealed three other specific patterns of using Instagram, which is a novel finding.

Among the consequences of Instagram use that were mentioned are feelings of increased connection to others and a sense of belongingness, but also a proneness to look for Instagram-worthy content during the day, problems with time management, a compulsive urge to enter the app that had not been felt before and engaging frequently in constant comparison. Also, time management issues, an urge to enter the platform, constant comparison, and self-presentation through *Instagramable* content are consistent with what other studies have reported previously (Foroughi et al., 2021; Sherlock & Wagstaff, 2018; Van Den Eijnden et al., 2018).

One of the most striking findings in this study was that although participants come from two very different realities - Belgium and Perú - their experiences with Instagram were very similar, in terms of motives, usage patterns, and consequences. The only major differences found were in terms of the content shared and the content exposed, which can also be attributed to individual differences rather than cross-cultural ones. This lack of major variability in the findings could be due to the global nature of Instagram and social networks. For instance, Davies (2020) proposes that social media has removed geographical and cultural barriers, since ideas, practices, and entertainment are globally accessible, become viral, and increase the pace and intensity of communication, feedback, and change. In that sense, youth may be experiencing Instagram fundamentally in the same way. It is also possible that Instagram targets fundamental needs shared by all human beings, such as the need for attention, recognition, to be seen, and to belong and that's why the motives found were more universal than culturally specific. Nevertheless, more research is needed to test these hypotheses or find alternative explanations.

1.4 On measuring problematic use of Instagram

Chapter 4 presented a detailed account of two studies that were concerned with the creation and validation of two new measures: the Instagram Motives Questionnaire (IMQ), and the Instagram Uses and Patterns Questionnaire (IUPQ), (Romero et al., 2022b). Both instruments were developed in parallel and went through exploratory and confirmatory factor analysis in two different samples, a smaller sample of 312 English-speaking individuals for the development of both questionnaires, and a larger sample of 6284 to validate the Spanish and French versions and test for language and gender invariance.

Two well-validated measures related to Instagram use resulted from these studies. The IMQ consists of 32 items measuring six different factor-analytically based

motives for Instagram use: *social impact seeking, emotional escape, souvenir keeping, social connection, attention seeking, and information seeking*. The IUPQ has 37 items that measure six different but related usage patterns: *loss of control, anxious posting, passive use, social approval, feelings of discomfort, and self-deprecating comparison*. Both questionnaires show good construct validity as testified by the fit indices and Omega reliability coefficients, and have demonstrated measurement invariance concerning language and gender, meaning that they are suitable to be used in cross-cultural studies. Further, construct validity evidence was gathered by portraying the relationships of both scales with other constructs that have been reported in the literature as known correlates of problematic Internet use.

Besides the limitations of the study discussed in chapter 4, it is also important to acknowledge that the initial development of both the IMQ and the IUPQ considered all the major motives and patterns that the participants of the qualitative study had mentioned based on their frequency. While other motives and behaviors had been mentioned, if they were not recurring in the data, or saturated, they were not considered. However, the factor analysis that was performed to develop the final versions of the scales led to shortening them. For instance, the IMQ ended up accounting for six motives, while the first version considered at least ten different ones from the qualitative study. While the IMQ and the IUPQ are valid and reliable instruments, they are not exhaustive, as they do not account for all the possible motives and patterns of Instagram use. It is fair to say that the motives and patterns that they do measure are the main ones. However, other more unique, or rare motives and patterns that could inform potentially problematic use might not have been included. It is also worth mentioning that if more affordances continue to be included on Instagram, and it continues to change and evolve, these scales might need to be updated to account for those changes. Nevertheless, we encourage the use of both scales where possible.

By providing valid and reliable measures of the main motives and patterns of Internet use drawing on the experiences of users with the platform and offering the possibility to be used consistently across countries and cultures, these two measurement instruments are a unique contribution to the field of study and practice of problematic Internet use. Future studies could collect more diverse and representative data to further extend the findings and augment their generalizability and pay more attention to potential cultural differences.

1.5 On understanding the correlates of problematic Instagram use

In Chapter 5 we presented a study applying structural equation modeling on a large sample of Instagram users aged 18-34 to understand the mechanisms by which *social comparison orientation* and *fear of missing out* (FoMO) are related to motives and patterns of use. Findings confirm that social comparison orientation and trait FoMO are indeed drivers of Instagram use and that they have an effect on the motives and different patterns of use both directly and indirectly. Specifically, social comparison orientation has a direct effect on *anxious posting*, *passive use*, and *self-deprecating comparison* patterns, while FoMO directly influences *loss of control*, *anxious posting*, *feelings of discomfort*, and *self-deprecating comparison*. These effects are interrelated, in the sense that individuals with higher comparison orientation tendencies are more afraid of missing out on exciting experiences and feel drawn to Instagram, as it offers so many targets for comparison. In terms of indirect effects, a higher *social comparison orientation* predicts the *social approval* pattern of Instagram use, through the mediation by FoMO and by the *attention-seeking* motive. In other words, the behavior of crafting posts and stories to get reactions from followers flows from a need for attention, a fear of missing out, and a tendency to compare oneself to others.

Although it was not the main purpose of the study, some evidence was also found for differential motives and usage patterns among women and younger people. Women showed a tendency to use Instagram more for souvenir keeping and exhibit more loss of control, anxious posting, social, approval, and self-deprecating comparison patterns than men. Also, the older a user gets, the lower they scored on FoMO, emotional escape seeking, social connection, and information seeking. They also exhibit less anxious posting, feelings of discomfort, and self-deprecating comparison.

These findings reflect how different usage motives are related to different patterns of use. For example, a very interesting finding is that the social connection motive does not predict any patterns of use, while the attention-seeking motive predicts anxious posting, social approval, and feelings of discomfort. It is likely that this is because Instagram is optimized for self-presentation rather than for fostering social connections, and while perhaps at the beginning of the pandemic participants reported using socials networks more to maintain their social connections active, maybe that effect disappeared after some months into the pandemic and when distancing and confining measures softened. As for the attention-seeking motive, it makes sense that the primary driver for using the platform is not to establish or

maintain relationships with others, but the need to belong, to be recognized, and to draw attention toward oneself (Kim & Kim, 2019, Yau & Reich, 2018). The direct and indirect effects of *social comparison orientation* and of *fear of missing out* on the motives and patterns of use confirm their key importance as drivers of Instagram use (Reer et al., 2019; Gomez et al., 2021). However, as stated in chapter 5, the relationships could be reciprocal, and besides trait FoMO, situational FoMO needs to be considered. Most of the features that constitute Instagram design, such as content personalization, notifications, and the inherent nature of *stories* which are displayed only for 24 hours, encourage compulsive checking that can trigger and sustain FoMO (Alutaybi et al., 2020). Thus, further studies should investigate how social comparison orientation and FoMo are related and further document their influence on specific Instagram usage patterns. Moreover, despite being close concepts, the relationship between FoMO and SCO has not received much attention from researchers. It would therefore be interesting to investigate the effect of these variables in longitudinal studies, to detect the developmental trajectories of use, which could inform the creation of tailor-made interventions where needed (Flayelle et al., 2022; Ioannidis et al 2018). However, these studies need to consider potential changes in the platforms that could influence their use.

Concerning, the influence of gender and age, although our findings regarding the effects of gender and age on problematic Internet use are small, they do point towards a tendency toward differentiated use. Future studies should also focus on some of the mechanisms that explain the differential influence of age and gender, by relating them to other variables and investigating how they align with the proposed theories that investigate predisposing variables of problematic social network use (Valkenburg & Peter, 2007; Wegmann & Brand, 2019; Wegmann et al., 2022).

1.6 On understanding the consequences of problematic Instagram use

In the last study of this thesis, presented in Chapter 6, we considered the relationship of specific Instagram use patterns with loneliness and psychological burden, as potential negative outcomes. Our findings showed that four Instagram use patterns had direct effects on loneliness, stress, anxiety, and depressive symptoms: *loss of control* (positive small effect on stress and negative small effects on anxiety and loneliness), *social approval* (negative small effect on anxiety and loneliness), *feelings of discomfort* (moderate positive effect on anxiety and loneliness), and *self-deprecating comparison* (small positive effect on stress and moderate positive effect on loneliness). In addition, we also found an indirect

relationship between the patterns of use and psychological burden through loneliness, which brings more support to the hypothesis that loneliness is a possible outcome of specific patterns of Instagram use (Foroughi et al., 2021; Ponnusamy et al., 2020; Yurdagül et al., 2019).

It is important to highlight that the relationships found are conditional, meaning that the interpretation of the estimated parameters' magnitude and direction needs to consider the other related parameters. One important conclusion emerging from our study is that the patterns of use are interrelated and that they can have a positive or negative effect on users when taking into consideration the other patterns. For instance, if the user is not comparing themselves on Instagram or is uncomfortable due to some issues experienced on the platform, then loss of control and passive use do not harm the individual and might even help them reduce loneliness and psychological burden.

Another important conclusion is that the effects of Instagram use are not only direct but also mediated by *loneliness*, which increases the need for more specific studies on loneliness, to understand the mechanisms by which Instagram use can foster loneliness. Our results are aligned with the perspectives presented by Newland et al. (2018) who very articulately give an account of how the relationship between loneliness and social internet use is bidirectional and fluid, can be influenced by age, and how research has not produced consistent results because the motivations have not been considered, different ways of using the platforms have not been measured, and longitudinal studies to measure change in loneliness have not been conducted. For instance, when individuals use the SNs to enhance their existing relationships, make new connections and interact in a way that helps them connect more in the real world, their loneliness can be reduced. However, when they use them to escape the social world and withdraw from interaction, feelings of loneliness could increase. Also, loneliness could be a determinant of how people interact with SNs, as lonely people will have a preference for online interaction, and displace time spent in offline social activities. Even further, specific actions executed online, such as updating a status, or sharing something could momentarily increase or decrease loneliness.

In this sense, and considering the results of this study, we are led to believe that these different actions executed on Instagram could increase or decrease loneliness. For instance, although uploading posts and stories allow users to get likes and shares which provide rewards that can satisfy their needs for attention, belonging, and connection, after the initial reward, they don't actually bring people together or

enhance relationships in the long term. That post or story might not have helped initiate actual conversations or interactions offline that can help form or maintain relationships. As such, users could actually feel lonelier in real life or even more disconnected or frustrated by bogus interactions that are less meaningful. Concerning the negative relationship that we found with other usage patterns, another possible explanation is that for some people, browsing without connecting, or engaging in these para-social connections is enough to satisfy their needs, thus their loneliness is lessened, and thus psychological burden (depression, anxiety, and stress) is reduced. Loneliness thus seems to be an important correlate and consequence of social network use, and, since it is related to well-being, it is essential to continue exploring its links to Instagram use. The self-determination theory could be a good fit to advance this research since, from this perspective, loneliness is understood as resulting from a deficiency in needs satisfaction. When individuals have higher needs for relatedness, autonomy, and competence, they report greater feelings of loneliness when these are not satisfied, especially because motivational integration (going from extrinsic sources to intrinsic motivation) is better supported by environments higher in relatedness (Ryan & Deci, 2000). Thus, it would be important to understand how the motives of Instagram use relate to these basic needs and if they are actually fulfilled by using Instagram, and how this could lead to variations in loneliness.

In summary, specific patterns of Instagram use can be related to either positive or negative mental health outcomes, mediated by loneliness, depending on *why* and *how* the platform is used, as suggested by other researchers previously (Kross et al., 2021; Newland et al., 2018). Although our study did not involve a representative sample and did not use a longitudinal study design, it helps bring nuance to some of the claims regarding the negative outcomes of Instagram use by highlighting *which* usage patterns could be problematic. However, as our study design did not allow drawing conclusions concerning the causal associations between these variables, other competing models should also be considered and tested.

1.7 On generating insights that can inform better prevention

Chapter seven presented an integration of the latest findings in the scientific literature and the results obtained from the studies presented in this thesis regarding how Instagram is designed to attract users' attention and stay hooked to the platform, the potential negative consequences of using it, and who are most vulnerable to these consequences on account of their motives and user patterns. By integrating these findings, it was possible to make suggestions for policies and

programs that can help to remedy or prevent some of these effects. With regard to the latter, three groups of possible actions were presented: promoting the adoption of ethical social network design, promoting responsible use of Instagram by addressing specific predisposing variables, habit formation and breaking, self-regulation and life-skills development; and promoting applied research on responsible Internet use and prevention.

While these recommendations are based on the studies presented in this thesis, they also concur with the findings of other studies proposed in the literature and with recommendations that emanate from them.

1.8 Further remarks

There are two elements of this thesis to further reflect on. The first one concerns *the choice of the population*. This thesis focused on people aged between 18 and 35 because they constitute the majority of Instagram users (Statista, 2022). While older people are more drawn to Facebook, and teenagers and people up to 24 are massively using TikTok, this specific cohort of users aged 18-35, has declared Instagram its preferred social network according to the latest report (Kemp, 2022). The population attracted to Instagram can be considered *young millennials and GenZ* (Dimock, 2019). Although the *generations* approach to understanding young people is a categorization extensively more used in marketing than in psychology, it points toward a specific cohort in a particular life stage (Dimock, 2019; Munsch, 2021). They are consolidating their identity, finding out who they are, and what defines them, and making important decisions about education, work, and relationships that will affect their adult life (Munsch, 2021; Roisman et al., 2004). They have to navigate those decisions while also managing their online presence and their social networks, something that previous generations did not have to do or think about. Thus, social comparison and FoMO are experienced in ways that had not been seen or studied before. After all, before social networks, young people would compare themselves to their peers and to the people they looked up to or wanted to be different from, but they did not have millions of possible comparison targets available or wouldn't have drawn that much attention to themselves by exposing their lives in social media (Tiggemann & Anderberg, 2020).

Using survey methods to assess as many individuals as possible in three different languages and several cultural backgrounds was a cost-effective approach to gathering enough data that would allow drawing statistically appropriate conclusions. However, there are three major shortcomings in our approach: (1) data

was not representative of the population; (2) people with lower education levels were not included, (2) some important characteristics that could impact the results were not assessed. For instance, although the data gathered on sociodemographic characteristics and Internet use tendencies follows the same trends found in global reports (Kemp, 2022), this sample was mostly educated. Some research suggests that less educated people are more “addicted” to social media (Andreassen et al., 2017), whereas other research also explains that lower education levels contribute to the *digital divide* (Bobkowski & Smith, 2013). Thus, we do not know to what extent the experiences on social media vary according to education level, and it would be very important to address them.

Moreover, being gender-inclusive in the survey was intended, and options to self-describe were given to the participants, but less than 1% of the sample identified themselves as non-binary. Also, we did not inquire about health problems, mental health problems, or specific diagnoses (e.g. eating disorders, clinical depression, social anxiety disorder, autistic spectrum disorders). Since marginalized communities (based on gender, sexuality, class, ethnicity, and disability) experience digital visibility in different ways and are more exposed to criticism, hate, and harassment (Duffy & Hund, 2019), but are taking many of their causes to social media, future studies need to be as inclusive as possible of these groups.

Finally, this thesis did not intend to address people with *Internet addiction* or sub-clinical forms given the controversy surrounding conceptualization and diagnosis. However, case study methodology with specific individuals showing detrimental use of social networks, considering functional impairment as a fundamental diagnostic criterion, would be very useful for advancing the study of the motives and patterns of use and the field in general. Despite those shortcomings, what was collected was a good starting point, and more importantly, the data is vast and can still be analyzed to search for clusters of individuals with specific demographics that could provide more insights into this research.

The second element that needs attention is the *impact of the COVID-19 pandemic* on this research. In chapter one, there is a section that presents the possible implications of COVID-19 on methodological decisions and how the pandemic might impact results. The data was gathered during the pandemic in July 2020 for the qualitative study, and, for the survey study, between June and September 2021. and might reflect augmented or specific usage trends that were occurring at those specific periods (e.g., during confinement vs. when vaccines were being applied).

While there is no way to account for the impact of the pandemic on the overall results, some information was gathered on how participants were using SNs and Instagram during the pandemic (see Appendix G for an account). Some interesting takeaways are the following: (1) social network use and Instagram use increased due to a profound need to stay connected, maintain relationships, be entertained, and stay informed during the pandemic; (2) youth fulfilled those needs by engaging in SNs in tandem and switching in between them, with unique combinations depending on the situation, the mood, and individual variables; (3) social network use could be perceived both as a relief and as overwhelming at times; (4) content posted and content that was sought after were different than before the pandemic, due to confinement and contact restrictions; (5) participants who acknowledged discomfort with the content they were exposed to or with their overuse engaged in different corrective strategies.

Overall, the constant during the pandemic were the many changes that users experienced in their motives, usage patterns, content exposure, perceived consequences, and corrective actions. Every experience was unique, and as some turned more into SNs, others refrained from them and controlled their use better. While non exhaustive nor conclusive, these findings are very informative. Understanding if these changes are still sustained, have returned to pre-pandemic levels, or evolved differently, would be of much value for advancing research.

2. Summary of studies conducted and main findings

The following table summarizes the objectives of the thesis which were outlined in Chapter 1, the research questions that followed, the study design and methods, and the main findings.

Table 1. Summary of studies conducted and main findings

Objectives	Research questions	Study design and methods	Main findings
On primary prevention efforts for PUI	- What are the available primary prevention programs for PUI in youth? - What definitions of PUI are used to guide the proposed programs? - Which tools are used to measure the outcomes? - How is the effectiveness of the program measured? - Is the available evidence enough to determine that these programs are effective against no intervention?	A systematic review of available primary prevention programs for problematic internet use and meta-analysis.	Few studies are available, most focusing on treatment. Most studies portray PUI from an addiction perspective, target adolescents, and university students, and used a variety of techniques and strategies to address the behavior. The evidence of their effectiveness is inconclusive.
On problematic use of Instagram	- What does Instagram mean for youth? - What motivates young people to use Instagram? - Are there any specific patterns of use of Instagram? - What are the perceived consequences of that use?	Qualitative interview study using the grounded theory approach to understand in-depth the meanings, motives, patterns, and consequences of Instagram use in youth (aged 18-28)	Instagram is a showcase, where the pursuit for likes, the search for perfection, and superficiality are the norm. Motives such as self-expression, curiosity, documenting, entertainment, and connection, among others, emerged. Five distinctive Instagram use patterns were found: urge and craving, passive use, anxious posting, social approval, and comparison.
On measuring problematic use of Instagram	- Will the Instagram Motives Questionnaire (IMQ) be a valid and reliable measure of motives of Instagram use? - Will the Instagram Uses and Patterns Questionnaire (IUPQ) be a valid and reliable measure of patterns of Instagram Use? - Will the IMQ and IUPQ be invariant across gender and languages?	Two studies on the development and psychometric validation of two measurement instruments (IMQ and IUPQ) to measure motives and patterns of Instagram use in a wide sample of youth aged 18-34. Obtention of validity and reliability evidence and measurement invariance across language and gender	The IMQ and IUPQ have demonstrated good validity and reliability evidence as well as measurement invariance across language and gender, which proves them suitable to measure motives and patterns of Instagram use in cross-cultural studies.

Objectives	Research questions	Study design and methods	Main findings
On understanding the correlates of problematic Instagram use	- How are the motives and patterns of Instagram use related? - What is the mechanism through which comparison orientation is related to Instagram motives and patterns of use? - What is the mechanism through which fear of missing out is related to Instagram motives and patterns of use?	A structural equation modeling study to obtain the different pathways (direct and indirect) that relate to social comparison orientation, fear of missing out, and the motives and patterns of Instagram use	Not every motive predicts every pattern of Instagram use. Both social comparison orientation and fear of missing out are important drivers of Instagram use and predict specific motives and patterns of use with direct and mediated effects.
On understanding the consequences of problematic Instagram use	- What are the mechanisms through which the patterns of Instagram use are related to loneliness, depression, anxiety, and stress? - Does loneliness mediate the relationships between Instagram use patterns and depression, anxiety and stress symptoms?	A structural equation modeling study to obtain the different pathways (direct and indirect) that relate the patterns of Instagram use and loneliness, depression, anxiety, and stress outcomes.	There are direct and mediated pathways of the patterns of Instagram use to psychological burden (depression, anxiety, stress) directly and through loneliness.
On generating insights that can inform better prevention	Which insights from the previous studies can inform policy makers, researchers, and individuals for better prevention?	Theoretical review of current evidence and synthesis of the findings of the previous studies. Recommendations for prevention.	Recommendations are given for promoting three fronts: ethical social network design, promoting responsible Instagram use and research on responsible Internet use and prevention.

3. Conclusion

This thesis aimed to provide insights into problematic Instagram use in youth with a view to better inform preventive efforts and intervention.

A systematic review and meta-analysis on primary prevention programs for problematic Internet use revealed a lack of consensus in the conceptualization, operationalization, and measurement of the different behaviors that constitute problematic Internet use, which hinder well-designed prevention programs that can effectively reduce some of the pervasive consequences of Internet use.

Therefore, the decision was made to focus on one of those behaviors: problematic social network use, and more specifically, Instagram use. This choice is warranted because most of the research in the area has been done on Facebook, whereas the affordances of each platform make them unique contexts for specific behaviors. A

series of studies on Instagram motives and patterns of use was undertaken, showing that Instagram has a specific meaning for its users, is motivated by very different and specific needs, and renders distinctive patterns of use. The results also showed the importance of social comparison orientation and fear of missing out as drivers for Instagram use, with both direct and indirect effects on the patterns of use. Finally, it was shown that some patterns of use have direct and indirect effects on psychological burden (depression, anxiety, and stress) directly and through loneliness, which is a variable that deserves to be studied further in depth.

The results of the studies presented in this thesis were integrated with the literature on the prevention of problematic social network use, leading to recommendations on three different strategies to improve the prevention of problematic internet use and promote a healthier use of Instagram: promote the adoption of ethical social network design, promote applied research on responsible Internet use and prevention, and promote a responsible use of Instagram in youth.

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Appendices

Appendix A. Informed consent

Consent for Participation in Interview Research

I volunteer to participate in a research project conducted by Prof. Stephan Van den Broucke, Silvana Romero, Palmyra Zollo and Wendy Van Beggelaer from Université Catholique de Louvain. I understand that the project is designed to gather information about my use of social networks. I will be one of approximately 30 people being interviewed for this research.

I understand that my participation in this project is voluntary and that I will not be paid for it. I may withdraw and discontinue participation at any time without penalty. If I decline to participate or withdraw from the study, no one will be told. I understand that most interviewees will find the exchange with the researchers interesting and thought-provoking. If, however, I feel uncomfortable in any way during the interview session, I have the right to decline to answer any question or to end the interview. Participation involves being interviewed online by one of the researchers. It will last approximately 45-60 minutes. The interview will be recorded and then transcribed. If I decide not to be taped, I will not be able to participate in the study. I may also be asked to provide with some of the content that I generate on social networks. I can accept or decline this request. This content will not be reproduced or used in any reports without asking for permission from me.

I understand that the researcher will not identify me by name in any reports using information obtained from this interview, and that my confidentiality and anonymity as a participant in this study will remain secure. Subsequent uses of records, data or social media will be subject to standard data use policies which protect the anonymity of individuals and institutions. Every possible measure will be taken to protect the recorded interview file and to guarantee it remains private and confidential. I understand and agree that I might need to be contacted again to do a follow-up interview which, if needed, will be brief (10 -15 minutes).

I understand that this research study has been reviewed and approved by the Ethics Committee of the Institut de Recherche en Sciences Psychologiques (IPSY). If I have any questions, doubts or inquiries I can contact professor Stephan Van den Broucke at this email address: stephan.vandenbroucke@uclouvain.be

I have read and understood the explanation provided to me. I have had all my questions answered to my satisfaction, and I voluntarily agree to participate in this study.

I have been given a copy of this consent form.

My Signature

Date

Appendix B. Demographic questionnaire

Age: _____

Gender: M ☐ F ☐ Other ☐

Occupation: _____

Please indicate which social networks do you use (all that apply)

☐ Facebook

☐ Messenger

☐ Instagram

☐ Snapchat

☐ TikTok

☐ Whatsapp

☐ Twitter

☐ YouTube

☐ Others : _____

Please indicate your top five most used social networks and an average time of use per day. You can consult your phone if you need to.

_____	Time: _____
_____	Time: _____
_____	Time: _____
_____	Time: _____
_____	Time: _____

Primary account name on Instagram: _____

Is your Instagram account: ☐ Public ☐ Private

If you have a second profile please provide the name: _____

Approximate time in years and months since you started using Instagram: _____

Number of followers you have on Instagram: _____

Number of accounts you follow on Instagram: _____

Number of publications on Instagram: _____

Do you consider your Instagram use as problematic?

- ☐ Not at all
- ☐ A bit
- ☐ Moderately
- ☐ Absolutely

Do you consider yourself an Instagram addict?

- ☐ Not at all
- ☐ A bit
- ☐ Moderately
- ☐ Absolutely

Appendix C. Semi-structured interview

Interview protocol – Interviewer instructions

Before the interview

- *Contact the participant and ask them if they are willing to be interviewed via skype or zoom. If they accept, forward them the informed consent and the questionnaire to an email address and ask them to read them thoroughly, complete them, and send them back to you before the interview date.*
- *Check that your internet connection is stable, that your camera and audio are well positioned and check how the record button works.*
- *Call the participant on the scheduled date and time. Greet him/her and ask if they were able to read the informed consent. If their answer is yes, tell them that you will start recording the interview. If they say no, go through the informed consent with them.*
- *In both cases ask them if they have any questions and solve them before starting.*
- *Start the interview recording by saying the date, time of the interview, the first name of the participant, and his/her age and ask the participant to give their oral consent for the interview.*
- *If they did not respond to the questionnaire, go through it with them until it is completed.*
- *After that, start the interview by saying this:*

I'm going to ask you some questions to explore your current use of social networks. Please try to be as descriptive and thorough as possible about your experience.

General questions

1. In the questionnaire you said you use XX social networks, have you always used them, or have you recently discovered some of them? Explain
2. You also listed the networks that you use the most. Why do you use them? Do you find that you use different ones for different reasons? Please explain.
3. Are you comfortable with the time you spend on social networks daily? Why/why not?

4. Do you think that there is a difference between your current use of social networks and how you used them before the Covid-19 pandemic? If so, please explain. How was it before? How is it now?

Instagram questions

1. You said that you XX (e.g. absolutely) consider that your Instagram use is problematic. Why is that?
2. In the questionnaire, you said that you XX (e.g. absolutely) consider yourself an Instagram addict. Why is that?

Ask this one only if the person has more than one profile, if not, go to the next question.

3. You said in the questionnaire that you have XX profiles on Instagram, why do you have more than one?
4. Your primary account is public/private according to the questionnaire. Why did you decide it to be that way?
5. Who are the majority of your followers? Why do you think your follower base has evolved like that? How do you feel about it? How do you feel about the number of followers you have?

If the person has more than one account, ask them to keep in mind their personal accounts and answer accordingly. Probe the person until you think you have got a detailed answer

6. Who are the majority of the accounts you follow? Why do you think it has evolved like that? How do you feel about it?

If the person does not know what to answer, give some examples (family, friends, strangers, influencers, company accounts, celebrities, actors, musicians, etc.

7. Please describe the content that appears the most on your feed today. Why do you think that is the content you get the most? How do you feel about it?

[Here we are trying to establish what are the types of content that appear in their feed so we can categorize them. This is based on Instagram's algorithm which in turn was based on participants' choices. Knowing what is on their feed can give us some notion of their preferred content.]

[If they need to take their phones out and look for themselves, let them do so. It is ok to use any words to describe the content but try to ask them to be as specific as possible about the different types of content they see.]

Usage and motivations for use questions

8. When do you use Instagram? What do you use Instagram for and why? Please be as detailed as possible

Allow the person to express themselves and say all they want. If necessary, you can ask the following:

- *How often do you post pictures/videos? Why do you post? How would you describe your posts if you had to? Which kind of content do you usually post?*
- *How often do you post stories? Why do you post stories? How would you describe your stories if you had to? Which kind of content do you usually post in a story?*

[It is very important that for each different behavior, at least a reason or motive can be recalled. You can also make questions to distinguish one behavior from the other, for example: do you think your reasons are different when you post a story rather than a post? Do you think the content you post is different from the content you post in a story?]

9. Do you post more, or do you upload stories more? Why?
10. In both posts and stories, do you use e.g., filters, hashtags, mentions, stickers, or music? Which ones do you use more often? Why do you do that?
11. Which other features of Instagram do you use (IGTV, private messaging, going live, etc.) Why and when do you use them?
12. Do you usually comment on posts or react to the stories of the accounts you follow? Why? Why not?
13. How often do you give likes to posts on Instagram? Why do you decide to do it? When do you do it? To which types of accounts?
14. Do you find yourself scrolling through your Instagram feed or watching stories often?

Here we are trying to understand passive social media behavior, so be thorough and stop only when you feel the information is saturated. If necessary, you can probe using the following questions:

- *How often? When? How much time would you say you spend doing that on a given day? Whose accounts do you find yourself looking to the most?*
15. What do you think encourages or discourages you to post?

16. Do you find any patterns in the way you use Instagram? Please describe.

Provide examples, if necessary, e.g. "I use it every night before going to sleep" "I find myself scrolling Instagram every hour when I am bored"

17. Which activities that you perform on Instagram are the most important to you? Why?
18. How do you think your Instagram use has changed after Covid-19?

Consequences questions

19. Which types of emotions do you feel when you are using Instagram? How does this make you feel?
20. How do you feel when you post a picture or a story? Why? Do you like having those feelings?
21. How do you feel when someone likes, comments, or reacts to your posts or stories? Why?
22. How do you feel when you check who and how many people have watched your stories?
23. What changes (positive or negative) have occurred in your daily life since you use Instagram?
24. What do you think is the most important way in which Instagram has changed your life?

Interviewers' notes

Please take note of any events, feelings, reactions, or questions that arise to you during the interview. Everything is welcomed if it is detailed and specific. It can be a specific non-verbal cue a participant may have given during the interview, a feeling, or a sensation you felt while conducting the interview, noise or events that may have disrupted the interview, rapport issues, etc.

Then transcribe your notes and put them in the same code that you will use for the audio file so we can pair audios with the interviewer's notes

After the interview

Ask the participant if they have any questions and address them. Stop recording. Say goodbye to the participant. Save the audio/video file. Review and transcribe your notes. Transcribe the interviews.

Appendix D. Informed consent form and demographic questions¹

Informed consent form

Thank you for your interest in this research and for volunteering to take the surveys. This research project is conducted by Prof. Stephan Van den Broucke, Silvana Romero, Clara Courboin and Palmyra Zollo from Université Catholique de Louvain and Prof. Pavica Sheldon from University of South Alabama.

This study is interested in understanding the motives and patterns of Instagram use in young people, so you will be asked some questions regarding your use of the social network and about yourself. It should take around 15 minutes to complete.

You can participate only if:

- You are at least 18 years old and up to 34
- You have an active Instagram profile, and you use it frequently

You have the right to discontinue your participation at any time you want without penalty. Also, if there are any questions that you would prefer not to complete, you can leave them blank. No personal information that could identify you will be collected, so rest assure that your anonymity and confidentiality will be guaranteed. We will use the information of this survey for academic and scientific purposes only and the results will be reported collectively, not individually.

This research study has been reviewed and approved by the Ethics Committee of the Institut de Recherche en Sciences Psychologiques (IPSY). If you have any questions, doubts or inquiries you can contact Stephan Van den Broucke at: stephan.vandenbroucke@uclouvain.be.

If you are taking this survey for extra credit, please tell us your class/section and your last name in the box provided at the end of the survey.

By checking the "I accept" box, you give your free and informed consent to participate in this research.

- ☐ I accept
- ☐ I do not accept/ I do not fulfill the requirements

¹ As uploaded on Qualtrics

Demographics

What is your age?

How would you describe yourself?

- ☐ Male
- ☐ Female
- ☐ Non binary/Third gender
- ☐ Prefer not to say
- ☐ Prefer to self describe:

Which level of education are you currently in? .If you are not studying, which is the highest level of education you have completed?

- ☐ High school diploma
- ☐ Technical/Professional
- ☐ Undergraduate degree/Bachelor
- ☐ Postgraduate studies/MA/Phd

In which country do you currently reside?

Please indicate which social networks you use (select all that apply)

- ☐ Facebook
- ☐ Messenger
- ☐ Instagram
- ☐ Snapchat
- ☐ TikTok
- ☐ Whatsapp
- ☐ Twitter
- ☐ YouTube
- ☐ Other(s) please write them down

Do you have an Instagram profile?

- ☐ No
- ☐ Yes

Your Instagram profile is:

- ☐ Public
- ☐ Private

How long have you been using Instagram? (In years)

0 1 2 3 4 5 6 7 8 9 10

On average, how much time (in minutes) do you spend on Instagram in a day?

Do you have more than one Instagram profile?

- ☐ No
- ☐ Yes

I think my time spent on Instagram has _____ since the COVID19 outbreak began

- ☐ Decreased
- ☐ Increased
- ☐ It has not changed

Appendix E. Supplementary material

Table S1. Descriptive statistics for the IMQ items.

	Item	Mean	SD	Median	Min	Max	Skew.	Kurtosis	SE
IMQ2	I use Instagram to keep an eye on what others are doing.	3.19	1.23	3	1	5	-0.20	-0.91	0.07
IMQ3	I use Instagram to keep a visual record and remember important moments of my life.	2.81	1.38	3	1	5	0.16	-1.20	0.08
IMQ5	Instagram helps me to keep in touch with meaningful people in my life.	2.88	1.23	3	1	5	-0.01	-1.03	0.07
IMQ6	I am on Instagram because that way I can stay up to date.	2.92	1.20	3	1	5	-0.03	-0.91	0.07
IMQ7	I use Instagram to escape from boredom.	3.47	1.17	4	1	5	-0.48	-0.61	0.07
IMQ8	I share content on Instagram to get attention/reactions from others.	2.32	1.24	2	1	5	0.50	-0.94	0.07
IMQ9	Instagram allows me to be up to date with what is happening in the world/my community.	3.10	1.23	3	1	5	-0.03	-0.74	0.07
IMQ10	I am on Instagram to promote my work/my business.	1.73	1.23	1	1	5	1.42	0.64	0.07
IMQ14	I post on Instagram to store my pictures.	2.32	1.37	2	1	5	0.59	-1.02	0.08
IMQ16	Using Instagram has allowed me to reconnect with people I had not seen in a while.	2.68	1.27	3	1	5	0.19	-1.17	0.07
IMQ18	I use Instagram to get away from reality for a little while.	2.65	1.17	3	1	5	0.12	-0.96	0.07
IMQ19	I enjoy the attention I get on Instagram.	2.49	1.28	2	1	5	0.31	-1.12	0.07
IMQ22	I am on Instagram to raise awareness on important matters.	1.84	1.06	1	1	5	1.16	0.54	0.06
IMQ24	I scroll through the Insta stories to see what people are up to.	3.32	1.15	3	1	5	-0.28	-0.73	0.07
IMQ25	I use Instagram as a gallery of the moments that I cherish the most	2.57	1.30	3	1	5	0.21	-1.15	0.07
IMQ26	Instagram allows me to pass the time in a fun way.	3.16	1.08	3	1	5	-0.21	-0.66	0.06

	Item	Mean	SD	Median	Min	Max	Skew.	Kurtosis	SE
IMQ27	I use Instagram to chat, catch up with people and make plans with them.	2.61	1.26	3	1	5	0.25	-1.06	0.07
IMQ29	I use Instagram to relieve my negative emotions (stress, anxiety, etc.).	2.12	1.15	2	1	5	0.73	-0.51	0.07
IMQ30	I enjoy Instagram because I can be seen by many people.	2.05	1.21	2	1	5	0.89	-0.38	0.07
IMQ32	I share content on Instagram to promote myself.	1.87	1.18	1	1	5	1.08	-0.13	0.07
IMQ37	You can always find something Interesting happening on Instagram.	3.05	1.12	3	1	5	-0.02	-0.88	0.06
IMQ38	Instagram enables me to develop my relationships with other people.	2.46	1.15	2	1	5	0.40	-0.76	0.06
IMQ40	I use Instagram to escape my responsibilities for a while.	2.60	1.26	2	1	5	0.27	-1.06	0.07
IMQ41	I enjoy the validation I feel when I get likes, comments, or reactions to my content.	2.88	1.29	3	1	5	-0.03	-1.11	0.07
IMQ43	I share content on Instagram to enlarge my follower base.	1.96	1.22	1	1	5	1.05	-0.04	0.07
IMQ44	I share content on Instagram hoping to inspire other people.	2.17	1.30	2	1	5	0.77	-0.68	0.07
IMQ45	I use Instagram as a tool to keep a visual record and remember good and fun moments.	2.72	1.36	3	1	5	0.22	-1.15	0.08
IMQ48	I use Instagram to pass the time in between activities.	3.42	1.11	4	1	5	-0.38	-0.59	0.06
IMQ50	I use Instagram to show others how skillful I am.	1.99	1.19	2	1	5	0.94	-0.26	0.07
IMQ51	I am on Instagram to uplift and make an impact on others.	1.98	1.15	2	1	5	0.95	-0.17	0.07
IMQ52	I use Instagram to show how creative I am.	2.11	1.30	2	1	5	0.80	-0.66	0.07
IMQ53	I use Instagram to engage people to take part in important matters.	2.00	1.13	2	1	5	0.83	-0.36	0.06

Table S2. Factor loadings and communalities of the IMQ items

	F1	F2	F3	F4	F5	F6	h^2
I share content on Instagram hoping...	.809						.728
I am on Instagram to uplift and make...	.784						.750
I share content on Instagram to promote...	.752						.662
I use Instagram to show how creative I am.	.711						.720
I am on Instagram to promote my work/my...	.707						.470
I share content on Instagram to enlarge my ...	.670						.665
I use Instagram to engage people to take...	.662						.651
I use Instagram to show others how skillful...	.645						.659
I am on Instagram to raise awareness on...	.593						.482
I use Instagram to escape my responsibili..		.734					.571
I use Instagram to pass the time in between...		.675					.523
Instagram allows me to pass the time in...		.662					.580
I use Instagram to get away from reality for...		.619					.412
I use Instagram to escape from boredom.		.594					.450
I use Instagram to relieve my negative...		.567					.421
You can always find something interesting...		.553					.468
I use Instagram as a gallery of the moments...			.895				.806
I use Instagram to keep a visual record and...			.774				.641
I use Instagram as a tool to keep a visual			.763				.707
I post on Instagram to store my pictures.			.721				.603
I use Instagram to chat, catch up with...				.775			.588
Instagram enables me to develop my...				.757			.657
Instagram helps me to keep in touch with...				.666			.495
Using Instagram has allowed me to...				.660			.671
I enjoy the validation I feel when I get likes...					.642		.667
I enjoy the attention I get on Instagram.					.636		.722
I share content on Instagram to get attention...					.602		.601
I enjoy Instagram because I can be seen by...					.458		.550
I am on Instagram because that way I can...						.744	.662
I use Instagram to keep an eye on what...						.661	.499
Instagram allows me to be up to date with...						.552	.537
I scroll through the Insta stories to see what...						.457	.462

Note. Extraction method: Principal Axis Factoring. Rotation method: Oblimin with Kaiser normalization. Rotation converged in 10 iterations. Factor 1 = Social Impact Seeking, Factor 2 = Emotional Escape Seeking, Factor 3 = Souvenir Keeping, Factor 4 = Social Connection Seeking, Factor 5 = Attention Seeking, Factor 6 = Information Seeking. h^2 = communalities

Table S3. Correlations between IMQ and IUPQ dimensions

	2	3	4	5	6	7	8	9	10	11	12
1. SIS	.271**	.567**	.471**	.682**	.243**	.327**	.324**	-.407**	.623**	.388**	.305**
2. EES	-	.289**	.272**	.376**	.528**	.624**	.395**	.160**	.366**	.467**	.491**
3. SK		-	.492**	.538**	.329**	.331**	.212**	-.328**	.483**	.326**	.263**
4. SCS			-	.430**	.376**	.320**	.295**	-.256**	.389**	.436**	.260**
5. AS				-	.385**	.390**	.443**	-.257**	.730**	.488**	.459**
6. IS					-	.436**	.302**	.163**	.338**	.331**	.387**
7. LC						-	.444**	.067	.501**	.563**	.563**
8. APO							-	.125*	.548**	.612**	.702**
9. PU								-	-.179**	.006	.131*
10. SAP									-	.469**	.509**
11. FD										-	.575**
12. SDC											-

Note. ** $p < 0.01$, * $p < 0.05$

Table S4. Descriptive statistics for the IUPQ items.

	Item	<i>M</i>	<i>SD</i>	<i>Me</i>	<i>Min</i>	<i>Max</i>	<i>Skewness</i>	<i>Kurtosis</i>	<i>SE</i>
IUPQ1	I feel like I'm on Instagram more than I should.	2.83	1.23	3	1	5	0.11	-0.98	0.07
IUPQ2	Instagram is an essential part of my daily life.	2.55	1.22	3	1	5	0.26	-0.94	0.07
IUPQ3	When I get likes or comments on a post, I feel happy and uplifted.	3.32	1.21	3	1	5	-0.35	-0.80	0.07
IUPQ4	I put a lot of effort into crafting beautiful posts and stories for my followers.	2.30	1.24	2	1	5	0.64	-0.64	0.07
IUPQ6	I do not post stuff on Instagram, but I watch other people's content.	3.15	1.26	3	1	5	-0.22	-1.02	0.07
IUPQ8	I wish I could control the time I spend on Instagram better.	2.64	1.36	3	1	5	0.30	-1.15	0.08
IUPQ9	I open Instagram many times during the day to see what is new.	3.28	1.23	3	1	5	-0.27	-0.94	0.07
IUPQ11	I edit my videos and pictures so they look good on Instagram.	2.73	1.42	3	1	5	0.22	-1.28	0.08
IUPQ13	I spend time mindlessly scrolling on Instagram.	3.02	1.10	3	1	5	0.01	-0.73	0.06
IUPQ14	I check other people's posts and stories to feel better about myself.	1.96	0.96	2	1	4	0.57	-0.81	0.05
IUPQ15	I wish I could spend less time on Instagram and more time living the present moment.	2.68	1.36	3	1	5	0.28	-1.10	0.08
IUPQ16	Opening Instagram and checking stories has become like a reflex (something I do automatically)	3.09	1.34	3	1	5	-0.13	-1.14	0.08
IUPQ17	When I post something on Instagram, I am afraid of being judged.	2.59	1.27	3	1	5	0.35	-0.91	0.07
IUPQ21	I wish I could have the life of some of the people on Instagram.	2.84	1.21	3	1	5	0.04	-0.89	0.07
IUPQ22	My relationships are suffering due to my Instagram addiction.	1.39	0.78	1	1	4	2.00	3.15	0.04
IUPQ23	I open Instagram in between activities automatically.	2.84	1.17	3	1	5	0.05	-0.91	0.07
IUPQ24	I tend to get anxious after posting something on Instagram because I fear people will not like it.	2.30	1.27	2	1	5	0.63	-0.69	0.07
IUPQ25	I refrain from posting something others may not like.	2.45	1.23	2	1	5	0.35	-0.97	0.07
IUPQ27	I enjoy checking out content on Instagram but I don't like sharing content myself.	3.20	1.16	3	1	5	-0.11	-0.78	0.07
IUPQ28	I can't help but compare myself to others on Instagram.	2.66	1.23	3	1	5	0.24	-0.95	0.07

	Item	<i>M</i>	<i>SD</i>	<i>Me</i>	<i>Min</i>	<i>Max</i>	<i>Skewness</i>	<i>Kurtosis</i>	<i>SE</i>
IUPQ29	I am procrastinating due to hanging out on Instagram too much.	2.50	1.22	2	1	5	0.35	-0.91	0.07
IUPQ30	While being on Instagram, I lose track of time.	2.59	1.21	3	1	5	0.32	-0.81	0.07
IUPQ31	When I post something on Instagram, I feel insecure and tense, waiting to see people's reactions.	2.41	1.23	2	1	5	0.45	-0.84	0.07
IUPQ33	If someone comments or reacts to my stories, I will answer them back.	3.43	1.14	4	1	5	-0.62	-0.35	0.06
IUPQ34	I would probably watch stories or posts on Instagram without liking or reacting to them.	3.48	0.99	4	1	5	-0.58	0.07	0.06
IUPQ35	Some of the content I see on Instagram makes me feel bad about myself.	2.38	1.16	2	1	5	0.45	-0.78	0.07
IUPQ37	I feel a need to enter Instagram and see what is happening.	2.59	1.11	3	1	5	0.14	-0.80	0.06
IUPQ38	I feel disappointed when the content I create does not get the reactions I expect.	2.51	1.22	2	1	5	0.31	-0.92	0.07
IUPQ39	I remove a post or a story when they don't get the reaction I expect.	1.79	1.07	1	1	5	1.20	0.37	0.06
IUPQ41	I check stories and posts, but I hardly react, like or comment them.	3.20	1.04	3	1	5	-0.18	-0.57	0.06
IUPQ42	I get annoyed when I can't access Instagram for any reason.	2.07	1.08	2	1	5	0.83	0.02	0.06
IUPQ44	Being on Instagram gives me mixed feelings.	2.75	1.23	3	1	5	0.11	-0.97	0.07
IUPQ45	When I share something on Instagram, I tend to feel vulnerable and exposed.	2.40	1.22	2	1	5	0.43	-0.80	0.07
IUPQ46	I get excited when my posts and stories receive likes and reactions.	3.29	1.23	3	1	5	-0.37	-0.79	0.07
IUPQ47	I believe the bar set by the influencers on Instagram is too high for me to achieve.	2.94	1.44	3	1	5	-0.02	-1.36	0.08
IUPQ49	When I see certain posts or stories on Instagram, I feel envious.	2.43	1.10	2	1	5	0.27	-0.79	0.06
IUPQ52	If I am not on Instagram, I feel disconnected from others.	2.01	1.01	2	1	5	0.71	-0.31	0.06

Table S5. Factor loadings and communalities of the IUPQ items

	F1	F2	F3	F4	F5	F6	h^2
I feel like I'm on Instagram more than I should.	.827						.734
I wish I could control the time I spend on Instagram better.	.820						.661
I wish I could spend less time on Instagram and more time living the present moment.	.763						.638
I am procrastinating due to hanging out on Instagram too much.	.757						.686
While being on Instagram, I lose track of time.	.743						.614
I open Instagram many times during the day to see what is new.	.695						.663
I open Instagram in between activities automatically.	.688						.641
I spend time mindlessly scrolling on Instagram.	.637						.518
Opening Instagram and checking stories has become like a reflex (something I do automatically)	.599						.647
Instagram is an essential part of my daily life.	.524						.526
I feel a need to enter Instagram and see what is happening.	.495						.590
I tend to get anxious after posting something on Instagram because I fear people will not like it.		.691					.769
When I post something on Instagram, I feel insecure and tense, waiting to see people's reactions.		.657					.751
When I post something on Instagram, I am afraid of being judged.		.642					.673
When I share something on Instagram, I tend to feel vulnerable and exposed.		.614					.666
I refrain from posting something others may not like.		.606					.590
I enjoy checking out content on Instagram but I don't like sharing content myself.			.735				.607
I do not post stuff on Instagram, but I watch other people's content.			.595				.392
I would probably watch stories or posts on Instagram without liking or reacting to them.			.451				.336
I check stories and posts, but I hardly react, like or comment them.			.449				.206
I get excited when my posts and stories receive likes and reactions.				.789			.758
When I get likes or comments on a post, I feel happy and uplifted.				.709			.635
I edit my videos and pictures so they look good on Instagram.				.452			.424
If someone comments or reacts to my stories, I will answer them back.				.452			.297
I put a lot of effort into crafting beautiful posts and stories for my followers.				.431			.521
I feel disappointed when the content I create does not get the reactions I expect.				.403			.608
My relationships are suffering due to my Instagram addiction.					.642		.481
If I am not on Instagram, I feel disconnected from others.					.530		.432

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	F1	F2	F3	F4	F5	F6	h^2
I get annoyed when I can't access Instagram for any reason.					.520		.446
I remove a post or a story when they don't get the reaction I expect.					.512		.512
I check other people's posts and stories to feel better about myself.					.507		.365
When I see certain posts or stories on Instagram, I feel envious.						.884	.736
Some of the content I see on Instagram makes me feel bad about myself.						.777	.687
I can't help but compare myself to others on Instagram.						.733	.661
I wish I could have the life of some of the people on Instagram.						.715	.493
Being on Instagram gives me mixed feelings.						.453	.479
I believe the bar set by the influencers on Instagram is too high for me to achieve.						.430	.410

Note: Extraction method: Principal Axis Factoring. Rotation method: Oblimin with Kaiser normalization. Rotation converged in 12 iterations. Factor 1 = Loss of control, Factor 2 = Anxious Posting, Factor 3 = Passive use, Factor 4 = Social Approval, Factor 5 = Feelings of Discomfort, Factor 6 = Self-deprecating Comparison. h^2 = communalities

Table S6. Descriptive statistics for all the variables of the study by language

	English			French			Spanish			Total		
	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>
Social Impact Seeking	1418	18.13	7.93	1826	14.7	6.4	3040	18.5	8.0	6284	17.32	7.76
Emotional Scape Seeking	1418	21.99	6.03	1826	20.6	5.4	3040	22.3	6.1	6284	21.75	5.95
Souvenir Keeping	1418	11.92	4.91	1826	10.3	4.6	3040	10.4	4.5	6284	10.70	4.69
Social Connection Seeking	1418	11.02	4.06	1826	9.8	3.9	3040	10.2	4.1	6284	10.26	4.05
Attention Seeking	1418	9.92	4.24	1826	8.8	3.7	3040	9.1	4.1	6284	9.22	4.05
Information Seeking	1418	12.75	3.65	1826	12.3	3.5	3040	12.3	3.9	6284	12.40	3.73
Loss of control	1337	30.82	9.47	1406	35.9	8.6	2372	31.2	9.5	5115	32.37	9.49
Anxious Posting	1337	13.31	5.35	1406	11.5	5.4	2372	11.4	5.2	5115	11.90	5.35
Passive Use	1337	12.86	3.61	1406	14.0	3.5	2372	13.2	3.4	5115	13.32	3.52
Social Approval	1337	17.37	5.20	1406	17.2	5.1	2372	15.8	5.2	5115	16.59	5.19
Feelings of Discomfort	1337	9.70	3.64	1406	8.6	2.9	2372	8.8	3.6	5115	8.99	3.44
Self-Dep. Comparison	1337	17.36	5.63	1406	16.0	5.4	2372	14.5	5.3	5115	15.65	5.55
Compulsive Internet Use	1368	14.11	4.19	1577	12.9	3.8	2700	13.5	4.1	5645	13.47	4.09
Self-Consciousness	1369	20.73	4.62	1575	20.8	4.4	2695	20.2	4.1	5639	20.48	4.31
Insight	1358	30.36	7.02	1573	31.1	6.9	2648	31.2	6.8	5579	30.99	6.87
FoMo	1295	25.95	8.38	1332	25.5	7.0	2225	21.4	7.7	4852	23.74	8.00
Comparison Orientation	1290	34.02	6.30	1314	34.0	7.1	2211	31.0	7.4	4815	32.62	7.23
Loneliness	1308	16.56	4.85	1330	14.6	4.7	2235	15.9	4.9	4873	15.74	4.90
Anxiety	1303	12.68	4.87	1329	11.6	4.4	2229	12.2	4.9	4861	12.15	4.79
Depression	1290	13.68	5.34	1330	12.6	5.2	2223	13.2	5.6	4843	13.15	5.44
Stress	1300	14.86	4.89	1331	14.2	5.0	2236	15.0	5.2	4867	14.74	5.04
Life Satisfaction	1310	21.60	6.66	1315	23.8	6.8	2230	22.0	6.7	4855	22.38	6.78

Table S7. Correlations between the IMQ and the IUPQ subscales and other relevant variables by language

	Age				Gender				Self-esteem			
	English	French	Spanish	Total	English	French	Spanish	Total	English	French	Spanish	Total
Social Impact Seeking	-.051	-.115**	.029	-.093**	.119**	-.072**	.122**	.028*	.129**	.095**	.066**	.144**
Emotional Scape Seeking	-.025	-.110**	-.158**	-.150**	.146**	.100**	.074**	.060**	-.073**	-.128**	-.114**	-.060**
Souvenir Keeping	.013	-.035	.053**	-.007	.229**	.037	.099**	.111**	.077**	.008	.084**	.053**
Social Connection Seeking	-.101**	-.228**	-.053**	-.136**	.133**	-.049*	-.001	.008	.049	.033	.070**	.060**
Attention Seeking	-.008	-.101**	-.015	-.058**	.129**	-.110**	.031	.020	.055*	.023	-.044*	-.001
Information Seeking	-.083**	-.139**	-.153**	-.138**	.146**	.045	.030	.059**	-.038	-.041	-.055**	-.046**
Loss of control	.053	-.065*	-.102**	.027	.087**	.124**	.104**	.147**	-.083**	-.083**	-.155**	-.169**
Anxious Posting	-.046	-.233**	-.141**	-.169**	.156**	.015	.121**	.105**	-.314**	-.165**	-.296**	-.260**
Passive Use	.028	.074**	-.120**	.011	-.020	.054*	-.014	.018	-.227**	-.110**	-.144**	-.173**
Social Approval	.001	-.181**	-.006	-.033*	.180**	-.043	.115**	.124**	-.042	.019	-.108**	-.095**
Feelings of Discomfort	-.058*	-.150**	-.147**	-.151**	.043	.061*	.051*	.048**	-.104**	-.124**	-.192**	-.150**
Self-Deprecating Comparison	-.031	-.145**	-.123**	-.111**	.217**	.077**	.149**	.171**	-.382**	-.260**	-.340**	-.355**

*p<0.05; **p<0.01

Note: Spearman correlations. P values adjusted using the false discovery rate procedure. Only complete cases were considered for each analysis, so for the English sample, $n = 1290$ - 1418 , for the French sample, $n = 1314$ - 1826 , for the Spanish sample, $n = 2211$ - 3040 and for the total sample, $n = 4815$ - 6284

Table S7. Correlations between the IMQ and the IUPQ subscales and other relevant variables by language (continued)

	Compulsive Internet Use				Self-Consciousness				Insight			
	English	French	Spanish	Total	English	French	Spanish	Total	English	French	Spanish	Total
Social Impact Seeking	.147**	.144**	.136**	.153**	.153**	.136**	.225**	.162**	-.130**	-.017	-.035	-.054**
Emotional Scape Seeking	.342**	.481**	.390**	.407**	.314**	.298**	.347**	.309**	-.071**	-.190**	-.162**	-.148**
Souvenir Keeping	.073**	.126**	.088**	.105**	.144**	.182**	.189**	.176**	-.024	-.035	-.026	-.035**
Social Connection Seeking	.146**	.173**	.130**	.156**	.187**	.199**	.253**	.218**	-.054*	-.080**	-.031	-.054**
Attention Seeking	.249**	.281**	.282**	.279**	.290**	.367**	.370**	.346**	-.120**	-.086**	-.131**	-.120**
Information Seeking	.210**	.319**	.285**	.280**	.333**	.334**	.337**	.334**	-.031	-.121**	-.092**	-.088**
Loss of control	.474**	.578**	.514**	.481**	.267**	.252**	.286**	.274**	-.148**	-.215**	-.245**	-.201**
Anxious Posting	.380**	.359**	.428**	.406**	.451**	.404**	.383**	.409**	-.296**	-.299**	-.327**	-.318**
Passive Use	.188**	.063*	.220**	.154**	.117**	-.016	.101**	.077**	-.053	-.059*	-.121**	-.083**
Social Approval	.329**	.332**	.328**	.327**	.377**	.414**	.382**	.395**	-.128**	-.115**	-.131**	-.130**
Feelings of Discomfort	.373**	.508**	.443**	.448**	.240**	.293**	.286**	.278**	-.262**	-.267**	-.310**	-.289**
Self-Deprecating Comparison	.404**	.406**	.461**	.430**	.454**	.408**	.348**	.398**	-.265**	-.328**	-.343**	-.321**

*p<0.05; **p<0.01

Note: Spearman correlations. P values adjusted using the false discovery rate procedure. Only complete cases were considered for each analysis, so for the English sample, $n = 1290$ -1418, for the French sample, $n = 1314$ -1826, for the Spanish sample, $n = 2211$ - 3040 and for the total sample, $n = 4815$ -6284

Table S7. Correlations between the IMQ and the IUPQ subscales and other relevant variables by language (continued)

	FoMO				Comparison Orientation				Loneliness			
	English	French	Spanish	Total	English	French	Spanish	Total	English	French	Spanish	Total
Social Impact Seeking	.291**	.186**	.292**	.210**	.055*	.080**	.120**	.059**	.078**	.065*	-.008	.064**
Emotional Scape Seeking	.309**	.350**	.382**	.308**	.308**	.362**	.270**	.271**	.096**	.244**	.167**	.183**
Souvenir Keeping	.227**	.267**	.226**	.244**	.169**	.106**	.090**	.123**	-.073**	-.025	-.099**	-.053**
Social Conn. Seeking	.269**	.240**	.316**	.275**	.176**	.151**	.172**	.163**	.015	.069*	-.063**	.010
Attention Seeking	.424**	.391**	.491**	.437**	.243**	.280**	.297**	.277**	.076**	.110**	.087**	.102**
Information Seeking	.357**	.383**	.427**	.384**	.298**	.331**	.273**	.291**	.011	.063*	.087**	.069**
Loss of control	.461**	.426**	.507**	.471**	.331**	.347**	.359**	.358**	.198**	.156**	.258**	.171**
Anxious Posting	.537**	.447**	.571**	.532**	.416**	.466**	.449**	.447**	.380**	.353**	.380**	.381**
Passive Use	.062*	-.053	.095**	.055**	.199**	.053	.190**	.160**	.214**	.059*	.249**	.165**
Social Approval	.506**	.455**	.526**	.516**	.366**	.339**	.358**	.374**	.164**	.173**	.175**	.166**
Feelings of Discomfort	.537**	.496**	.615**	.560**	.231**	.388**	.379**	.348**	.286**	.295**	.364**	.334**
Self-Dep. Comparison	.581**	.493**	.611**	.593**	.515**	.512**	.508**	.527**	.401**	.384**	.437**	.404**

*p<0.05; **p<0.01

Note: Spearman correlations. P values adjusted using the false discovery rate procedure. Only complete cases were considered for each analysis, so for the English sample, $n = 1290$ - 1418 , for the French sample, $n = 1314$ - 1826 , for the Spanish sample, $n = 2211$ - 3040 and for the total sample, $n = 4815$ - 6284

Table S7. Correlations between the IMQ and the IUPQ subscales and other relevant variables by language (continued)

	Anxiety				Depression				Stress				Life Satisfaction			
	Eng	Fr	Sp	Total	Eng	Fr	Sp	Total	Eng	Fr	Sp	Total	Eng	Fr	Sp	Total
Social Impact Seeking	.27**	.07*	.11**	.15**	.17**	.08**	.07**	.11**	.24**	.08**	.10**	.14**	.08**	-.10	.12**	.04**
Emotional Scape Seeking	.14**	.28**	.20**	.21**	.15**	.30**	.21**	.22**	.20**	.31**	.26**	.26**	.00	-.19**	-.03	-.08**
Souvenir Keeping	.10**	.04	-.03	.05**	.015	.02	-.04	.00	.12**	.05	.012	.06**	.17**	.038	.18**	.13**
Social Connection Seeking	.15**	.14**	.04*	.11**	.10**	.08**	.01	.06**	.15**	.09**	.05*	.09**	.07*	-.01	.17**	.08**
Attention Seeking	.17**	.10**	.14**	.15**	.14**	.13**	.14**	.15**	.20**	.14**	.17**	.17**	.06*	-.06*	.02	-.00
Information Seeking	.06*	.15**	.10**	.11**	.05	.11**	.09**	.09**	.12**	.13**	.15**	.14**	.12**	-.04	.08**	.05**
Loss of control	.21**	.18**	.27**	.21**	.26**	.25**	.29**	.25**	.30**	.26**	.31**	.26**	-.06*	-.10**	-.07**	-.03**
Anxious Posting	.38**	.35**	.35**	.37**	.39**	.34**	.35**	.37**	.39**	.32**	.34**	.35**	-.20**	-.22**	-.19**	-.21**
Passive Use	.06*	.06*	.18**	.10**	.16**	.06*	.20**	.14**	.10**	.05	.19**	.12**	-.11**	-.03	-.13**	-.08**
Social Approval	.23**	.18**	.18**	.20**	.21**	.16**	.19**	.19**	.28**	.19**	.20**	.21**	.02	-.08**	.01	-.01
Feelings of Discomfort	.36**	.29**	.36**	.35**	.32**	.33**	.34**	.34**	.34**	.30**	.34**	.33**	-.10**	-.18**	-.14**	-.15**
Self Dep. Comparison	.35**	.37**	.37**	.36**	.41**	.43**	.41**	.41**	.42**	.41**	.39**	.39**	-.20**	-.32**	-.29**	-.26**

*p<0.05; **p<0.01

Note: Spearman correlations. P values adjusted using the false discovery rate procedure. Only complete cases were considered for each analysis, so for the English sample, $n = 1290$ - 1418 , for the French sample, $n = 1314$ - 1826 , for the Spanish sample, $n = 2211$ - 3040 and for the total sample, $n = 4815$ - 6284

Appendix F. Instagram motives questionnaire – IMQ and Instagram uses and patterns questionnaire – IUPQ

Instagram motives questionnaire – IMQ (English version)

Please indicate to what extent these statements describe you:

<i>Does not describe me</i>	<i>Describes me slightly well</i>	<i>Describes me moderately well</i>	<i>Describes me very well</i>	<i>Describes me extremely well</i>
1	2	3	4	5

1. I share content on Instagram hoping to inspire other people.
2. I use Instagram to escape my responsibilities for a while.
3. I use Instagram as a gallery of the moments that I cherish the most
4. I use Instagram to chat, catch up with people and make plans with them.
5. Instagram allows me to be up to date with what's happening around me and in the world.
6. I enjoy the validation I feel when I get likes, comments, or reactions to my content.
7. I am on Instagram to uplift and make an impact on others.
8. I use Instagram to pass the time in between activities.
9. I use Instagram to keep a visual record and remember important moments of my life.
10. Instagram enables me to develop my relationships with other people.
11. I enjoy the attention I get on Instagram.
12. I am on Instagram because that way I can stay up to date.
13. I share content on Instagram to promote myself.
14. Instagram allows me to pass the time in a fun way.
15. I use Instagram as a tool to keep a visual record and remember good and fun moments.
16. I use Instagram to engage people to take part in important matters.
17. I use Instagram to get away from reality for a little while.
18. Instagram helps me to keep in touch with meaningful people in my life.
19. I use Instagram to show how creative I am.
20. I use Instagram to escape boredom.
21. I scroll through the Insta stories to see what people are up to.
22. I use Instagram to show others how skillful I am.
23. I use Instagram to relieve my negative emotions (stress, anxiety, etc.).
24. I post on Instagram to store my pictures.
25. I am on Instagram to promote my work/my business.
26. Using Instagram has allowed me to reconnect with people I had not seen in a while.

27. I share content on Instagram to get attention/reactions from others.
28. I think there is always something Interesting happening on Instagram.
29. I use Instagram to keep an eye on what others are doing.
30. I share content on Instagram to enlarge my follower base.
31. I enjoy Instagram because I can be seen by many people.
32. I am on Instagram to raise awareness on important matters.

Instagram uses and patterns questionnaire – IUPQ (English version)

Please state the frequency in which these statements apply to you:

<i>Never</i>	<i>Rarely</i>	<i>Sometimes</i>	<i>Often</i>	<i>Always</i>
1	2	3	4	5

1. I feel like I'm on Instagram more than I should.
2. I tend to get anxious after posting something on Instagram because I fear people will not like it.
3. I get excited when my posts and stories receive likes and reactions.
4. My relationships are suffering due to my Instagram addiction.
5. I wish I could control the time I spend on Instagram better.
6. When I see certain posts or stories on Instagram, I feel envious.
7. When I get likes or comments on a post, I feel happy and uplifted.
8. I wish I could spend less time on Instagram and more time living the present moment.
9. When I post something on Instagram, I feel insecure and tense, waiting to see people's reactions.
10. I enjoy checking out content on Instagram, but I don't like sharing content myself.
11. If I am not on Instagram, I feel disconnected from others.
12. I am procrastinating due to hanging out on Instagram too much.
13. Some of the content I see on Instagram makes me feel bad about myself.
14. I edit my videos and pictures so they look good on Instagram.
15. While being on Instagram, I lose track of time.
16. When I post something on Instagram, I am afraid of being judged.
17. I do not post stuff on Instagram, but I watch other people's content.
18. I spend time mindlessly scrolling on Instagram.
19. If someone comments or reacts to my stories, I will answer them back.
20. I get annoyed when I can not access Instagram for any reason.
21. I can't help but compare myself to others on Instagram.
22. Opening Instagram and checking stories has become like a reflex (something I do automatically)
23. When I share something on Instagram, I tend to feel vulnerable and exposed.

24. I would probably watch stories or posts on Instagram without liking or reacting to them.
25. Instagram is an essential part of my daily life.
26. I put a lot of effort into crafting beautiful posts and stories for my followers.
27. I remove a post or a story when they don't get the reaction I expect.
28. I wish I could have the life of some of the people on Instagram.
29. I feel a need to enter Instagram and see what is happening.
30. I feel disappointed when the content I create does not get the reactions I expect.
31. Being on Instagram gives me mixed feelings.
32. I open Instagram many times during the day to see what is new.
33. I refrain from posting something others may not like.
34. I check stories and posts, but I hardly react, like, or comment on them.
35. I open Instagram in between activities automatically.
36. I believe the bar set by the influencers on Instagram is too high for me to achieve.
37. I check other people's posts and stories to feel better about myself.

Instagram motives questionnaire – IMQ (Spanish version)

Por favor indica en qué medida las siguientes frases te describen/te representan o no:

<i>No me describe</i>	<i>Me describe un</i>	<i>Me describe</i>	<i>Me describe</i>	<i>Me describe</i>
<i>1</i>	<i>poco</i>	<i>moderadamente</i>	<i>bastante</i>	<i>extremadamente</i>
	<i>2</i>	<i>3</i>	<i>bien</i>	<i>bien</i>
			<i>4</i>	<i>5</i>

1. Comparto contenido en Instagram para inspirar a otros.
2. Instagram me permite escapar por un momento de mis responsabilidades.
3. Instagram es como una galería de los momentos que más valoro.
4. Uso Instagram para hablar y ponerme al día con otras personas y hacer planes con ellas.
5. Instagram me permite estar al tanto de lo que está pasando a mi alrededor y en el mundo.
6. Disfruto la validación que siento cuando recibo un like, comentarios o reacciones a mi contenido.
7. Estoy en Instagram para apoyar y generar un impacto en los demás.
8. Uso Instagram para pasar el tiempo entre una actividad y otra.
9. Uso Instagram para mantener un registro visual y recordar momentos importantes de mi vida.
10. Instagram me permite desarrollar mis relaciones con otras personas.
11. Disfruto la atención que recibo en Instagram.

12. Estoy en Instagram porque así puedo mantenerme al día.
13. Comparto contenido en Instagram para promoverme a mí mismo/a.
14. Instagram me permite pasar el tiempo de forma divertida.
15. Uso Instagram como herramienta para mantener un registro visual y recordar momentos lindos y divertidos.
16. Uso Instagram para incentivar a las personas a que participen en asuntos importantes.
17. Uso Instagram para alejarme de la realidad por unos instantes.
18. Instagram me permite mantenerme en contacto con personas significativas en mi vida.
19. Uso Instagram para mostrar cuan creativo/a soy.
20. Uso Instagram para escaparme del aburrimiento.
21. Me la paso chequeando los stories de Instagram para ver en qué está la gente.
22. Uso Instagram para mostrar mis habilidades.
23. Uso Instagram para aliviar mis emociones negativas (estrés, ansiedad, etc).
24. Posteo en Instagram para guardar mis fotos.
25. Estoy en Instagram para promover mi trabajo/ mi empresa.
26. Usar Instagram me ha permitido reconectarme con personas que no había visto en un buen tiempo.
27. Comparto contenido en Instagram para obtener atención/reacciones de otros.
28. Creo que siempre puedes encontrar algo interesante pasando en Instagram.
29. Uso Instagram para estar al tanto de lo que hacen lo demás.
30. Comparto contenido en Instagram para tener más seguidores.
31. Disfruto estar en Instagram porque así puedo ser visto/a por más personas.
32. Estoy en Instagram para crear consciencia sobre asuntos importantes.

Instagram uses and patterns questionnaire – IUPQ (Spanish version)

Indica la frecuencia en la que las siguientes frases se aplican a tu caso particular:

<i>Nunca</i>	<i>Rara vez</i>	<i>A veces</i>	<i>Con frecuencia</i>	<i>Siempre</i>
<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>

1. Siento que paso más tiempo en Instagram del que debería.
2. Tiendo a ponerme ansioso luego de postear algo en Instagram porque temo que no le guste a la gente.
3. Me entusiasmo cuando mis posts y mis historias reciben “likes” y reacciones.
4. Mis relaciones están sufriendo por culpa de mi adicción a Instagram.
5. Me gustaría poder controlar mejor el tiempo que paso en Instagram.
6. Cuando veo ciertos posts o stories en Instagram, me da envidia.
7. Cuando recibo un “me gusta” o comentarios en un post, me siento feliz y motivado.
8. Me gustaría pasar menos tiempo en Instagram y más tiempo viviendo el momento presente.

9. Cuando posteo algo en Instagram, me siento tenso e inseguro esperando a ver las reacciones de la gente.
10. Disfruto chequeando contenido en Instagram, pero no me gusta compartir contenido por mi cuenta.
11. Si no estoy en Instagram me siento desconectado de los demás.
12. Estoy procrastinando por pasar mucho el rato en Instagram.
13. Parte del contenido que veo en Instagram me hace sentir mal conmigo mismo/a.
14. Edito mis fotos y videos para que se venan bien en Instagram.
15. Mientras estoy en Instagram, pierdo la noción del tiempo.
16. Cuando posteo algo en Instagram, me da miedo ser juzgado.
17. No posteo cosas en Instagram, pero si veo el contenido de otras personas.
18. Me la paso “escrolleando” inconscientemente en Instagram.
19. Si alguien comenta o reacciona a mis historias, le contesto o reacciono de vuelta.
20. Me fastidio cuando no puedo entrar a Instagram por algún motivo.
21. No puedo evitarlo, pero tiendo a compararme con otros en Instagram.
22. Abrir el Insta y chequear las historias se ha vuelto una especie de reflejo (algo que hago en automático).
23. Cuando comparto algo en Instagram, tiendo a sentirme vulnerable y expuesto.
24. Es probable que vea posts e historias en Instagram sin darles “like” o reaccionar a ellos.
25. Instagram es una parte esencial de mi vida cotidiana.
26. Me esfuerzo para crear posts e historias hermosos para mis seguidores.
27. Elimino un post o una historia cuando no obtienen las reacciones que espero.
28. Me gustaría poder tener la vida que tienen algunas personas en Instagram.
29. Siento la necesidad de entrar a Instagram para ver qué está pasando.
30. Me siento decepcionado cuando el contenido que creo no tiene las reacciones que espero.
31. Estar en Instagram me produce sentimientos encontrados.
32. Abro Instagram varias veces al día para ver qué novedades encuentro.
33. Evito postear algo que pueda no gustarles a otros.
34. Chequeo posts e historias, pero casi no reacciono, o les doy “like” o les comento.
35. Abro Instagram entre actividades de manera automática.
36. Creo que la vida que han puesto los influencers en Instagram es muy difícil de alcanzar.
37. Reviso los posts y las historias de otras personas para sentirme mejor conmigo mismo.

Instagram motives questionnaire – IMQ (French version)

Dans quelle mesure les déclarations suivantes vous décrivent-elles ?

<i>Ne me décrit pas</i>	<i>Me décrit légèrement</i>	<i>Me décrit moyennement</i>	<i>Me décrit très bien</i>	<i>Me décrit extrêmement bien</i>
1	2	3	4	5

1. Je partage du contenu sur Instagram en espérant inspirer d'autres personnes.
2. J'utilise Instagram pour fuir mes responsabilités un moment.
3. J'utilise Instagram comme une galerie des moments que je chéris le plus.
4. J'utilise Instagram pour discuter, prendre des nouvelles des gens et planifier des choses avec eux.
5. Instagram me permet d'être à jour sur ce qui arrive autour de moi et dans le monde.
6. J'apprécie la validation ressentie quand j'obtiens des likes, des commentaires ou des réactions à mon contenu.
7. Je suis sur Instagram pour égayer les gens et les toucher.
8. J'utilise Instagram pour passer le temps entre deux activités.
9. J'utilise Instagram pour garder une trace visuelle et me remémorer les moments importants de ma vie.
10. Instagram me permet de développer mes relations sociales.
11. J'apprécie l'attention que je reçois sur Instagram.
12. Je suis sur Instagram parce que cela me permet de rester à jour.
13. Je partage du contenu sur Instagram pour me promouvoir.
14. Instagram me permet de passer le temps de façon fun.
15. J'utilise Instagram comme un outil pour garder une trace visuelle et me remémorer de bons moments.
16. J'utilise Instagram pour inciter les gens à prendre part à des questions importantes.
17. J'utilise Instagram pour échapper à la réalité le temps d'un instant.
18. Instagram m'aide à rester en contact avec des personnes importantes pour moi.
19. J'utilise Instagram pour montrer à quel point je suis créatif.
20. J'utilise Instagram pour échapper à l'ennui.
21. Je scroll les stories Instagram pour voir ce que font les gens.
22. J'utilise Instagram pour montrer aux autres à quel point je suis compétent.
23. J'utilise Instagram pour soulager mes émotions négatives (stress, anxiété, etc.).
24. Je poste sur Instagram pour stocker mes photos.
25. Je suis sur Instagram pour promouvoir mon travail / mon entreprise.
26. Utiliser Instagram m'a permis de renouer avec des personnes que je n'avais pas vues depuis un moment.
27. Je partage du contenu sur Instagram pour attirer l'attention / les réactions des autres.
28. On peut toujours trouver quelque chose d'intéressant qui se passe sur Instagram.
29. J'utilise Instagram pour garder un œil sur ce que font les autres.

30. Je partage du contenu sur Instagram pour augmenter mon nombre d'abonnés.
31. J'apprécie Instagram car je peux être vu(e) par beaucoup de monde.
32. Je suis sur Instagram pour sensibiliser les autres à des sujets importants.

Instagram uses and patterns questionnaire – IUPQ (French version)

Veillez indiquer à quelle fréquence les déclarations suivantes s'appliquent à vous :

<i>Jamais</i>	<i>Rarement</i>	<i>Parfois</i>	<i>Souvent</i>	<i>Toujours</i>
1	2	3	4	5

1. J'ai l'impression que je suis sur Instagram plus que je ne devrais.
2. J'ai tendance à être anxieux(se) après avoir posté quelque chose sur Instagram parce que j'ai peur que les gens ne l'apprécient pas.
3. Je suis enthousiasmé(e) lorsque mes posts et mes stories reçoivent des likes et des réactions.
4. Mes relations souffrent de mon addiction à Instagram.
5. J'aimerais mieux contrôler le temps que je passe sur Instagram.
6. Quand je vois certains posts ou stories sur Instagram, je me sens envieux(se).
7. Lorsque je reçois des likes ou des commentaires sur un post, je me sens heureux(se) et égayé(e).
8. J'aimerais pouvoir passer moins de temps sur Instagram et plus de temps à vivre dans l'instant présent.
9. Lorsque je publie quelque chose sur Instagram, je me sens peu sûr de moi et tendu, attendant de voir les réactions des gens.
10. J'aime consommer du contenu sur Instagram, mais je n'aime pas partager du contenu moi-même.
11. Quand je ne suis pas sur Instagram, je me sens déconnecté des autres.
12. Je procrastine parce que je traîne trop sur Instagram.
13. Il arrive que le contenu que je vois sur Instagram me fasse me sentir mal dans ma peau.
14. J'édite mes vidéos et mes photos pour qu'elles aient l'air bien sur Instagram.
15. En étant sur Instagram, je perds la notion du temps.
16. Quand je poste quelque chose sur Instagram, j'ai peur d'être jugé(e).
17. Je ne poste pas de contenu sur Instagram, mais je regarde celui des autres.
18. Je passe du temps à scroller sans réfléchir sur Instagram.
19. Si quelqu'un commente ou réagit à mes stories, je réponds en retour.
20. Ça m'ennuie de ne pas pouvoir accéder à Instagram, pour quelque raison que ce soit.
21. Je ne peux m'empêcher de me comparer aux autres sur Instagram.
22. Ouvrir Instagram et checker les stories est devenu une sorte de réflexe (je le fais automatiquement).

23. Lorsque je partage quelque chose sur Instagram, j'ai tendance à me sentir vulnérable et exposé.
24. J'ai tendance à regarder des stories ou des posts sur Instagram sans les liker ou y réagir.
25. Instagram est une partie essentielle de ma vie quotidienne.
26. Je fais beaucoup d'efforts pour créer de beaux posts et stories pour mes followers.
27. Je supprime un post ou une story lorsque la réaction attendue n'est pas obtenue.
28. J'aimerais pouvoir avoir la vie de certaines personnes sur Instagram.
29. Je ressens le besoin d'ouvrir Instagram et de voir ce qu'il s'y passe.
30. Je suis déçu(e) lorsque le contenu que je crée n'obtient pas les réactions attendues.
31. J'éprouve des sentiments mitigés lorsque je suis sur Instagram.
32. J'ouvre plusieurs fois Instagram au cours de la journée pour voir ce qu'il y a de nouveau.
33. Je m'abstiens de publier quelque chose que les autres pourraient ne pas aimer.
34. Je check les stories et les publications, mais je ne réagis, n'aime ou ne commente pratiquement jamais.
35. J'ouvre Instagram entre deux activités de façon automatique.
36. J'ai l'impression que la barre fixée par les influenceurs sur Instagram est trop haute pour que je puisse l'atteindre.
37. Je regarde les posts et les stories des autres pour me sentir mieux dans ma peau.

Appendix G. Use of SN during the COVID-19 Pandemic

The rationale for addressing this issue

As outlined before, SNs have revolutionized how people define and express their social identity and manage and support their social networks. These digital places offer endless possibilities, but at the same time, can become pervasive and have adverse effects on the lives of users. The COVID-19 pandemic has possibly affected the ways in which youths use SNs, their motivations for use, and the time they spend on them. However, given the recency of the phenomenon, empirical research on these topics remains limited.

Drawing on a more extensive interview study regarding the motives and patterns of Instagram by youths, the results described here come from some additional questions regarding the COVID-19 pandemic and the use of SNs posed to the participants.

Results

An overview of the different themes, subthemes, and categories that emerged from the interview data is given in the following table

Themes	Subthemes	Categories
Use of SN in general	Most used social networks	Instagram, Whatsapp, Messenger, Facebook, YouTube, TikTok
	Motives for the use of social networks	Connect, remain in contact, and communicate to others To peek on what others are doing For fun/entertainment Cope with boredom, passing the time or avoid negative emotions Stay up to date/Information To use for networking For studies/work To share/show their lives
	Time spent	Reducing/regulating time Procrastination/waste of time Bingeing social networks
Use of social networks during COVID	Increased use	Need to feed social connection Need to stay up to date and exchange information Need for entertainment Need for distraction
	Same use Reduced use	Information overload Detoxing Increased workload

Use of Social Networks in general

Most used SNs

Instagram was the most often used SN as reported by the participants, ranking first (n=10) and second (n=7). Participants use Instagram as a tool for self-expression, entertainment, maintaining social relationships, and avoiding boredom and uncomfortable emotions. A more specific and in-depth elaboration of these results will be reported in Chapter 3.

Besides Instagram, messaging apps are the second most frequently used SNs. There was a marked preference for WhatsApp among Peruvian youths (eight participants had it in their top three) and Messenger among Belgians (eight participants mentioned it in their top five). Participants reported that it felt more natural for them to use these platforms than the messaging features of other SNs since they can share voice notes, stickers, gifs, etc. while avoiding sending SMS. Both WhatsApp and Messenger are used to communicate, stay connected, send private messages to family, friends, and close contacts, and participate in group chats with close friends, acquaintances, and colleagues from work.

Most participants (n=14) had been Facebook users for many years, but Belgian participants seem to use it more (n=9). Their current use of this SN is mainly to remain informed about upcoming events, coordinate with study groups, or participate in group exchanges.

“I mainly use Facebook for my study groups (...) actually for groups in general. Yeah, class groups, dance groups uh (...) book groups. In short, all the groups that relate to one area of my life, communicate around practical information”.

- Tami, female, 23, Belgium

Facebook is also used to maintain one's social network. Some participants reported having grown up using Facebook and, as a result, their network includes friends from school, close and distant family members, friends they met while traveling, etc. Even though they may not use Facebook very often anymore, they prefer to keep their contacts. Belgian participants specifically remarked that while growing up and becoming adults, they set different mechanisms to keep their network private and select whom they want to be part of their network or not. Some participants also reported using Facebook to stay informed about what is happening

in the world. When they scroll through their *feed*, they find new posts and videos containing that information.

YouTube was also mentioned frequently (n=13) as an essential SN, used by both sub-samples but slightly preferred by Belgians. This platform is mainly used for entertainment purposes, watching music videos, following specific YouTubers, and watching tutorials. Participants subscribe to a specific channel when they enjoy the content but will not comment, like, or interact with other users on the platform. Some participants indicated that it is easy to have YouTube running *in the background* while doing other things, like studying or working. One participant exemplifies the way YouTube is explicitly utilized for entertainment and not for interacting:

“Well, YouTube is only to watch content or watch music. I won’t bother commenting. I’m not going to give tons of likes or follow people... I only subscribe to the channels because I like their content, that’s all.

- Andre, male, 23, Belgium

Finally, more than half of the participants in both countries (n=12) acknowledged downloading TikTok and installing it after the pandemic outbreak. TikTok was especially preferred by Peruvian participants (seven had them in their top five most used SNs, against none of the Belgian participants). They reported using the app to pass the time and watch funny or engaging videos. None of them reported uploading videos themselves. They all mentioned the “*addictive nature*” of the app and the fact that the short videos are meant for people to continue scrolling and watching endlessly for pure entertainment and passing the time.

“I started using TikTok this year, and it has this dynamic of watching a video and then the next, and then the next, and you can stay for hours and hours watching videos non-stop. It is quite addictive, right? (...) Tik Tok is just about the video, and they are quite engaging, right? People make them with the sole purpose of you watching continuously.”

- Ali, male, 25, Perú

Motives for the use of SNs

Regarding the motives for use of these SNs and messaging apps, the most frequently cited motives were: (1) to connect, remain in contact, and communicate with others, (2) to check on what others are doing, (3) for fun or entertainment, (4) to cope with boredom, passing the time or avoid negative emotions, (5) to stay up

to date with what is happening in the world, (6) for studies/work, (7) for networking, and (8) to share and show what is going on in their lives.

As an example of the latter, one participant highlights this *mandate* of publishing something, creating content, and showing himself in a particular way, which is also mentioned by other participants.

So, for me, a social network is a platform where we can exchange with people we have selected, hum, people who are close or less close. But also, it is not just about the discussion. It is about sharing content (...). It is this feeling that I publish something to show myself, to show something.

- Francis, 24, male, Belgium

Another participant highlights the need to check on what others are doing and stay informed through SNs. She also mentions that being on SNs helps her get distracted.

I'm looking for the same thing in all of them. It is hard to put it, well, I am there to see a little of others' daily lives and see how it goes elsewhere, in fact. The goal of social networks is...it is the fact that it can help you get distracted, and you can see what is going on.

- Eli, 22, female, Belgium

Several of these motives could be fulfilled using different social networks or combining them. There is not one SN that fulfills just one need or serves only one purpose. Moreover, the motives come up in the participants' discourse in an integrated and combined way.

Time spent on SNs

Concerning the time spent on SNs, around half of the participants were aware that they needed to change their usage patterns or reported that they had already made efforts to reduce their time on social media.

I am worried because (laughs), there is so much procrastination, I mean on YouTube you have such a variety of videos, and you can stay for way too long watching content. When I am there for too long, I tell myself, "Damn, I am not doing anything, uff (laughs), I have to do something productive to compensate for those lazy hours" (...) it is like your phone is there, and you want to enter WhatsApp or Instagram or whatever. So, this is like a procrastination device that tells you, "come look at me." If you have your notifications turned on, it is worse.

- Ali, 25, male, Perú

This reflection exemplifies that the reasons for reducing time on social media include guilt over extended usage, thinking that it is a waste of time, procrastination, and undesired consequences in fulfilling one's responsibilities. Some participants acknowledged that regardless of the actual time spent on SNs, the feeling of having wasted time without any real interaction with others or without gaining something valuable from them was enough of a reason to try to control their use of SNs. Also, mindlessly scrolling through SNs *news feeds* or *stories* was acknowledged as a waste of time, as well as an automatic behavior.

Conversely, some participants from both countries indicated that their social media use was not that problematic compared to other people's use.

Well, I still think it is a lot but I am not among the highest. When I check my screen time (...), I tell myself, "hold on, 90 minutes a day, 1h30m is not excessive either." I mean, it is still a lot. (...) Anyway, I think so because when you see the younger types, they hang out on their phones 24/7, they are way beyond me (...), so I finally say that 1h-1h30m makes one film in the day, you know, in terms of time. I tell myself that, in the end, I am still okay.

- Eli, female, 22, Perú

Many participants mentioned a *bingeing* pattern. They reported that they would jump from one social network to the next to find out what is new or what is going on and that this behavior is like a *reflex* that they perform at different moments of the day. Here we can find two examples:

I binge apps. For example, I am looking at TikTok, then I get bored, so I open Twitter, Facebook, Instagram (...), see what is going on each, and then I close them (...). If I find something that I like, I stay a little longer and close it. But this is my *modus operandi*, let's say. I open all the apps at the same time to see what is going on.

- Mary, female, 24, Perú

It is always the same pattern, I enter YouTube, and if there is nothing else to watch, I open Instagram (...) I watch stories, maybe ten, depending on what is new. Then I leave it, and I open another app, and once I am finished with all of them, I go back to Instagram mainly because I am bored and want to see what is new.

- Nala, female, 18, Perú

Use of Social Networks during the COVID-19 pandemic

Concerning the use of social networks during the COVID-19 pandemic, the participants' responses were diverse and mixed. Some reported an increased utilization (n= 8), others reported no change (n=5), and others reported a reduction in use (n=5) overall. Increased utilization during the pandemic was sometimes attributed to a need to feed one's social connections. Participants who referred to this motive reported that they used SNs to contact their friends and family and make sure they were doing well during the pandemic and confinement. This contributed to more time spent on SNs and more engagement with SNs overall. Some participants also reported using SNs to stay up-to-date and exchange information regarding the pandemic and the latest measures, which entailed not only receiving information but also posting more and sharing relevant information. Others cited entertainment and passing the time as the main reason for the increased use of SNs. The pandemic and confinements impaired their possibility to engage in their usual leisure activities, and since the time spent at home increased, there was a greater need for entertainment, distraction, and consumption of content. Some participants who acknowledged a greater use of SNs during COVID-19 explicitly referred to greater consumption of content rather than a generation of content. Going through content on SNs allowed them to escape reality for a while and served as a protective bubble and as a distraction. This is expressed by the following quote:

At the beginning of the pandemic... when I felt sad, I started going back to SNs to get some distraction from being at home all day. It was a way of escaping reality, mainly because in the news everything was about the pandemic. It was like a fake scape, (...) it worked as this sort of bubble protecting me from what was happening outside (...) it was like "ok, I need to lower this intensity, people are dying, this illness is attacking so many humans," and then I had this fake calm feeling you know? Because this was not going to be magically solved in the 2 hours I spent watching videos on Instagram, but, at least for that time, I forgot, and I felt a bit more at ease.

- Mary, female, 24, Perú

Of those participants who reported little or no change in their use of SNs, several reported that the usage frequency, the time spent on SNS, the kind of platform used, the content, or the engagement with the content had remained the same. However, some participants reported a change in the content they posted while in confinement: since they were "not doing much", their posts and stories shared

changed from events and experiences outside to more *homely* content such as interests, home activities, what studying from home looked like, what they had cooked, what their pets look like, etc.

[Now, during the pandemic], my use did not change much, but the content did change. What I share now is my daily activities, what I do at home or what I'm interested in. Before the pandemic, I didn't do that, and I didn't see that, because before our distractions were more outside the house than inside (...) so now what you share is more of the inside, home stuff, family stuff (...) for example, now I can share a movie that I'm watching on a Sunday, a dish that I am making, while before I could share "oh this is where I am, I am at this place doing this."

- Diane, female, 27, Perú

The reduction in the use of SNs during COVID-19 that was reported by a few participants mainly resulted from information overload, anxiety, and stress due to negative news regarding the pandemic. The reduced use took the form of less time spent on SNs, fewer activities such as posting, commenting, or liking, or limiting their use of specific SNs such as Facebook or Twitter, but also of performing SNs "*detox*" or "*cleaning*" their profiles, followers, and accounts, and starting to follow accounts that could be of help.

It's especially with Facebook that it has changed. Because before I was on Facebook as often as on other networks. I saw people ranting, but that didn't bother me. But now I think that with the stressful situation that we have had and then all the negative information coming in all the time, since we don't know this virus, the numbers are increasing, people contradict each other, people ranting, the measures are not good enough, etc. I think it has changed a lot. I don't go in unless I have a notification (...) the app is not even in the same place on my phone; it is set apart from other apps.

- Loise, female, 23, Belgium

One participant mentioned that even if she was spending more time on SNs, she wanted only to see content that could help her feel better since there was too much negativity on social media. Therefore, she went on to filter her contacts and the profiles and accounts she followed. An example of posting less content is given by the following quote of a participant explaining her decreased use of Instagram during the pandemic:

Ah well (...) I got bored suddenly during the Covid, and it is marked on my feed because I have not published anything. You don't take lots of

pictures when you are at home. You don't do much at the end of the day, so I haven't published much about my hobbies since I didn't have any. And so, I think I have been more passive than active on Instagram.

- Tami, female, 23, Belgium

For other participants, the reduction of the use of SNs was due to an increase in their academic or work activities, or to a need to concentrate on their courses during the pandemic. Reducing the time spent on the phone, social media, posting, and consuming content required active regulation, especially for those who believed they were wasting time and procrastinating too much. This wasn't easy to achieve, as illustrated by the following quote:

I was not focusing on university... and too much on my phone. So, I would be overthinking and, sometimes you just stay for too long without doing much, and you are bored, and then you are sad and all because of what we are going through, and then I was able to find a balance with the help of some of my friends who would tell me "do this or that," so I saw some videos, and then I would organize my morning to work, then watch a movie, then lunch, and then read or do some of my university work. And then I was organizing myself better. Sometimes I don't, because I watch a picture or a video, and then an hour is gone, and you are like "what!" and time just goes by. It is difficult, I don't know if for everyone, but for me, it was hard, but you can get that balance.

- Sergei, 19, male, Perú

As shown in this quote, adapting to studying from home required the development of strategies to balance coursework and entertainment by setting limits, as it was easy to get distracted. Active strategies to set boundaries to both the time spent on SNs and the contents exposed to in SNs were reported by participants in both countries.

Discussion

This study aimed to investigate how the COVID-19 pandemic affected the ways in which youths use social network sites, their motivations for use, and the time they spend on them, and whether these changes are different for youths in countries with another political, social, and economic background.

It was noted that Instagram is the most popular SN, ranking first or second in terms of preference for all participants in both Belgium and Peru. This is not surprising since Instagram is the most frequently used SN among youths between 18 and 34

(Statista, 2021a). In 2020 its audience in Belgium grew by 4.5% quarterly, reaching 4.5 million Belgians, and by 4.2% quarterly in Perú, reaching 7.5 million Peruvians (Alvino, 2021; Degraux, 2021). It is the SN where youths share and upload content the most.

Concerning messaging apps, a marked preference was noted for Whatsapp among the Peruvian participants, and Messenger among the Belgian ones. Whatsapp has consistently been the preferred messaging app in Latin America, followed by Messenger (Statista, 2021b). It was one of the first apps in the region that allowed messaging free of charge, thus replacing SMS. Since it was free, straightforward, innovative, and came with no ads, it appealed to many, regardless of their education level or socioeconomic status. While Whatsapp is used in Peru for almost every type of communication, including personal, work-related, professional, or business-related communication (Martinez, 2020), in Belgium, messaging apps and social networks are used less often for working or professional purposes (Degraux, 2021).

For entertainment, Belgian youths prefer YouTube and Peruvians TikTok. This aligns with the statistics showing that until 2018 the user share of YouTube in Belgium was between 52-60%, compared to 41% in Perú (Statista, 2021c; 2021d). According to a recent study, TikTok use increased by 226% in Perú in the first half of 2020, especially among 18 to 24-year-olds. The preferred activities on the platform are watching *challenges*, comedy, and videos involving music or people singing, and only 31% record and upload videos (Ipsos, 2020). The increase in TikTok use reported by the Peruvian participants can be positioned against the fact that Perú went through extended collective confinement of 3.5 months (Pighi & Horton, 2020), which means there was an increased need for entertainment, distraction, and escape from boredom. TikTok may have offered a boost of novelty and creativity, while the possibility to shoot challenges or dance videos, share them, and like others' dance videos may have provided relaxation, social interaction, and escape from the difficult pandemic.

The time spent on SNs, as reported in this study, gave a median of 5.33 hours per day (5.88 for women and 5.27 for men). Although it is impossible to draw firm conclusions about the accuracy of this estimate or the time spent on different sites, this seems a lot. In this regard, it is important to note that for a sizable proportion of the participants, the time spent on SNs increased during COVID-19. As the confinements due to COVID-19 limited the opportunities for youths to meet with friends and engage in other leisure activities, the obligation to stay at home may have increased the use of SNs, both in terms of a higher engagement and more

usage time, to fulfill their needs for social contact, entertainment, and maintaining a social life.

Concerning the motives and patterns of use of the different SN platforms, our findings confirm the view that media selection is purposeful and active rather than a mere passive consumption of content (Rubin, 2009) and that media use is only maintained if it gratifies a person's individual needs (Keep et al., 2019; Orchard, 2019; Rubin, 2009). The data shows that different social networks were purposefully engaged in to satisfy different needs, some of which are fundamental (e.g., connection, belonging, networking) while others are less so (e.g., entertainment, escape, information, sharing, etc.). The participants in our study seem to be aware of their needs and know which specific SNs can satisfy them. Also, since some SNs can satisfy the same needs, they can easily switch between platforms if gratification is not maintained (for example, participants could engage with YouTube, TikTok, or Instagram to cope with boredom). This also explains why interaction with one or many SNs varies within and between individuals, depending on the gratification sought and the features that fulfill those needs.

While the motives for SNs use before and during the COVID-19 pandemic are very similar, the motives to seek social connection (contact with others and checking on others), information, and distraction (entertainment and avoidance of negative emotions) were stronger during the pandemic for both Belgians and Peruvians. As confinements due to the pandemic may have increased feelings of loneliness, fear, uncertainty, and disconnection (Geirdal et al., 2020; Holmes et al., 2020; Wade et al., 2020), accessing social network platforms provided a reasonable and healthy way to fulfill these fundamental needs. On the other hand, using these networks for extended periods of time, and being more exposed to negative content (bad news, fake news, negativity, the pandemic) also made them feel overwhelmed, resulting in decreased usage or unfollowing specific profiles. This can be considered a form of self-protection since an overload of information and constant media use can increase psychosocial problems (Aristovnik et al., 2020; Gao et al., 2020).

Spending a lot of time on social media caused a certain discomfort among many participants, both in Belgium and Peru. Feelings of a waste of time, guilt, procrastination, and difficulties fulfilling other obligations were mentioned as reasons to actively change consumption patterns. Some participants referred to their behavior as automatic and disengaged, exemplified by mindlessly scrolling through the feed without really paying attention, coming back to the apps constantly to find new content, or the "bingeing pattern" mentioned. Similar observations were reported by Baym et al., 2020 and are indicative of awareness that the SNs have been *designed* to be *addictive* and produce craving and

engagement. Indeed, SNs use elements of surprise, novelty, repetition, and easily consumable content to capture the individual's attention and create a systematic gratification system (Giraldo et al., 2020; Hofmann et al., 2016; Purohit et al., 2020; Stothart, et al., 2015) which will elicit automatic affective reactions (e.g., excitement, curiosity) and approach reactions (e.g., open the notification and enter the platform) in the user (Eyal, 2014; Hofmann et al., 2016; Rauch, 2018). Therefore, the individual will be more likely to engage in SNs browsing, even if it is inconsistent with long-term goals (e.g., studying for an exam, or being present in an online class). This mechanism also perpetuates itself because it interacts with social appreciation, acceptance, belonging, comparison, fear of missing out, and recognition (Przybylski et al., 2013; Van Koningsbruggen et al., 2017). Since individuals are trying to satisfy fundamental intrinsic needs through SNs and have previously learned to associate SN use with pleasurable experiences (Hofmann et al., 2012; Reinecke et al., 2014; Sheldon et al., 2011), engagement was higher and resisting engaging more difficult during the COVID-19 pandemic, particularly during confinement. Thus, finding a balance between the short-term gratifications and the long-term costs of delaying or neglecting responsibilities is a challenge to users. SNs have been important channels that allowed young people to satisfy their connection, entertainment, and information needs during the COVID-19 pandemic. However, their extended use can perpetuate an instant gratification cycle that can be detrimental in the long run if they solely rely on it.

This analysis is not without limitations. Even though it produced interesting results regarding the use of social networks during the COVID-19 pandemic, these may not reflect profoundly the way youths are using social networks. Furthermore, we did not analyze the participant's profiles on the preferred social networks or have examples of the posts or videos they are exposed to or share, which could have been interesting for triangulation purposes. Further research could ask participants to provide some examples of the content they share/are exposed to further elaborate on the insights they provide. It is also important to note that the study took place during a particular period of the pandemic, and only involved participants from an educated background, which limits the generalizability of our findings. On the other hand, it is a strength that the interviews were conducted in the participant's language and then analyzed and managed by bilingual researchers, allowing for a conjoint analysis that stayed true to the participant's experiences.

In conclusion, although some differences were found between the preferred SNs among Belgian and Peruvian youths, their motives for using SNs are very similar, and an increase in the connection, information, and distraction motives was noticed during the COVID-19 pandemic. The motives for SNs use are complex as these

networks can satisfy different needs simultaneously, and when used in tandem, their chance of fulfilling these needs increases. Finally, it was also found that youths want to manage and control their time and frequency of SNs use but find it challenging to do so despite their acknowledgment that SNs are designed to attract and maintain their attention.

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Social networks facilitate social interaction, but their use can also lead to mental health problems. While it is recognized that preventive efforts are needed to mitigate these potential adverse effects, the conceptualization, measurement, determinants, and consequences of problematic internet use (PUI) remain unclear. This thesis presents a series of studies using a range of methods including systematic review and meta-analysis, qualitative inquiry, psychometric analysis, and structural equation modeling to improve the understanding of PUI and, particularly, Instagram use, to inform prevention. It is noted that research and interventions are often based on the *addiction* framework, which does not do justice to the specificity of PUI. The identification of distinctive motives and patterns of Instagram formed a basis for the development and validation of two self-report measures (the IMQ and the IUPQ). Using these instruments, it was shown that *social comparison orientation* and *fear of missing out* have direct and indirect effects on motives and patterns of Instagram use, and these patterns are related to depression, anxiety, and stress through loneliness. The implications of these findings and suggestions for better prevention are provided.

Les réseaux sociaux facilitent l'interaction sociale, mais leur utilisation peut également entraîner des problèmes de santé mentale. Bien que la nécessité d'atténuer ces effets négatifs potentiels soit reconnue, la conceptualisation et mesure, et les déterminants et conséquences de l'utilisation problématique d'Internet (UPI) restent flous. Cette thèse présente une série d'études utilisant un éventail de méthodes, dont l'examen systématique et la méta-analyse, l'enquête qualitative, l'analyse psychométrique et la modélisation d'équations structurelles, afin d'améliorer la compréhension d'UPI, et d'Instagram en particulier, pour informer la prévention. Il a été noté que la recherche et les interventions sont souvent basées sur le cadre théorique de la dépendance, ce qui ne rend pas justice à la spécificité de l'UPI. L'identification de motifs et de modèles distincts d'utilisation d'Instagram servi de base au développement et à la validation de deux mesures d'auto-évaluation (l'IMQ et l'IUPQ). Grâce à ces instruments, il a été démontré que l'orientation vers la comparaison sociale et l'anxiété de ratage ont des effets directs et indirects sur les motifs et les modèles d'utilisation d'Instagram, et que ces modèles sont liés à la dépression, à l'anxiété et au stress par la solitude. Les implications de ces résultats et des suggestions pour une meilleure prévention sont fournies.



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