From Instagram overuse to instastress and emotional fatigue: the mediation of addiction

Del uso excesivo de Instagram al instastress y a la fatiga emocional: el papel mediador de la adicción

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Abstract

Purpose – Today's society interest in mobile photography drives consumers' and brands' growing usage of Instagram. This paper aims to address the consequences of excessive use of Instagram on the negative feeling of losing information when not connected and the emotional fatigue resulting from an overcharge with new information. The mediating role of addiction between Instagram overuse and the two outcomes is also analyzed.

Design/methodology/approach – Data from 342 active Instagram users were used to test the proposed model, applying the partial least square equation modeling method (SmartPLS 3).

Findings – Addiction partially mediates the impact of overuse on emotional fatigue and instastress. Addiction to Instagram was mainly due to respondents' lack of control over the time spent on it resulting in incapability to reduce its usage.

Social implications – Social networking site managers, educators, families and public institutions should promote an adequate use of Instagram, making users (especially the young) aware of the potential threats of its excessive usage. The control on the amount of time devoted to Instagram is a key factor for detaining overuse and addiction, as well as avoiding the negative outcomes analyzed in this research.

Originality/value – The findings contribute to the extant knowledge on the negative side of the digitization of the individual, as little is known about it to the best of the authors' knowledge.

Keywords Emotional fatigue, Instagram, Addiction, Overuse, Social network site, Instastress

Paper type Research paper

Resumen

Propósito – La presente investigación aborda las consecuencias del uso excesivo de Instagram relacionadas con el sentimiento negativo de pérdida de información, cuando no se está conectado, y la fatiga emocional

derivada de la sobrecarga de información. El estudio también analiza el papel mediador de la adicción entre el uso excesivo de Instagram y ambas consecuencias.

Diseño/metodología/enfoque – Para testar el modelo propuesto se utilizó información de 342 usuarios activos de Instagram, aplicándose el método de ecuaciones estructurales por mínimos cuadrados parciales (SmartPLS 3).

Hallazgos – La adicción media parcialmente el impacto que el uso excesivo de Instagram tiene sobre (i) la fatiga emocional y (ii) el Instastress. La adicción a Instagram se deriva principalmente de la falta de control del tiempo invertido en su uso, lo que da como resultado su incapacidad para reducir dicho uso.

Implicaciones sociales – Los responsables de los medios sociales, los educadores, las familias y las instituciones públicas deberían promover un uso adecuado de Instagram, haciendo que los usuarios (especialmente los más jóvenes) sean conscientes de las amenazas potenciales de su uso excesivo. El control sobre la cantidad de tiempo dedicado a Instagram es un factor clave para detener el uso excesivo y la adicción, así como para evitar los resultados negativos analizados en esta investigación.

Originalidad/valor – Los resultados contribuyen a ampliar el conocimiento sobre el lado negativo de la digitalización del individuo, dada la escasa literatura al respecto.

Palabras claves – Adicción, Uso excesivo, Instastress, Fatiga emocional, Redes sociales, Instagram

Tipo de artículo – Artículo de investigación

1. Introduction

Social media may still be at its infancy, but it has already become an integral part of consumers' everyday life activities. The proliferation of social networking sites (SNS) has made it easy for individuals to find a social platform that is suitable to his/her interests or needs: e.g. Facebook for those who seek to keep up with what is happening with friends and brands, Twitter for users who want to share ideas and information instantly, or Instagram for the ones keen on capturing and sharing their everyday life moments. The variety of activities offered by the diverse SNS attributes give them the power to engage users, with the amount of time people spend connected increasing each year. A recent report published by Nielsen (2017) showed that adults spent an average of 5 h and 30 min per week in 2016, a 36 per cent growth rate as compared to 2015. However, millennials are the ones spending the most time on social media (6 h and 19 min weekly); they spend on social media a 24 per cent of their total time spent on media, whereas that percentage reduces to 20 per cent when talking about adults 50 years and up.

Previous research has established that social media use may enhance human interaction and psychological well-being (Baumer, 2013), as well as improve users' civic engagement (Obar *et al.*, 2012) and learning processes (Garrett and Cutting, 2012). Besides, social media has also been found to constitute an important tool for creating and maintaining customer–brand relationships through improving brand loyalty (Baumöl *et al.*, 2016), brand awareness (Hutter *et al.*, 2013), brand engagement (Schultz, 2016) and emotional attachment (Hudson *et al.*, 2015), among others.

Nevertheless, questions have recently been raised about the "Janus face" of SNS (Mäntymäki and Islam, 2016), drawing attention to the possible negative outcomes of social media overuse and even addiction. Overuse refers to an excessive medium use and is associated with an immoderate amount of time spent online (Kubey *et al.*, 2001). Previous research on internet use has documented a relationship between the amount of time spent online and a problematic internet use, resulting in negative cognitive and behavioral outcomes (e.g. interpersonal, educational, professional, etc.) (Caplan, 2002; Morahan-Martin and Schumacher, 2003). In the aforementioned studies on "the dark side" of social media, various adverse effects of the excessive SNS use have also been reported such as social comparison (Fox and Moreland, 2015), jealousy (Muise *et al.*, 2009), interpersonal problems and loneliness (Song *et al.*, 2014; Zheng and Lee, 2016), or even family and work conflicts (Zheng and Lee, 2016).

Although those consequences are not to be underestimated, one of the most significant Instastress and perils of social media is its potential as a source of addiction, which has been subjected to emotional considerable discussion lately (Carbonell and Panova, 2017; Kircaburun and Griffiths, 2018; fatigue Yang *et al.*, 2016). SNS addiction happens when the user has a problematic dependency on SNS usage (Turel and Serenko, 2012; Yang *et al.*, 2014; Yang *et al.*, 2016). In fact, research posits that social media is one of the most addiction-generating technologies, in general (Andreassen *et al.*, 2017; Kircaburun and Griffiths, 2018; Yang *et al.*, 2016), interfering negatively not only in users' daily activities [e.g. poor work and study efficiency (Andreassen, 2015)] but also in their human functions [e.g. low self-esteem (Hawi and Samaha, 2016)].

Drawing on these considerations, the present research addresses specifically the consequences of Instagram excessive use. The interest in that particular SNS is motivated by several reasons. First, it is the fastest growing mobile social platform worldwide, whose active users increased by 25 per cent last year, thus reaching 1 billion users in the beginning of 2019 (We are social, 2019). Instagram is also the SNS which is most frequently accessed by Spanish users, who spent an average of 57 min per day on that SNS (IAB Spain, 2018). Moreover, its popularity among young adults (71 per cent of online users aged between 18 and 34 use Instagram - Statista, 2019), makes it an attractive communication channel for retailer and fashion brands targeting that segment (Enberg, 2018). Finally, Instagram is the most used SNS platform by opinion leaders (Markets Insider, 2017), with 78 per cent of them using it when collaborating with brands (eMarketer, 2017). To the best of the authors' knowledge, little is known about what negative implications may the Instagram overuse have. Provided that Instagram users are young "digital natives", who share pictures as a way of self-digitization (Kretz, 2010), they would be more likely to experience its adverse effects.

Given the paucity of research on this topic, the main aim of our study is to gain new insights into Instagram users' excessive use phenomenon. The present investigation explicitly considers the mediating role of addiction in determining Instagram users' emotional fatigue and the stress triggered by Instagram (i.e. instastress) as a result of heavy Instagram usage. As far as the authors' knowledge, this is the first research exploring the mediating effect of addiction in the context of Instagram as a social media platform and the first one that examines SNS usage applying the paradoxes of technology framework proposed by Mick and Fournier (1998). The research contributes to the extant knowledge on the dark side of Instagram, which has been scarcely investigated. The findings add to the emerging line of research on understanding addictive SNS behavior, not only at the personal level, which has received more research attention, but also regarding the relationship between users and brands.

The paper is structured in the following way. Section 2 addresses research on Instagram and its negative side, as it is the key SNS of the present study. After that in Section 3, the relevant literature on negative outcomes of SNS overuse is presented, focusing on the constructs of instastress, emotional fatigue and addiction. The research hypotheses are developed and the proposed theoretical model is presented. Next, the methodological approach and research design are described in Section 4. Section 5 presents the findings of the research and the paper closes with discussion, practical implications, limitations acknowledgement and future research lines.

2. Instagram: what we already know about its dark side
As mentioned before, Instagram is one of the most popular SNS worldwide. Its success is based not on the features of uploading and liking pictures, but on the fact that it constitutes a platform for users to gain instant and convenient popularity among other users, as well as co-create value with opinion leaders (Casaló *et al.*, 2018). That is why Instagram engagement

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rate is higher, compared to other SNS (Locowise, 2017). According to its website, the platform is continuously offering users new ways to interact and form deeper connections with their friends or celebrities/brand they might follow. These features, together with the recently launched Instagram shopping tool, provide both, entertainment and utility to users, which results in increased satisfaction and intention to follow and recommend the Instagram account (Casalo et al., 2017a).

Instagram has received increasing attention from scholars and practitioners (Dumas et al., 2017; Lee et al., 2015; Kircaburun and Griffiths, 2018). Casaló et al. (2017b) identified three main research lines on Instagram: the type of content uploaded and its behavioral consequences, users' personal feelings, and the main motivations and gratifications of using Instagram. Within those research streams, there is scarce literature examining the negative aspects associated with the use of Instagram. In this regard, Dumas et al. (2017) highlighted a relevant emerging segment of adults engaged in what they refer to as deceptive like-seeking behaviors (i.e. buying likes or changing one's appearance in photos using specific software), that turned out to be linked to users' narcissistic personality and a weak sense of peer belonging. Instagram use had also been previously related to depressive symptoms (Lup et al., 2015) among the same target. Similarly, Yang (2016) associated Instagram broadcasting with higher loneliness among undergraduate students, whereas Frison and Eggermont (2017) uncovered that Instagram browsing was related to future increases in adolescents' depressed mood, which, in turn, was related to future increases in Instagram posting.

In light of the above, the consequences of Instagram overuse have barely been addressed. Addiction, but not overuse, was analyzed by Kircaburun and Griffiths (2018), reporting that it is positively associated with daily Internet use and negatively related with agreeableness, conscientiousness, and self-liking. To deepen in the analysis of overuse and addiction to Instagram, we tapped into the body of knowledge on the negative consequences of Internet use in general, given that research has been more prolific in this domain. Therefore, the following section reviews the existing literature from a broader perspective (i.e. internet), drawing relevant conclusions and applying the findings to the specific context of our research: Instagram as a social media platform.

3. Literature review: instastress, emotional fatigue and addiction

There is no doubt that internet has brought a radical change in the way companies and individuals communicate with each other, and within this context, the role of social networks has been largely acknowledged. However, not everything is rosy when individuals' behavior on the Internet is concerned. While there is plenty of evidence showing that companies can benefit from online customer relationships, past research has also pointed out the dark side of the internet, though empirical support in this regard is scarcer. In this line, previous studies suggest the need to analyze "the role SNS users' feelings play in forming their overall SNS usage experiences" (Zhuang et al., 2013, p. 34), as those feelings are a key aspect in their experiences (Muise et al., 2009).

To analyze the negative consequences of the Internet usage in general, as well as of those regarding the context of SNSs, several researchers have considered the paradoxes of technological products framework proposed by Mick and Fournier (1998). According to these authors, technology itself is paradoxical as each of its specific characteristics, can have both, a positive and a negative side at the same time, leading to individuals' anxiety and stress. Adopting a holistic approach, they suggest eight paradoxes of technology: control/chaos; freedom/enslavement; new/obsolete; competence/incompetence; efficiency/inefficiency; fulfills/creates needs; assimilation/isolation and engaging/disengaging. Among

them, control/chaos, freedom/enslavement and competence/incompetence can be applied in the study of SNS usage. Though technology can facilitate order (control), independence (freedom) and feelings of intelligence (competence), it "can also breed [. . .] upheaval and dependency", and lead to feelings of ignorance (Mick and Fournier, 1998, p. 128). Within the context of SNSs, Utz and Krämer (2009) and Zhuang *et al.* (2013) also refer to those paradoxes to denote some of the counterproductive effects of individuals' engagement with SNSs, calling for more research on how the paradoxes of technology may influence individual experience.

3.1 Social networking sites overuse and instastress

In today's society, a widely recognized phenomenon is stress, a feeling that endangers the peace and wellbeing of the individual; however, discussions about technostress, a term coined by Brod in 1982, are less common. As a sub-dimension of stress, technostress refers to the negative effects that the use of computer-based information and communication technologies directly or indirectly generate on individuals' attitudes, thoughts or behaviors (Weil and Rosen, 1997). Technostress has been researched mainly in the context of human resources and business organizations management, due to its impact on diverse organizational processes and outcomes (Ragu-Nathan *et al.*, 2008; Shu *et al.*, 2011; Tarafdar *et al.*, 2007); however, it has recently attracted an increasing interest in other areas of research such as smartphone usage (Lee *et al.*, 2014).

In 1984, Brod suggested two possible trigger mechanisms for technostress:

(1) the struggle to accept computer technology, which generates pressure on the individual to accept and use computers; and

(2) the overidentification with computer technologies, which unconsciously make users behave as machines, looking always for efficiency and speed.

In the context of the present research, the second mechanism suggested by Brod (1984) results relevant. Individuals and especially young adults have to face an extensive amount of incoming information, and, as a consequence, the information and communication technologies are widely integrated into their daily routine. As the use of new technology increases, the amount of accessible information may exceed what individuals are able to absorb, resulting in informational anxiety (Wurman, 1989; Peljto *et al.*, 2012). Under this scenario, users can experience a negative feeling of losing information (Ragu-Nathan *et al.*, 2008), heightened levels of physiological activation, as well as tension and discomfort when dealing with these technologies (Negahban and Talawar, 2018; Salanova *et al.*, 2013). Accordingly, among the core factors influencing technostress, suggested by the literature, are technology usage experience (Brod, 1982), sense of invasion due to the possibility of being reached anytime (Tarafdar *et al.*, 2007), information overload (Harper, 2000; Tarafdar *et al.*, 2007), complexity resulting from users' need to invest time and cognitive resources (Tarafdar *et al.*, 2007), and technology overuse particularly when it is not primarily task-related (Brooks and Longstreet, 2015). For example, extant research highlighted that the possibility of using smartphones for checking emails can turn those devices into a source of stress (Barley *et al.*, 2011). Smartphones actually favor the sense of overloading, as the volume of received emails increases continuously.

SNS are supposed to be used for fun and relaxation or in general, to provide pleasure to users in a voluntary manner, but they can as well be a source of stress (Maier *et al.*, 2012). If we translate the above ideas into the specific context of SNSs, and particularly Instagram, it is expected that the novel information, which is continuously made available on the platform can make heavy users experience technostress (e.g. instastress), as they are aware of the

vast amount of information that they need to access not to feel incompetent and keep up with what is going on in the SNSs. It follows that users may experience the competence/incompetence paradox, suggested by Mick and Fournier (1998). With this as a foundation, we propose the following hypothesis, applied to Instagram:

H1. The higher the overuse of Instagram, the more probable it is for individuals to develop instastress.

3.2 Social networking sites overuse and emotional fatigue

The term fatigue has usually been associated with health issues and though it has been widely related to the use of information and communication technologies, studies on internet-related fatigue are lacking. In this regard, research on hospital nurses reported a positive relationship between Internet addiction and fatigue (Lin *et al.*, 2013). In a similar vein, Gerrard *et al.* (2006) found that information technology fatigue was among the primary reasons for consumers not to use internet banking.

Yang and Wu (2005) defined fatigue as "a subjective state of an imbalance in the availability of inner resources needed to perform physical or mental activities" (p. 1357). The authors claim that fatigue is determined not only by the availability of inner resources, but also by the physical and/or mental demands of the activities individuals have to perform. In the context of the information and communication technologies, Lewis (1996) highlighted the relevance of the information fatigue syndrome as a specific type of fatigue associated with information overload. As evidence suggests, individuals' relationship with computer technologies may result in informational fatigue (Weil and Rosen, 1997; Brod, 1984), as novel information is constantly updated on the Internet and users have to manage it. Though anxiety and fatigue are the most common affective variables regarding the use of information and communication technologies (Dhir *et al.*, 2018; Salanova *et al.*, 2013), and in the present SNS context both of them refer to availability of information, they should be regarded as different concepts. In particular, while instastress addresses the need to stay updated so as not to miss any relevant information, emotional fatigue refers to managing the information overload.

In this study, we focus on the mental demands that SNSs may request from users. In the case of SNSs, the amount of information offered is being constantly updated, which may result in informative chaos according to the terminology of the paradoxes of Mick and Fournier (1998). Thus, heavy SNSs users may experiment emotional (mental) fatigue due to being overcharged with new information. So, we posit that:

H2. The higher the overuse of Instagram, the more probable it is for individuals to develop emotional fatigue.

3.3 The mediating role of social networking sites addiction

There is extensive literature addressing the consequences of Internet usage, with its level of use being among the most researched topics when its negative outcomes are concerned. In fact, a considerable amount of literature has been published on the relationship between the level of internet use and individual's well-being, examining some social and psychological variables such as depression, loneliness, isolation and self-esteem, among others. However, results are inconclusive: while there is evidence demonstrating a positive relationship (Kraut *et al.*, 2002; Pierewan and Tampubolon, 2014), there are also studies reporting a

negative one (Ybarra *et al.*, 2005; Stepanikova *et al.*, 2010) or even indicating no relationship at all (Gross *et al.*, 2002; Pierewan and Tampubolon, 2014).

Although in general terms addiction is related with an excessive and dependent use/consumption, in our context of SNS, that conceptualization is too simple. According to LaRose *et al.* (2003) and van der Aa *et al.* (2009), it is not a question of the level of internet use, but of how it is used. In the same vein, Caplan (2002, 2005) distinguished between excessive internet use and compulsive internet use; he claimed that they constitute different concepts, though being quite similar in terms of behavioral patterns. While the author referred to excessive use as a level of internet usage, that is higher than what could be considered as a "normal" one, compulsive internet use is related to individuals' inability to control his/her own internet behavior. According to the literature (Caplan, 2002; Van den Eijnden *et al.*, 2008; van der Aa *et al.*, 2009), both behavioral patterns can result in negative outcomes for the individual, though compulsive use is claimed to be a more powerful predictor. So, a maladaptive internet use may contribute to low individual well-being (van der Aa *et al.*, 2009). Nie *et al.* (2002) maintains that internet overuse can disrupt individuals' normal life, when users dedicate their time to the Internet instead of passing time with family and friends, which, ultimately, would lead to narrower social circles and loneliness. Though, as mentioned, the counterproductive effects of internet use are not exactly a synonym to increased level of usage, the study conducted by van der Aa *et al.* (2009) demonstrated a strong and positive relationship between daily internet use and compulsive internet use. One could expect that the higher the internet use, the more inclined users are to adopt compulsive behavior, as they can develop dependence towards it, as Mick and Fournier's (1998) paradox suggested (enslavement).

Compulsive internet behavior has been considered as one of the most relevant dimensions of internet addiction (Lortie and Guitton, 2013), with past studies using both internet addiction and compulsive Internet use to refer to the same phenomenon (Lin *et al.*, 2013). Previous research has demonstrated that addiction can be generated not only to internet usage, in general, but also towards specific SNS sites, with compulsion being one of its underlying components (De Cock *et al.*, 2014; Kang *et al.*, 2013). This is justified by the premise that cyber-relationships addiction is one of the specific subtypes of Internet addiction (Young, 1999). Therefore, we assume that compulsive use can be interpreted as a proxy for addiction.

Van der Aa *et al.* (2009) reported that compulsive internet use or addiction mediates the relationship between daily internet use and negative outcomes such as low well-being (measured as loneliness, low self-esteem and depressive moods).

In the context of SNSs, it is quite intuitive to expect that users may get engaged with them more easily than with internet in general, due to the specific benefits they offer. The possibility to connect with other users, share different type of information, and help people and companies on diverse issues have made SNSs the fastest-growing Internet applications in the last two decades (Zhuang *et al.*, 2013). On the basis of van der Aa *et al.* (2009) finding that compulsive internet use mediates the relationship between daily internet use and negative outcomes, we formulate the following hypotheses applied to the context of Instagram:

H3. Instagram addiction mediates the relationship between Instagram overuse and instastress.

H4. Instagram addiction mediates the relationship between Instagram overuse and emotional fatigue.

The hypothesized relationships to be tested in this study are depicted in Figure 1.

4. Methodology

4.1 Data collection
A self-administered questionnaire survey was designed to collect empirical data. The questionnaire was pre-tested by 30 respondents and revised accordingly so as to ensure content validity. As a result, the wording of some of the items was modified to improve the clarity of the questions.

The study universe included young Spaniards aged over 18, who access Instagram on a daily basis and stay connected for more than an hour. Respondents had to meet this minimum time requirement, as the "Annual study of social media use" in Spain elaborated by IAB Spain (2018) revealed that users spent 57 min on average on Instagram. As the present study aims at understanding the overuse SNS behavior, we were only interested in those Instagram users who spent more than the average amount of time connected to that social network.

The rationale behind choosing that particular population was that it is more susceptible to developing problematic behaviors associated with technology overuse (Renau *et al.*, 2015).

The field research was conducted by a market research company with experience in online studies, employing a non-probability sampling method. Overall, 360 questionnaires were collected, though some of them had to be discarded because of extreme values. Finally, data from 342 respondents were used to test the proposed model, with an effective rate of 95 per cent.

As for the characteristics of the sample, it should be noted that the number of female respondents was significantly greater than the number of male respondents (70.5 and 29.5 per cent, respectively). Besides, the average age of the interviewees was 22 years and most of them were students (85.7 per cent). Regarding the frequency of Instagram usage, the respondents declared checking the Instagram application 32 times per day, spending approximately 2 h and a half connected on average.

The control variables tested (respondents' age and frequency of Instagram access) did not produce any effect on the constructs in the structural model.

4.2 Common method bias
Common method bias was assessed through Harman's single factor test. The indicators of all the constructs in the proposed structural model were included in an exploratory factor analysis (Podsakoff *et al.*, 2003). Evidence of common method bias is found when:

- a single factor emerges; or
- one factor explains the greatest part of the covariance between the dependent and independent variables.
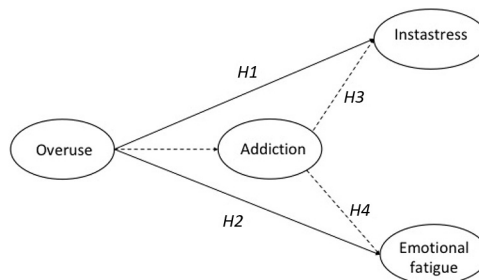

Figure 1.
Theoretical model

According to Podsakoff and Organ (1986), the latter is a concern when the first of all factors with autovalues greater than 1, explains more than half of the variance of the extracted factors. In our case, the principal component analysis with Varimax rotation showed the existence of four factors, with the first one explaining 30 per cent of the total variance (80.1 per cent). Hence, common method variance is not a concern in this study.

4.3 Measures

The variables included in the proposed theoretical model were assessed on a five-point Likert scale (from (1) "strongly disagree" to (5) "strongly agree"). All measurement scales were obtained through literature revision and were already verified by past studies.

Instagram addiction was measured by eight items, developed by Lu and Wang (2008). To assess Instagram overuse, three items were used from the subscales of the Generalized Problematic Internet Use Scale (GPIUS) (Caplan, 2002). Emotional fatigue was operationalized with four items using the Maslach Burnout Inventory, developed by Maslach *et al.* (1996). Instastress was measured with two of the items of the Techno-invasion scale by Tarafdar *et al.* (2007), which were adapted to the context of the present research. Some of the items of the previously published measures of emotional fatigue and instastress were eliminated, as they were incompatible with the study context.

While addiction is posited as a formative construct, all other constructs in the presented theoretical model are designated as reflective ones.

4.4 Data analysis

To test our model, SmartPLS3 was used for assessing both, the measurement instrument and the structural model (Ringle *et al.*, 2014). Partial least square (PLS) modelling is an alternative method to covariance-based structural equation modeling, which unlike traditional SEM, does not report the same goodness of fit index for the research model (Rigdon, 2005). PLS is especially recommended when there are formative constructs included in the model (Roldán and Sánchez-Franco, 2012), as it is the case in the present study.

5. Results

5.1 Measurement model

Before testing the hypotheses, the construct reliability and validity were assessed for the reflective constructs to ensure the appropriateness of the research instrument.

The internal consistency for reliability of the measurement models was assessed using Cronbach's alpha and composite reliability (Fornell and Larcker, 1981). Table I indicates that Cronbach's alpha and the composite reliability of the scales exceed the recommended threshold of 0.70 (Churchill, 1979), thus showing adequate internal consistency.

Convergent validity was evaluated through examining the item loadings and their associated *t*-values, as well as the Average Variance Extracted (AVE) index. All indicators resulted greater than 0.70 (Chin, 1998), except for EF4 which had to be eliminated, and the AVE values for the three measurement scales were above the minimum threshold value of 0.50, indicating that convergent validity (Table I).

When testing the formative measurement scale of the "addiction" variable, the recommendations of Diamantopoulos (2008) were taken into account. In this regard, considering that none of the formative indicators could be eliminated as this would affect the

Constructs	VIF	Weight	Loading	CR	AVE
Addiction (formative)				n.a	n.a
A1: I feel the need to spend increasing amounts of time on Instagram to achieve satisfaction	1.54	0.18			
A2: I feel preoccupied with Instagram (think about it when off line or anticipate my next online session)	1.37	0.20			
A3: I have lied to friends or family members to conceal the extent of Instagram use	1.28	0.01			
A4: I feel restless, moody, or irritable when attempting to cut down or stop Instagram use	1.51	0.16			
A5: I have repeatedly made unsuccessful efforts to control, cut back, or stop the use of Instagram	1.42	0.37			
A6: I use Instagram as a way of escaping from problems or relieving feelings of helplessness, anxiety or depression	1.40	0.11			
A7: I spend more time on Instagram than originally intended	1.22	0.67			
A8: I have risked the loss of significant relationship, job, educational, or career opportunity because of my Instagram behaviour	1.48	0.02			
Overuse (reflective)				0.85	0.66
O1: I think that the amount of time I spend on Instagram is excessive			0.81		
O2: I spend an unusually large amount of time on Instagram			0.74		
O3: I spend more time on Instagram than most other people			0.88		
Instastress (reflective)				0.87	0.76
IA1: I feel my personal life is being invaded by the information I receive from Instagram			0.88		
IA2: I spend less time with my family due to Instagram			0.87		
Emotional fatigue (reflective)				0.84	0.63
EF1: I feel emotionally drained from the use of Instagram			0.81		
EF2: I feel used up by the use of Instagram at the end of the day			0.77		
EF3: I feel fatigued when I use Instagram			0.80		

Notes: All values are significant at the 0.05 level. CR = Composite reliability; AVE = Average Variance Extracted

Table I.
Measurement model

content validity of the construct, the possible multicollinearity problems were assessed through calculating the variance inflation factor (VIF) values, which were below the recommended threshold of 5 (Diamantopoulos and Winklhofer, 2001).

Two tests were applied to assess discriminant validity (Table II). The first one posits that the square root of the AVE of each construct should be greater than its correlations with the rest of the variables in the proposed model (Fornell and Larcker, 1981). This criterion is fulfilled in the present study since the square roots of AVE are greater than the inter-construct correlations. The second approach is the heterotrait–monotrait ratio of correlations (HTMT) (Henseler *et al.*, 2015), whose values should be less than 0.90 for discriminant validity to be demonstrated. As showed in Table II, this condition is also satisfied for all assessed constructs.

5.2 Direct effects

Table III provides the standardized structural path coefficients (β) with their corresponding *t*-values. Following Hair *et al.* (2017), bootstrapping (5,000 resamples) was used to generate t-statistics.

Four of the five direct effects described in Table III resulted significant, while the *H1* was not confirmed, as the direct relationship between overuse and instastress was found to be non-significant ($\beta = 0.07$, t = 1.10). Nevertheless, the results confirmed the hypothesized direct positive relationship (*H2*) between overuse and emotional fatigue ($\beta = 0.48$, t = 4.89). The rest of the constructs in the proposed model were also found to be relevant antecedents of their respective dependent variables. The latter was supported after examining the Cohen's values (effect sizes), which are well above the recommended limit of 0.02 (Roldán and Sánchez-Franco, 2012).

Variables	Addiction	Overuse	Emotional fatigue	Instastress
Addiction	*n.a*	–	–	–
Overuse	0.75	*0.81*	0.73	0.26
Emotional fatigue	0.67	0.68	*0.79*	0.33
Instastress	0.17	0.22	0.23	*0.84*

Notes: Diagonal values represent AVE square root; values below the diagonal reflect latent variable correlations; above the diagonal are HTMT ratios

Table II. Discriminant validity

Ho	Direct effect (β)	Weights (loading)	*t*-value (bootstrap)	Contrast	R^2	Q^2	f^2
Overuse $\rightarrow$ addiction	0.78[***]		36.81	Accepted			0.05
Overuse $\rightarrow$ Instastress	0.07		1.10	Non accepted			0.04
Overuse $\rightarrow$ emotional fatigue	0.48[***]		4.89	Accepted			0.45
Addiction $\rightarrow$ emotional fatigue	0.34[***]		3.66	Accepted			0.03
Addiction $\rightarrow$ Instastress	0.31[***]		3.43	Accepted			0.04
Formative measures							
Addiction1 $\rightarrow$ Addiction		0.18[**]	2.79				
Addiction2 $\rightarrow$ Addiction		0.20[***]	3.83				
Addiction3 $\rightarrow$ Addiction		0.01	0.43				
Addiction4 $\rightarrow$ Addiction		0.16[*]	2.07				
Addiction5 $\rightarrow$ Addiction		0.37[***]	7.49				
Addiction6 $\rightarrow$ Addiction		0.11[*]	2.22				
Addiction7 $\rightarrow$ Addiction		0.67[***]	12.91				
Addiction8 $\rightarrow$ Addiction		0.02	0.38				
Addiction					0.61	0.18	
Emotional fatigue					0.61	0.31	
Instastress					0.31	0.11	

Notes: [*]$p < 0.05$; [**]$p < 0.01$; [***]$p < 0.001$ (based on t(4999), one-tailed test); SRMR= 0.041 The items Addiction3 and Addiction8 were not eliminated, as, though their weights resulted non-significant, their associated loadings were found significant ($\beta = 0.228$; t = 3.337 and $\beta = 0.419$; t = 7879 respectively)

Table III. Direct effects tests

In addition, R^2 and Q^2 parameters were used to evaluate the structural model. The value of R^2 was examined as an indication of the overall predictive strength of the model, with a threshold of 0.10 (Falk and Miller, 1992). In our case, R^2 values of addiction (0.61), emotional fatigue (0.61) and instastress (0.31) indicated that the exogenous variables of the constructs explain approximately 61, 61 and 31 per cent of their variances, respectively. As for measures of predictive relevance of the dependent variables in the proposed model, the Q^2 test was used. The values of Q^2 for addiction (0.18), emotional fatigue (0.31) and instastress (0.11) were all greater than zero, thus indicating predictive relevance and the ability to explain the endogenous latent variables. Lastly, we report the standardized root mean square residual (SRMR) of the model, which indicates the difference between the observed correlation and the expected correlation matrix (Henseler *et al.*, 2016). SRMR values that are lower than 0.08 are indicative of good model fit. In our case the SRMR criterion is met, as its value amounted to 0.041 (Table III).

In the present study, addiction is conceptualized as a construct with eight items which shape a general perception of the addiction to Instagram in a holistic way. As can be seen from Table III, six out of the eight addiction items exerted a significant influence on the construct, though their weights were found to be quite different. The results showed that addiction to Instagram was mainly due to the fact that the respondents spent more time on Instagram than initially intended, which results in their incapability of reducing its usage. However, the risk of losing a significant relationship, job or career opportunity was not found to be a significant consequence of their addictive Instagram usage.

5.3 Indirect effects

A mediation analysis was conducted to test the indirect effects in the model (Table IV). To estimate the mediation effect, all the direct, indirect and total effects between the variables in the model were assessed.

As Table IV shows, overuse had a significant total effect on instastress. When the mediator was introduced, the path from overuse to instastress was no longer significant, thus supporting *H3*. To evaluate the strength of the mediation effect, the variance accounted for (VAF) index, which determines the size of the indirect effect with respect to the total effect, was calculated. As the VAF score is 77.41 per cent, which is close to 80 per cent, partial mediation can be inferred.

On another note, Table IV indicates that the relationship between overuse and emotional fatigue is significantly reduced introducing addiction in the model. The beta coefficient for the relationship between overuse and emotional fatigue dropped from 0.75 ($p < 0.001$) to 0.48 ($p < 0.001$), thus supporting *H4*. The VAF value of 36 per cent indicates that the mediation is no longer full, but partial.

Ho	Total effect		Direct effect		Indirect effect		
	Coef.	*t*-value	Coef.	*t*-value	Point estimate	*t*-value	VAF(%)
Overuse → Instastress	0.31	3.69	0.07[ns]	1.12			
Overuse → Addiction → Instastress					0.24	3.55	77.41
Overuse → Emotional fatigue	0.75	24.23	0.48	4.02			
Overuse →Addiction →Emotional fatigue					0.27	3.87	36.00

Table IV.
Mediating effect tests **Notes:** ns: not significant (based on *t* (4999), one-tailed test). VAF: variance accounted for

6. Conclusions, implications, limitations and future research

Nowadays social media usage has become a common daily activity for young adults. Though SNSs may generate gratifications, their usage can also trigger negative consequences such as addiction. An addictive behavior, in turn, may result in users losing control of their social media usage, being completely absorbed by that activity and ultimately, suffering disorders in their daily life.

This study aimed to examine Instagram addiction in greater depth, by analyzing its antecedents and outcomes. To the best of the authors' knowledge, this is the first investigation into the mediating effect of addiction in the context of Instagram as a social media platform and the first one that examines SNS usage applying the paradoxes of technology framework proposed by Mick and Fournier (1998).

The approach herein is to place overuse at the beginning of the process, as a main antecedent of emotional fatigue and instastress, while addiction plays a mediating role in the relationships between overuse and emotional fatigue and between overuse and instastress. The results show that addiction partially mediates the impact of overuse on emotional fatigue and instastress.

Our results are in line with past research indicating that SNS can be a source of stress (Brod, 1984; Maier *et al.*, 2012; Weil and Rosen, 1997), as we conclude that Instagram overuse results in emotional fatigue. The findings are also consistent with Van der Aa *et al.* (2009)'s research regarding the mediating role of Internet addiction.

The findings of the present study offer relevant theoretical implications. Importantly, the research contributes to the extant knowledge on the dark side of Instagram, which has been scarcely investigated. The findings also add to the emerging line of research on understanding the mechanisms underlying addictive SNS behavior, not only at the personal level, which has received more research attention, but also regarding the relationship between users and brands.

The present study has significant implications not only for addicted Instagram users, but also for families, educators, SNS managers and public institutions. Being aware of the negative consequences of excessive Instagram use, as well as the role of Instagram addiction on those negative consequences, e.g. instrastress and emotional fatigue, preventive measures should be taken. These implications can be organized into two groups: treatment and prevention strategies.

As for treatment, our results highlight that overuse and addiction are different constructs, but both can lead to negative individual consequences. Thus, whereas Instagram addiction has a direct effect on instastress and emotional fatigue, overuse has been found to affect only emotional fatigue. Accordingly, a higher level of Instagram overuse favors addiction, which, in turn, results in reducing user's universe to a function of the constant filter of the SNS, displacing face-to-face interactions in the background and generating instastress and emotional fatigue. SNS addiction could be viewed as a new type of pathology that requires comprehensive treatment by professionals, and addicted users should look for help from these professionals.

Measures for reducing Instagram usage should not be taken only when the user has developed an addictive behavior, but also when excessive use is observable, given its considerable negative consequences. Ideally, the users should not reach that point, and therefore, implementation of prevention strategies is imperative. On one hand, as overuse and addiction to Instagram can both lead to adverse outcomes such as instastress and fatigue, users should be adverted about the possible addictive facet of Instagram usage. In this regard, social network sites managers should offer that information in the process of account creation and every time new features are promoted, users should be required to read

about them and accept the "potential side effects of an excessive use". On the other hand, users' role should not be overlooked, even though they can be more or less keen on implementing the preventive measures. In the case of young Instagram users, teachers and parents can serve as significant role models, playing a crucial role for toning down excessive SNS use. Parents (and teachers) should not only teach the youngest how to use SNS, but should also lead by example regarding the use of new technologies and SNS, in particular. Accordingly, it is advisable that parents make use of social media in a responsible manner and dictate or negotiate rules with their young adults about when or how much time they can devote to SNS use. For instance, it should not be allowed to use smartphones during family gatherings, so that family time has a priority over SNS use, thus not hindering family relationships. The parental control has to be done carefully, as youngsters may consider such attempts an intrusion into their autonomy and privacy (Valkenburg and Peter, 2011). Another course of action would be to help young adults enhance face-to-face communication abilities. In this regard, activities such as fostering social relationships, encouraging new "offline" hobbies (e.g. reading, cinema and other cultural activities), enrolling in sport and group activities or enhancing family communication and relationships, among others, are recommended. However, if regardless of following these guidelines parents and educators identify an increasing abusive SNS use, it is also advisable to look at other potential problems camouflaged under the overuse of the SNS; as literature suggests, psychosocial problems that originate through online communication often resemble those found in the "offline" lives (e.g. disappointing friendships or social exclusion) (Valkenburg and Peter, 2011). All these actions could be reinforced by media campaigns in by public institutions and social organizations. Following the example of government-sponsored campaigns on traffic accidents prevention or responsible alcohol consumption, public institutions should increase awareness in societies about the negative consequences of SNS excessive use, identified in this research.

In the case of middle-aged users, other actions can be suggested to prevent Instagram overuse and addiction. One possible alternative is the use of web or smartphone application trackers that provide information on the amount of time spent on each particular online platform. Additionally, turning off the notifications about other users' activity on Instagram would be another possible means for reducing instastress.

Based on the results of this study, new lines of research can be proposed to further explore the possible negative consequences of the Instagram use. At the user-level, a fruitful area of future research would be to investigate the possible moderating role of SNS users' socio-demographic, psychographic and technological traits on the theoretical relationships of the proposed model. Besides, further research could also assess other moderating variables related to SNS use, such as frequency or amount of time spent on using the SNS. As far as user-brand relationships are concerned, it would be interesting to analyze to what extent the level of engagement and the relationship between the consumer and the company through SNS could be damaged as a consequence of Instagram overuse and addiction. Previous studies have explored only the benefits of SNS usage for companies, disregarding the possible negative role of excessive SNS consumption.

The results of the present study are subject to certain limitations. One source of weakness in this research, which could affect the generalizability of the findings, is that it only examines one SNS in particular - Instagram. Thus, future work might test the proposed model in other SNSs, such as Facebook or Twitter, so that the results can be compared and relevant conclusions drawn. The greater presence of female respondents in our sample can also be regarded as a limitation of the research, although recent studies evidence that this SNS has increasingly more female than male users.

Another limitation of the study is that it is focused on a small subset of antecedents and negative outcomes of Instagram addiction. In this regard, additional precursors and consequences would be worthy to explore.

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