Compulsive Instagram Use: Roles of Stickiness, Gratifications, and Mindfulness

Yu-Hsun Lin

Department of Business and Management, Ming Chi University of Technology, Taiwan

Abstract

Accumulated reports have revealed the dark side of Social Networking Site (SNS) usages: compulsive use. How compulsive SNS use develops should receive more concern, so as to find a way to decrease its harmful effects. Based on uses & gratifications (U&G) theory and mindfulness, the present study aims to develop an integrated research model to investigate the enablers and inhibitors of compulsive Instagram use. Partial Least Squares (PLS) approach was employed to analyze data from 143 students in a northern Taiwan university who use Instagram as their preferred SNS to gratify their needs online in terms of self-documentation, entertainment, passing time, and self-expression. The findings conclude that: 1) users' gratifications of self-documentation, entertainment, passing time, and self-expression are directly related to users' stickiness toward Instagram; 2) stickiness is an important mediator in the process of forming compulsive Instagram use; 3) users' trait of mindfulness can decrease their compulsive use; 4) users' mindfulness can mitigate the effect of stickiness on compulsive Instagram use. This study, with U&G theory and mindfulness as its underpinning, thus, explains the formation of compulsive Instagram use and confirms the inhibiting effect of mindfulness on the compulsive use. It contributes to the understanding of two opposite forces, mindfulness and stickiness, acting on the compulsive use of SNSs, particularly for compulsive use of Instagram. Research and managerial implications − such as studying samples from adults and different populations, SNS operators fostering specific gratifications, and policy actions promoting mindfulness training − are articulated.

Keywords: compulsive SNS use; mindfulness; stickiness; uses & gratifications

Editorial Record

Introduction

Social Networking Sites (SNSs) have attracted millions of Internet users worldwide to engage in online social interaction and have transformed how people communicate and socialize with others (Sriwilai & Charoensukmongkol, 2016). Accessing SNSs has been a part of human everyday life because SNS usages can gratify the users' different needs (B. Kim & Y. Kim, 2019). Also, it provides them with an ability to stay connected with community members that offers them a sense of belonging to counter loneliness, especially of value for those experiencing low self-esteem and with life satisfaction also at low level (Ellison et al., 2007). Further,

researchers have found that SNS usage, especially using image-based social media such as Instagram, can decrease the users' sense of loneliness (Pittman & Reich, 2016). However, currently accumulated research has revealed the dark side of SNS excessive usages, such as compulsive use (Dhir et al., 2018), which may cause fatigue (Dhir et al., 2018), as well as perceived stress (Apaolaza et al., 2019) and hindering of students' academic performance (Turel & Qahri-Saremi, 2016); these dark side features surrounding excessive SNS usage are matters that have received growing concern (e.g., Turel & Osatuyi, 2017).

According to a mid-2021 report, the top-five most popular social network platforms are, in order, Facebook, YouTube, WhatsApp, Instagram, and Weixin/WeChat (Statista, 2021). Compared with the above social media platforms, the main feature of Instagram is its functionality of visual communication: it is a visual interactive social network platform for sharing and viewing picture-based or video-based content (Faelens et al., 2021; Rozgonjuk, Sindermann, et al., 2020; Senín-Calderón et al., 2020). Nowadays, Instagram provides several interactive photo-based features for users, such as taking, filtering, editing, posting, and sharing pictures; but also launches video-based functions such as live broadcast, IGTV (InstaGram TeleVision), and Reels to attract users to prolong their usage time on the platform. Pittman & Reich (2016) noted that young adults are more likely to suffer loneliness than other age groups. Compared with text-based social media, image-based social media, such as Instagram, by more easily offering a sense of social presence, can help that younger group to battle loneliness (Pittman & Reich, 2016). Instagram, with its image-based features, has become the leading social media for college students to communicate (Aparicio-Martínez et al., 2020).

Instagram has gained as of July 2020 more than one billion active online users per month and has become one of the most popular SNSs in the world. Among these users, while over one-third of global Instagram users (33.8%) were aged between 25 and 34 years, 29.3% of global Instagram users were aged between 18 and 24 (Statista, 2020). As over 60% of the total Instagram users were aged under 34 years, it is critical to understand the behavioral patterns of the young Instagram users.

A 1997 survey, #Status of Mind report, by the Royal Society for Public Health (RSPH) ranked Instagram as the worst social media for youths' mental health (ages 14 to 24), compared with YouTube, Twitter, Facebook, Snapchat. It is described as more addictive and as negatively impacting young people's health, including low sleep quality, over-concern about body image, FOMO (fear of missing out), cyberbullying, anxiety, depression, and loneliness (RSPH, May 1997). Nowadays, after more than twenty years later, accumulated studies still reported these detrimental effects of excessive Instagram usage in connection with problematic Instagram use (e.g., Balta et al., 2020; Feltman & Szymanski, 2018; Pittman & Reich, 2016; Rozgonjuk, Sindermann, et al., 2020). Also, systematic review of the research recently confirmed the relationship between Instagram use and mental health wherein (intensity of) Instagram use is related to more social comparison, negative body image, and disordered eating (Faelens et al., 2021). Although significant progress has been made in exploring the relation of (excessive) Instagram uses to health outcomes, the mechanism of how excessive Instagram use develops and leads to addictive behaviors remains vague (e.g., Rozgonjuk, Sindermann, et al., 2020).

Manifestations of addiction consist of six symptoms: salience, mood modification, tolerance, withdrawal symptoms, conflict, and relapse (Griffiths, 2005). Anyone who behaves in a manner that meets the above components may be in a state of addiction (Aparicio-Martínez et al., 2020). Andreassen and Pallesen (2014) outlined SNS 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),– a definition that reflects, in the symptoms of addiction mentioned above, the same ones as addressed by the American Psychiatric Association's DSM-5 (5th edition of the Diagnostic and Statistical Manual of Mental Disorders) (APA, 2013).

Although overuse of SNS may cause potential addiction-like symptoms (Montag et al., 2019), the idea of SNS addiction remains contentious (Ihssen & Wadsley, 2021). Billieux et al. (2015) noted addictive research generally postulated that nearly all daily life activities might lead to a genuine addiction. In this regard, researchers should not over-pathologize every life activity as addiction. In other words, the notion of addiction should not be employed to explain all daily life activities as being addictive. Thus, research on internet-related addiction, such as SNS addiction, should focus on specific addictive behavior instead of stressing addiction on the Internet itself (Montag et al., 2019). An example supporting this idea is that the DSM-5 listed internet gaming disorder but does

not include internet disorder (APA, 2013). In the same vein, the research focus of this study is compulsive Instagram use but does not cover general compulsive SNS use.

As related research has shown, problematic use and compulsive use on a specific SNS share some core features of substance-related addiction symptoms (Ihssen & Wadsley, 2021; Turel & Osatuyi, 2017; Turel & Qahri-Saremi, 2016), including salience, mood modification, tolerance, withdrawal, conflict, and relapse (Griffiths, 2005), which therefore can be understood in an addiction perspective (Andreassen, 2015). Compulsive use refers to a use pattern of an impulse-control disorder, representing those users who exhibit dysfunctional compulsive behavior (McIntyre et al., 2015); such users are incapable of controlling or stopping their specific favorite Internet application use, e.g., compulsive Facebook use (Turel & Osatuyi, 2017) and compulsive Instagram use (e.g., Okazaki et al., 2021). This means that for Instagram users with such a behavioral symptom as compulsive Instagram use, they would feel their desire and imperative to surf Instagram. In particular, they will overly engage in specific Instagram usages, such as using Instagram to gratify their needs for self-documentation, entertainment, passing time, and self-expression, which are correlated with the intensity of their Instagram use (Alhabash & Ma, 2017).

Concerning the relations of users' gratifications to compulsive use, the Interaction of Person-Affect-Cognition-Execution (I-PACE) model by Brand et al. (2019) can provide an explanatory foundation to delineate how gratifications play a role in the formation process of the problematic Instagram use. The I-PACE model is a theoretical framework underpinned by psychological and neuroscientific theories concerning specific internet-use disorders and addictive behaviors (Brand et al., 2016; Brand et al., 2019). It describes specific problematic behaviors in the initial stage, and addictive behaviors in the later stage as the consequences of the interactions among several personal core characteristics, moderating variables, and mediating variables (Brand et al., 2019). In the early stage, unique core characteristics (e.g., personal traits, needs, and motives) may determine the person's cognitive and affective responses to external and internal triggers and behavior in specific problematic manners. Over time, the gratification expectancy and reward via using the particular substance may reinforce and bias the person's cognitive and affective responses in uncontrolled ways. In doing so, the persons may develop the habitual behavioral pattern of "cue-creativity and craving" (the concept of the urge to use the specific substance) (Brand et al., 2019; Brand et al., 2016). As such, substance use disorder (due to the addictive behaviors) becomes the consequence of (excessively) engaging in specific behaviors.

While gratifications attainment and repeatedly using a specific application/site to compensate for psychosocial and social isolation problems are central ingredients of the I-PACE model by Brand et al. (2016) and Brand et al. (2019), this model assumes that individuals have a first-choice application/site among those having similar functionality. Additionally, disorders due to addictive behaviors may stem from engagement in specific behaviors, such as engaging in using a particular application/site of choice. Taken together, the I-PACE model is suitable for the present study to delineate the concept of engaging in using Instagram as their "first-choice SNS" among SNS-dependent youths and investigate compulsive Instagram use development.

According to the I-PACE model, the attainment of gratification, in the short term, rewards users for engaging in using a specific SNS. In the long run, as the compulsive process progresses, the level of specific gratifications may diminish. However, psychological and social isolation problems still exist and there is a need to compensate for the issues by repeatedly using or overusing the specific SNS of choice. In this circumstance, their self-regulation for reasonable use may be in an uncontrolled state that entails compulsive use of the specific SNS. Uses & Gratifications (U&G) theory may provide a foundation to explain how users (overly) engage in using Instagram, and then the compulsive use develops. U&G theory assumes that users tend to actively search for and use specific media to meet their particular expectations, so their media usage is goal-directed (Zhang et al., 2011). If the SNS can gratify the users' specific needs, they may develop stickiness by prolonging their stay at the SNS (Y.-C. Chen, 2014; Y.-H. Lin et al., 2016). The concept of stickiness originated from exploring the phenomenon of Internet usage and is an indicator of continued engagement with specific website usage. Stickiness reflects the habitual behavioral pattern of individuals tending to use the specific (first choice) website continuously (J. C. Lin, 2007) and being willing to prolong their stay at (Karahanna et al., 2009; J. C. Lin, 2007) and their dependence upon the website (Xu & Liu, 2010). Apaolaza et al. (2019) noted that users exhibit compulsive social media use due to their attachment to social media, implying that stickiness is related to compulsive use. Thus, when Instagram has become the most popular among the youths, for those youth dependent on

Instagram, the concept of stickiness can be employed to reflect their behavioral patterns of high engagement in using Instagram. Instagram stickiness, therefore, is included in the framework of the I-PACE model to explore the formation process of compulsive use.

In contrast to stickiness, which may be positively related to compulsive SNS use, mindfulness has been found to hinder the compulsive SNS use (Apaolaza et al., 2019). Mindfulness refers to observing one's own mental phenomena as the way to regulate affect and impulse in a nonjudgmental manner (Taylor & Mireault, 2008), representing the ability of an individual to be sensitive to context and to focus his/her attention on the present experience in a nonjudgmental manner (Brown & Ryan, 2003). As the means of regulating emotion and impulse, mindfulness increases an individual's tolerance with respect to negative emotions and impulses (Taylor & Mireault, 2008); it, therefore, probably serves as the essential element for individuals to overcome some types of disorder, such as eating disorder and substance use disorders, borderline personality features, and compulsive behavior (Vohs & Baumeister, 2004).

Recently, mindfulness has been noted as particularly influential in contributing insight into avoiding specific compulsive SNS use (e.g., Apaolaza et al., 2019; Turel & Osatuyi, 2017). As investigated by Turel and Osatuyi (2017), mindfulness is a critical personal positive trait in explaining compulsive SNS use in the context of using Facebook. They found that mindfulness is positively associated with compulsive use when the user observes an increase in use by peers, but mindfulness also has social pressure self-efficacy as a feature, which has an inhibiting effect on compulsive use (Turel & Osatuyi, 2017). Yet, it is a field that is still under-discussed and under-explored, especially in the context of youths using Instagram. However, current evidence has shown that mindfulness not only lessens compulsive mobile SNS use by enhancing self-esteem and then decreasing social anxiety (e.g., Apaolaza et al., 2019), but also plays a moderating role on compulsive SNS use – such as by fostering self-efficacy in the face of social pressure (namely, the ability to handle the use situations and resist using SNSs) – in lessening compulsive SNS use (e.g., Turel & Osatuyi, 2017). As such, mindfulness may play a potentially beneficial and/or intervening role in attenuating compulsive Instagram use.

Drawing on U&G theory, stickiness, and mindfulness as outlined above, this study aims to develop an integrated research model based on the framework of the I-PACE model wherein stickiness is conceptualized as a behavioral tendency of high and habitual engagement in the use of Instagram (considered here as a specific accustomed pattern of repeated use in the I-PACE model) and hypothesized to be stimulated by the needs of gratifications (viewed here as particular needs and also as an important core element of the I-PACE model), and postulated to be associated with compulsive Instagram use in the I-PACE model. Conversely, mindfulness (considered here as one predisposing variable of personal core characteristics in the I-PACE model) has been theorized to be negatively related to compulsive Instagram use and to inhibit the positive relation of Instagram stickiness to compulsive Instagram use. Understanding and inhibiting the formation of Instagram compulsive use and addressing its negative impact on Instagram users is a critical research issue that should receive comprehensive understanding and deserved attention in current Instagram research. In doing so, the present study may contribute to the academics and the practitioners in understanding and dealing with users' compulsive SNS use.

Theoretical Foundation and Hypothesis Development

Instagram Gratifications and Stickiness

According to U&G theory (McGuire, 1974), SNS research disclosed that SNS users proactively seek and use specific SNSs to gratify their context-specific needs (e.g., Zhang et al., 2011). For example, Huang and Su (2018) found that most students use Instagram to navigate posts, particularly for engaging with social interaction and diversion. Scholars also noted that some specific gratifications are associated with problematic SNS use (e.g., H.-T. Chen & Y. Kim, 2013; Kircaburun et al., 2020). However, little is known about context-specific gratifications, such as Instagram gratifications and their possible relations with the corresponding occurrence of problematic use.

Scholars have identified that several specific gratifications are motives for using Instagram (e.g., Alhabash & Ma, 2017; Ellison et al., 2007; Kircaburun et al., 2020; Sheldon & Bryant, 2016). Of these, some types of gratifications

may act as stickiness-specific gratifications. Sheldon and Bryant (2016) revealed that college students who engage in social activity, e.g., traveling, going to sporting event, and visiting friends, tend to use Instagram for documentation. Kircaburun et al. (2020), based on the U&G framework, identified seven motives for social media use among university students. Specifically, they found that passing time, entertainment, and presenting oneself as more popular are more significantly correlated with Instagram use and problematic social media use.

Alhabash and Ma (2017) identify eight cross-platform motivations for the uses of Facebook, Twitter, Instagram, and Snapchat among college students; Instagram, in particular, received the most significant amount of time spent on it by participants who were college students. However, of these gratification motivations, only four – self-documentation, entertainment, passing time, and self-expression – are related to the intensity in using Instagram. In SNS-related studies, the use intensity has been conceptualized as the level of specific SNS usages, such as Instagram use intensity (Alhabash & Ma, 2017) and Facebook use intensity (Ellison et al., 2007). It reflects revisiting the specific SNS is a habitual behavior and has become part of the users' everyday activity on the specific SNS (Alhabash & Ma, 2017; Ellison et al., 2007), which is like the concepts of stickiness. Both studies reveal that users' engagement with the specific SNS and visiting the favorite SNS has become the satisfied users' long-term behavioral tendency and is internalized as their must-have online activity. Thus, Instagram use intensity may serve as a predictor of Instagram stickiness and the four Instagram usage gratifications mentioned above may be related to users sticking to Instagram. The following hypothesis is, therefore, proposed.

H1: Users' gratifications from using Instagram for self-documentation, entertainment, passing time, and self-expression are positively related to users' stickiness to Instagram.

H1a: Users' gratification from using Instagram for self-documentation is positively related to users' stickiness to Instagram.

H1b: Users' gratification from using Instagram for entertainment is positively related to users' stickiness to Instagram.

H1c: Users' gratification from using Instagram for passing time is positively related to users' stickiness to Instagram.

H1d: Users' gratification from using Instagram for self-expression is positively related to users' stickiness to Instagram.

Instagram Gratifications, Stickiness, and Compulsive Use

Compulsive use does not occur in all contexts of Internet application use and may arise with respect to engaging in specific online activities (McIntyre et al., 2015; Meerkerk et al., 2009). Scholars also have noted that when individuals have the usage symptom of sticking to the specific website, they will create dependency upon the website (Xu & Liu, 2010). The website will become the individuals' first choice online; so, they show loyalty to the website and would like to make as many return visits to the website as possible and available (Karahanna et al., 2009). With respect to the impact of users' high engagement with social media activities, Apaolaza et al. (2019) indicated that when users have established an attachment relationship with a specific social media, they will use it compulsively. Also, as mentioned above, specific gratifications gained via using Instagram may be related to users' stickiness to Instagram. Taking the two arguments together as the whole, Instagram stickiness is likely to mediate the relation of users' specific Instagram gratifications to their compulsive use. Thus, the following two hypotheses are suggested.

H2: Users' stickiness to Instagram is positively related to Instagram compulsive use.

H3: Users' stickiness to Instagram mediates the effect of Instagram gratifications on Instagram compulsive use.

Mindfulness and Compulsive Instagram Use

Mindfulness can be considered an indicator of behavioral self-regulation. Individuals with mindfulness have adaptive emotional regulation skills (Taylor & Mireault, 2008), thus exhibiting the ability of self-regulation on using the Internet applications; consequently, they experience less social anxiety and show better interpersonal skills for expressing themselves in social situations, thus reducing their likelihood of preferring online social interactions (Gámez-Guadix & Calvete, 2016). Apaolaza et al. (2019) also confirmed a psychological process of mindfulness lowering compulsive mobile WhatsApp use. Following these results, users having higher mindfulness are expected to evidence less compulsive Instagram use. Hence, the following hypothesis is suggested.

H4: Users' mindfulness is negatively related to their compulsive Instagram use.

The Moderating Effect of Mindfulness

In essence, individuals with a shortage of mindfulness would struggle to control their use of social media (Kuss & Griffiths, 2011). In contrast to the several empirical studies that have supported the negative association between mindfulness and compulsive use (Apaolaza et al., 2019; Gámez-Guadix & Calvete, 2016), what has received little attention is the association of stickiness on compulsive use. In H2, stickiness is hypothesized as having a relational link with compulsive use on Instagram. Further, as Bishop et al. (2004) revealed, individuals with higher mindfulness should have the ability to regulate the focus of attention, such as keeping sustained attentiveness toward their current event and necessary goal over prolonged periods of time. As such, mindfulness should help them live in the present as far as possible and decrease the impact of their aroused Instagram stickiness, – from the gratification of using Instagram, – on their compulsive use. Therefore, the above argument is examined by the following proposed hypothesis.

H5: Mindfulness serves as a protective factor to moderate (mitigate) the positive relationship between Instagram stickiness and compulsive use.

Gender and Life Satisfaction as Control Variables

De Cock et al. (2014) showed that females are likely to compulsively use SNS. Nevertheless, other SNS studies have shown that gender difference is not related to problematic SNS use, e.g., Facebook addiction (Koc & Gulyagci, 2013). Thus, the relation of gender difference to compulsive Instagram use should be examined with caution and according to the context of Instagram use. Specifically, Instagram allows users to compare their appearance with the idealized photographs from significant others serving as reference models (Senín-Calderón et al., 2020). For those females caring about their body image, Instagram provides an opportunity for them to internalize third-party perspectives and objectify their physical selves as the object to be looked at and evaluated, which is associated with their increase in Instagram use (Feltman & Szymanski, 2018). Baker et al. (2019) later showed that female college students take the audience's perspective and care about how they are viewed by others on Instagram. They put much effort into posting, e.g., being careful selecting the best photo of themselves and caring about receiving likes and comments from others. According to the examination by Rozgonjuk, Pruunsild, et al. (2020), females reported higher scores on Instagram disorder use; one may, therefore, postulate that the symptom of compulsive Instagram use tends to be more likely to happen among female undergraduate students than male undergraduate students.

Moreover, life satisfaction is linked to (excessive) Instagram usages. Sheldon et al. (2021) found that older Instagram users with poor life satisfaction declared more Instagram uses to gratify their needs for diversion and companionship, suggesting the use of Instagram as their way to escape and avoid loneliness. A previous study has found the importance of life satisfaction in reducing social media addiction, where stress is negatively associated with life satisfaction (Longstreet & Brooks, 2017). As stress has been confirmed to be positively related to compulsive social media use (e.g., Apaolaza et al., 2019), one may postulate that life satisfaction should be negatively associated with compulsive Instagram use among young youths. Thus, the above two factors serve as control variables by being incorporated into the research model to capture whether these two factors can also affect compulsive Instagram use.

Taking the above development of the five hypotheses as a whole, the present study proposed the two pathway model dealing with the process by which compulsive use is formed or alleviated (see Figure 1).

Figure 1. *The Proposed Research Model*.
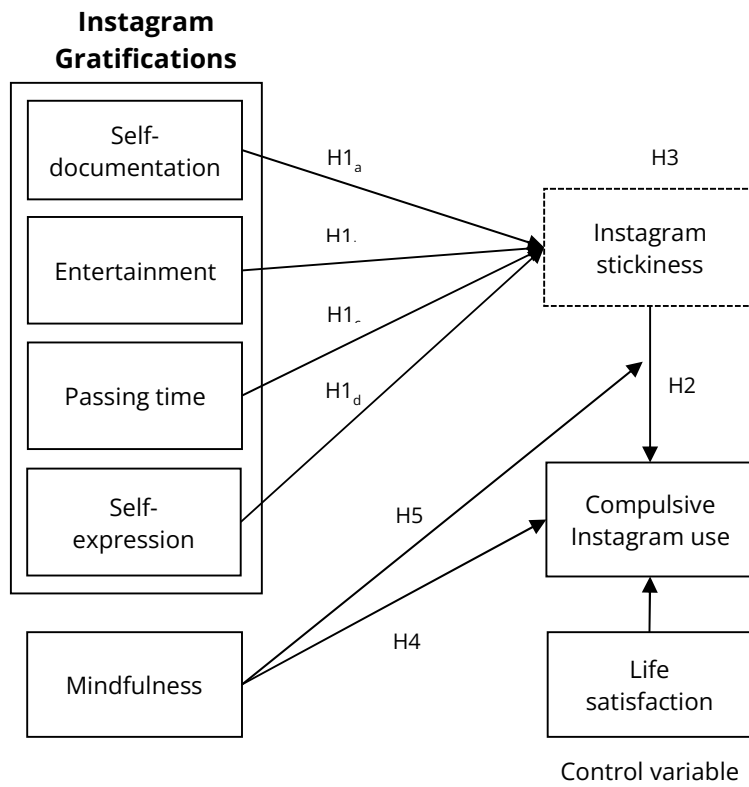
Note. The variable in the dash-line box, stickiness, acts also as a mediator.

Method

Participants and Procedure

To examine the research model, a field survey was carried out with the students in a university of northern Taiwan. Convenience sampling for the field survey was adopted because all sampling subjects would be accessible in one geographical area (on the campus of one university in Taiwan) and it is helpful for researchers to perform data collection easily and quickly during a given period (Etikan et al., 2016). Three master students were recruited for data collection. They randomly invited the voluntary participants on the campus. The period for data collection lasted about two months, from April 1, 2020, to June 30, 2020.

The students participated voluntarily to fill the questionnaire by paper-and-pencil. An informed consent placed at the front of the questionnaires gives the author contact information, brief research description, and the responders' right to their personal information filled in on the questionnaire. The note informs responders that the content of the questionnaire they fill out is protected, used only for academic research purposes, and will not be publicly disseminated, all of which is to conform with academic ethics requirements. Before responding to the formal survey, all participants received, read, and accepted the informed consent to complete the anonymous questionnaires.

Measures

All measurement items are presented in Table 1 and use a 5-point Likert scale, which ranged from *strongly disagree* (representing a score of one) to *strongly agree* (representing a score of five). Three items measuring self-documentation and three items measuring passing time are adapted from Alhabash and Ma (2017). Three items measuring entertainment are adapted from B. Kim and Y. Kim (2019). One item from Alhabash and Ma (2017) and three items from Thorbjørnsen et al. (2007) are adapted to measure entertainment. A total of six items are selected and adapted from Karahanna et al. (2009) and Lin (2007) to measure Instagram stickiness.

Table 1. *Measurement Items of Variables.*

Scale items (Source)

Self-documentation, SD (Alhabash & Ma, 2017)

SD1. I use Instagram to record what I do in life.
SD2. I use Instagram to record what I have learned.
SD3. I use Instagram to record where I have been.

Entertainment, EN (B. Kim & Y. Kim, 2019)

EN1. I use Instagram because it is fun.
EN2. I use Instagram because it is enjoyable.
EN3. I use Instagram because it is entertaining.

Passing time, PT (Alhabash & Ma, 2017)

PT1. I use Instagram to help myself to pass the time.
PT2. I use Instagram to pass the time when I have nothing better to do.
PT3. I use Instagram to relax me.

Self-expression, SE (SE1 : Alhabash & Ma, 2017 ; SE2, SE3, SE4 : Thorbjørnsen et al., 2007)

SE1. I use Instagram to show my personality.
SE2. Instagram is part of how I express my emotions when using it.
SE3. Instagram can help me express what I am thinking.
SE4. Instagram can help me express what I want.

Stickiness, ST (ST1, ST2: J. C. Lin, 2007; ST3, ST4, ST5, ST6: Karahanna et al., 2009)

ST1. Instagram is my preferred way of interacting with others.
ST2. Instagram has earned my loyalty.
ST3. I would stay a longer time on Instagram than other websites.
ST4. I intend to prolong my stay on Instagram.
ST5. I would visit Instagram as often as I can.
ST6. I intend to link to Instagram every time I am online.

Mindfulness, MI (Apaolaza et al., 2019; Baer et al., 2006)

MI1. When I do things, my mind often wanders off and I'm easily distracted.[*]
MI2. I have trouble concentrating and paying attention to the things I am doing.[*]
MI3. I find myself doing things without paying attention.[*]
MI4. It seems I am "running on automatic" without much awareness of what I'm doing.[*]
MI5. I find it difficult to stay focused just on what's happening in the present, without making any judgment about it.[*]

Satisfaction with University Life, SA (Ellison et al., 2007)

SA1. In most ways, my life at my university is close to my ideal.
SA2. The conditions of my life at my university are excellent.
SA3. I am satisfied with my life at my university.
SA4. So far, I have gotten the important things I want at my university.
SA5. If I could live my time at my university over, I would change almost nothing.

Compulsive use, CU (Apaolaza et al., 2019)

CU1. I feel nervous on days I don't use Instagram.
CU2. I feel anxious on days I don't use Instagram.
CU3. I spend time on Instagram even though I have other obligations or deadlines.
CU4. If I have any time left at the end of my day, I just have to spend it on Instagram.
CU5. I spend time on Instagram to make myself feel better.
CU6. I feel others would be horrified if they knew of my Instagram use habits.

Note. [*]reverse items.

Five items measuring mindfulness are selected from the awareness dimension of mindfulness in the Five-Facet Mindfulness inventory, developed by Baer et al. (2006). This shortened version of the mindfulness questionnaire was employed in the research on mobile compulsive WhatsApp use (Apaolaza et al., 2019). Moreover, the six items measuring compulsive use of Instagram are adapted from the scale of compulsive WhatsApp use by Apaolaza et al. (2019), which is selected from the compulsive buying scale of Faber and O'Guinn (1992) and previously adapted by Turel and Osatuyi (2017) to measure and confirm compulsive Facebook use. The shortened measurement here can briefly denote the problematic behavioral patterns that typically become very difficult to stop as being addictive symptoms, including withdrawal (CU1 and CU2), salience (CU3), mood modification (CU5), relapse (CU4), and conflict (CU6) but does not directly mention tolerance.

Finally, five items that measure the control variable, life satisfaction, are adapted from Ellison et al. (2007). The scale items concerning university life were selected because the research target is university students. For most college students, the campus offering life and learning is their focus.

Results

Data analysis was performed by the Partial Least Squares, PLS, approach illustrated by SmartPLS 3.0 (Ringle et al., 2015). The PLS approach provides a causal-predictive analysis (Fornell & Bookstein, 1982). It is also suitable for a research model with little theoretical information and a smaller sample size (Chin et al., 2003).

Data Screening and Descriptive Analysis

A total of 166 volunteers, university students, filled and returned their questionnaires. Two screening items examine whether responders are active Instagram users. The first asks whether they use Instagram. If they responded *no* to the query, the case was dropped. The second item asks whether they use Instagram every day. If they respond to the question by *not using Instagram every day*, the case also was deleted. Among all cases, a total of 143 samples reported that they are active Instagram users with the experiences of using Instagram every day and completed the questionnaire. This sample is used for the following data analysis. All responders reported that they use the smartphone to access Instagram. The sample consisted of 79 (55.24%) females and 64 males (44.76%), aged 18 to 23 years (M = 20.17, SD = 1.631). Eleven participants were master students (7.69%), while 132 were undergraduates (92.31%). The three highest frequency Instagram usages are surfing, clicking the "Love" button, and chatting with friends. 55.24% of respondents answered that the average daily time spent on Instagram is more than one hour, and 49.65% of respondents who reported the frequency of using Instagram per day is more than 10 times. Table 2 presents the detailed results from this descriptive analysis.

The impact of gender difference, a control variable, on compulsive Instagram use was examined using the t-test by SPSS software version 20. The analysis result indicated that there is no gender difference in compulsive Instagram use between females and males (female M = 2.342, SD = 0.892; male M = 2.3, SD = 0.852; t = -0.284, p = .777). Thus, gender was not included in the following PLS analysis for testing the measurement model and the structural model.

Common Method Bias Test

Self-report questionnaires may produce the Common Method Bias (CMB). Ideally, the survey can collect the actual tendency of the interviewee. In practice, some variations in the response may stem from the instrument rather than from the actual predispositions of the interviewee. Briefly, in the survey, the instrument may produce bias. The case, common method bias, generally happens and is questioned when all data collection is based on the instrument without other means (e.g., collecting third-party data as surrogates for some variables in the proposed model). A widely used post-remedy method proposed by Podsakoff and Organ (1986), Harman's single factor test (Harman, 1976), was performed to scrutinize the effect of CMB. An unrotated principal axis factoring analysis, exemplified by SPSS software package version 20, yielded five significant factors with the eigenvalues larger than 1. The five factors were extracted and emerged from a total of twenty-eight measurement items and explained 73.33% of the variance. Additionally, the first factor explains 42.24% of the variance, i.e., less than 50% of the variance, revealing CMB should not be the problem in this study.

The Measurement Model Testing

First, construct reliability was examined by measuring Cronbach's alpha and composite reliability (CR). Nunnally (1978) suggested that the cut-off value of Cronbach's alpha is .7. One item for mindfulness and one item for compulsive Instagram use were dropped due to their lower values of factor loading (< 0.7), thus yielding Cronbach's alphas of all constructs in the research model such that all samples exceeded .7. Then, the values of the Cronbach's alphas for all eight constructs were shown in Table 3. Additionally, the value of CR for each construct was more significant than the recommended minimum value, .6, as recommended by Fornell and Larcker (1981). Thus, the construct reliability is validated.

Table 2. *Demographic Statistics and Instagram Usage Experience.*

Demographic	Statistics	Number	%
Gender	Female	79	55.24%
	Male	64	44.76%
Age	18	19	13.29%
	19	52	36.36%
	20	12	8.39%
	21	19	13.29%
	22	29	20.28%
	23	10	6.99%
	24	2	1.40%
Number of Instagram friends	0-200	65	45.45%
	201-300	38	26.57%
	300-400	20	13.99%
	401-500	12	8.39%
	501-600	0	0.00%
	601-700	3	2.10%
	701-800	0	0.00%
	801-900	1	0.70%
	901 or more	4	2.80%
Time and Frequency Data	**Statistics**	**Number**	**%**
Average daily time spent on Instagram	<10 minutes	14	9.79%
	10 minutes – < 30 minutes	28	19.58%
	30 minutes – < 1 hour	22	15.38%
	1 hour - < 2 hours	27	18.88%
	2 hours - < 3 hours	22	15.38%
	3 hours or more	30	20.98%
Frequency use of Instagram per day	1 time	7	4.90%
	2-5 times	33	23.08%
	6-10 times	32	22.38%
	11-15 times	16	11.19%
	16-20 times	20	13.99%
	>20 times	35	24.48%

Note. n = 143.

Next, as presented in Appendix Table 1, the value of factor loading for each item on its respective construct is above 0.7, the threshold value suggested by Hair et al. (2006). As demonstrated in Table 3, Average Variance Extracted (AVE) values for the eight constructs ranged from .685 to .854. All these values are greater than the accepted threshold value of 0.5, suggested by Fornell and Larcker (1981) and, thus, indicate that items loading on the corresponding variable achieve convergent validity.

Finally, according to Kline (2005), the discriminant validity criterion is the correlation of two structures below 0.85. Also, the square root values of AVE for all constructs were higher than the values of their inter-construct correlations, thus confirming that the requirement for passing discriminant validity (Fornell & Larcker, 1981) has been met. Taken together, the combination of the above examinations proved the measurement model satisfactory.

Table 3. *Latent Variable Correlations and Descriptive Statistics.*

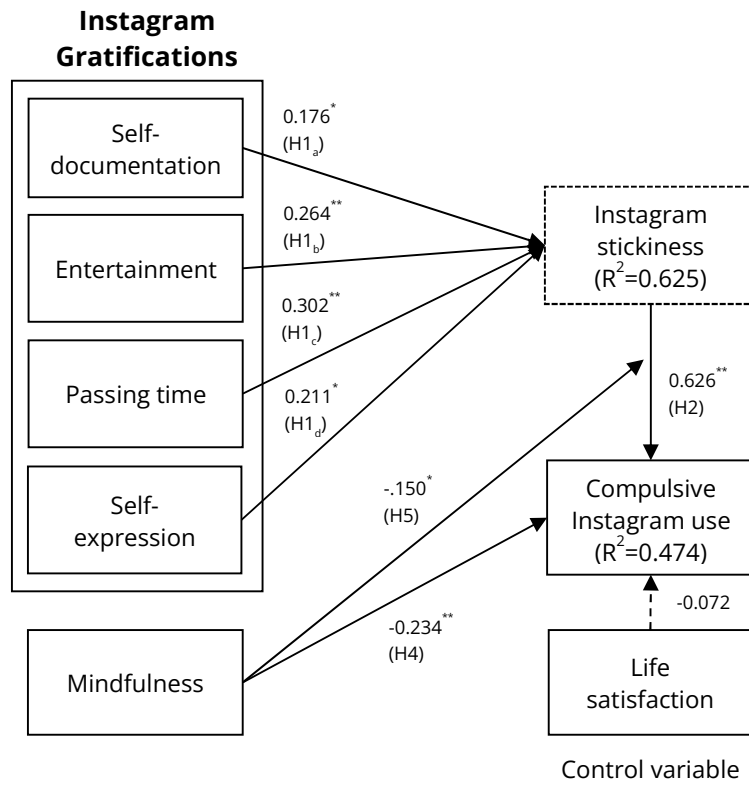| Variable	SD	ET	PT	SE	ST	MI	SA	CU
SD	**.908**							
ET	.440	**.924**						
PT	.418	.750	**.828**					
SE	.703	.555	.554	**.914**				
ST	.566	.684	.690	.648	**.839**			
MI	.156	.058	-.038	-.001	-.070	**.872**		
SA	.057	.118	.148	.151	.227	.137	**.889**	
CU	.307	.437	.516	.479	.626	-.288	.077	**.854**
α	.894	.915	.766	.934	.915	.896	.879	.907
CR	.934	.946	.866	.953	.934	.927	.919	.931
AVE	.825	.854	.685	.836	.703	.760	.791	.730
Mean	3.191	3.469	3.214	3.021	3.013	3.199	2.930	2.323
SD	0.932	0.811	0.772	0.938	0.844	0.844	0.789	0.871

Notes. The eight constructs are: SD, Self-Documentation; ET, Entertainment; PT, Passing Time; SE, Self-Expression; ST, Stickiness; MI, Mindfulness; SA, Satisfaction with university life; CU, Compulsive Use. Average Variance Extracted, AVE. Composite Reliability, CR. The diagonal line lists the square root of AVE for the eight constructs (in bold and italics).

The Structural Model Testing

Assessing the path coefficient's significance was performed using the built-in bootstrapping method of the Smart PLS 3.0 software package, resampling 5000 cases from the pool of 143 samples. As shown in Figure 2, Figure 3, and Table 4, all path coefficients for testing Hypotheses are significant ($p < .01$ or $p < .05$) except the path coefficient for testing the control variable, life satisfaction. Following the PLS approach of testing moderating and mediating effects in the manner illustrated by Ramayah et al. (2018), the orthogonalization approach was employed first to verify the moderating effect of mindfulness in H5. This orthogonalization approach could minimize the estimation bias in testing the moderating effect compared with the other built-in – two-stage and product indicator – approaches (Ramayah et al., 2018). As presented in Figure 2, the coefficient on the moderating path ($\beta = -0.150$, $p < .05$) is significant. The simple effect of stickiness at low and high mindfulness on compulsive Instagram use is depicted in Figure 4. The line of low mindfulness is steeper than the line of high mindfulness, indicating that the positive relationship of Instagram stickiness and compulsive Instagram use is weaker when mindfulness is high. As shown in Figure 2 (the moderator included) and Figure 3 (the moderator excluded), R^2 of compulsive Instagram use (the moderator included) = .474 and R^2 of compulsive Instagram use (the moderator excluded) = .453. The effect size ($f^2 = .040$) was calculated and passes the requirement of small effect suggested by Cohen (1988), thus confirming the moderating impact of mindfulness and supporting Hypothesis 5.
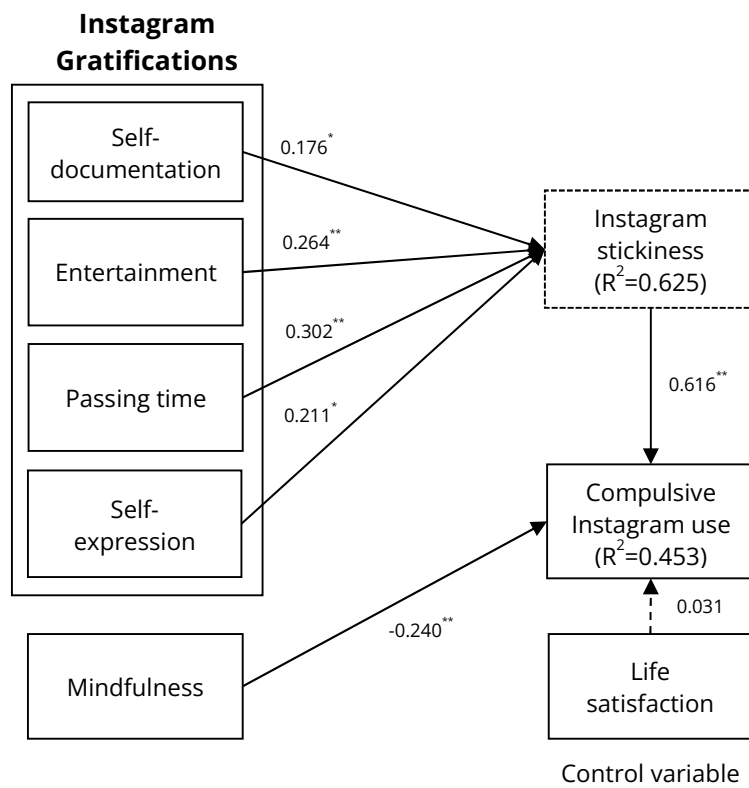
Second, examining the mediating effect as shown in Table 5, all indirect effects regarding the four mediating paths are positively significant ($\beta = 0.110$, $p < .05$ for the pathway of H3a; $\beta = 0.165$, $p < .01$ for the pathway of H3b; $\beta = 0.189$, $p < .01$ for the pathway of H3c; $\beta = 0.132$, $p < .05$ for the pathway of H3d). For each of these mediating paths, the range between the upper level (UL) and lower level (LL) of 95% bootstrap Confidence Interval, CI, Bias Corrected does not straddle 0 [0.13, 0.226], [0.063, 0.287], [0.084, 0.310], [0.015, 0.250]; these results satisfy the requirement of confirming mediating effect following the recommendation by Preacher and Hayes (2008). Thus, the correlations of self-documentation, entertainment, passing time, and self-expression to compulsive Instagram use were mediated by stickiness. H3 was therefore supported. In sum, H1, H2, H3, H4, H5 were supported.

Figure 2. *The Results for PLS Path Analysis in Structural Model Testing (the Moderator Included).*

Instagram Gratifications

Self-documentation — 0.176^* (H1$_a$)

Entertainment — 0.264^{**} (H1$_b$)

Passing time — 0.302^{**} (H1$_c$)

Self-expression — 0.211^* (H1$_d$)

Instagram stickiness (R^2=0.625)

0.626^{**} (H2)

Compulsive Instagram use (R^2=0.474)

$-.150^*$ (H5)

Mindfulness — -0.234^{**} (H4)

Life satisfaction

-0.072

Control variable

Notes. For mediating analysis with respect to H3, see Table 5. *n* = 143; $^{**}p < .01$; $^*p < .05$.

Figure 3. *The Results for PLS Path Analysis in Structural Model Testing (the Moderator Excluded).*

Instagram Gratifications

Self-documentation — 0.176^*

Entertainment — 0.264^{**}

Passing time — 0.302^{**}

Self-expression — 0.211^*

Instagram stickiness (R^2=0.625)

0.616^{**}

Compulsive Instagram use (R^2=0.453)

Mindfulness — -0.240^{**}

Life satisfaction

0.031

Control variable

Notes. n = 143; $^{**}p < .01$; $^*p < .05$.

Figure 4. *The Result of Simple Slope Test.*
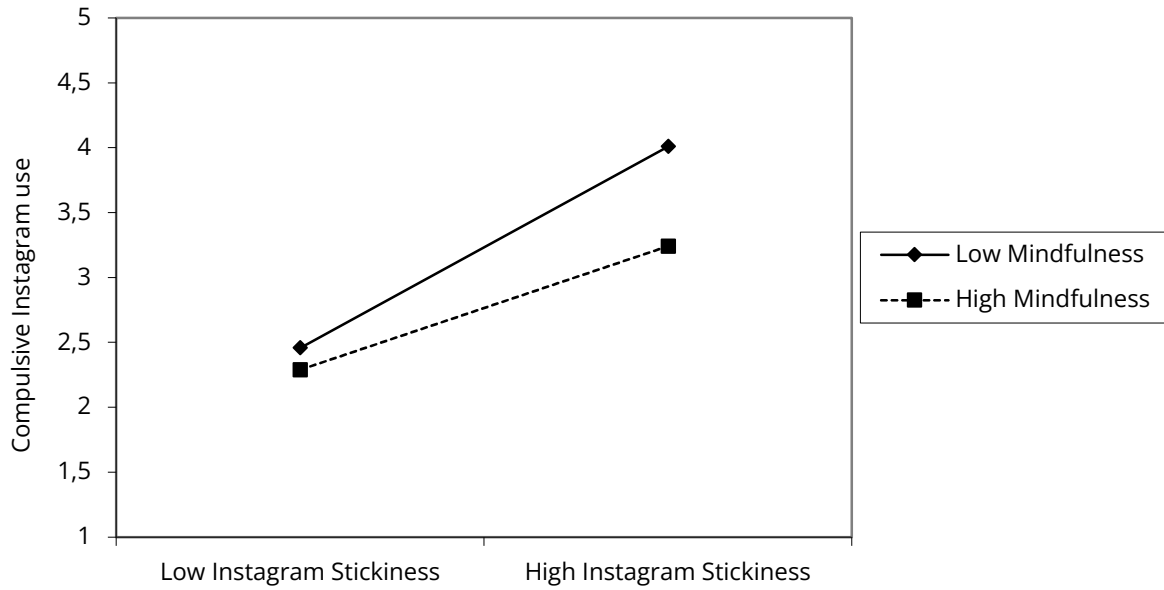
Table 4. *The Result of Hypothesis Testing (Except for H3).*

Hypothesis	Path	β coefficient	*t* value	Confirmed
H1a	SD $\rightarrow$ ST	0.176*	2.062	Yes
H1b	ET $\rightarrow$ ST	0.264**	3.011	Yes
H1c	PT $\rightarrow$ ST	0.302**	3.715	Yes
H1d	SE $\rightarrow$ ST	0.211*	2.209	Yes
H2	ST $\rightarrow$ CU	0.626**	9.448	Yes
H4	MI $\rightarrow$ CU	-0.234**	3.915	Yes
H5	MI × ST $\rightarrow$ CU	-0.150*	1.971	Yes

Note. **$p < .01$; *$p < .05$.

Table 5. *The Result of Hypothesis 3 Testing on Mediation.*

No	Path	Indirect effect	SD	*t* value	95% Bias Corrected		Supported
		Std. β			LL CI	UL CI	
H3a	SD $\rightarrow$ ST$\rightarrow$ CU	0.110*	0.054	2.043	0.013	0.226	Yes
H3b	ET $\rightarrow$ ST$\rightarrow$ CU	0.165**	0.057	2.880	0.063	0.287	Yes
H3c	PT $\rightarrow$ ST$\rightarrow$ CU	0.189**	0.057	3.302	0.084	0.310	Yes
H3d	SE $\rightarrow$ ST$\rightarrow$ CU	0.132*	0.061	2.150	0.015	0.250	Yes

Note. UL CI - Upper Limit of Confidence Interval; LL CI - Lower Limit of Confidence Interval. **$p < .01$, *$p < .05$.

Discussion

Although the present study is a preliminary investigation into the driving force of stickiness and the hindering effect of mindfulness on compulsive Instagram use, its relevance for U&G theory can also be seen. According to the related studies based on U&G theory, this study identifies four gratifications of Instagram usages (Alhabash & Ma, 2017) and further assessed their effects on Instagram stickiness in testing H1. As revealed in the present study, through the four gratifications, the users create their behavioral tendency of chronic and habitual use of Instagram, which constitutes their stickiness toward Instagram. In this regard, previous U&G research primarily focused on gratifications as motivations for using a particular SNS. This study further addresses the gap in understanding the relation of these gratifications to a long-term continuance intention of Instagram usage, conceptualized here as Instagram stickiness.

Also, Apaolaza et al. (2019) have indicated that users' compulsive mobile social media usage is attributed to their continuous attachment to their mobile devices. The result of the present study is in accordance with this argument by confirming, in the testing of H2, the relation of Instagram stickiness to compulsive Instagram use. As shown in Table 3, the stickiness of Instagram and the compulsive use of Instagram are highly correlated. The validity of the discriminant testing suggested that they are linked, but different, concepts about Instagram use. Stickiness here is conceptualized as users' habitual behavioral pattern toward a preferred SNS, Instagram, reflecting users' behavioral intention to prolong Instagram use and showing the behavioral tendency of the users to build a long-term relationship with the specific SNS, that is, Instagram loyalty.

The study confirmed the relations of four Instagram gratifications to stickiness in H1 and stickiness to compulsive use in H2. The result is in line with the assumption of the I-PACE model of specific disorders of the Internet. That is, the gratifications obtained from specific Instagram usages are the rewards for the users and reinforce (cue-creativity and craving) them engaging in the use of Instagram (behavioral response to particular gratifications). In the long term, engaging behaviors can create a behavioral pattern encompassing a customary manner, as Instagram stickiness proposed in this study, leading to problematic compulsive use behavior. In a nutshell, once the usual behavioral pattern as stickiness presented here has been established in the specific SNS, compulsive use may occur afterward. As such, Instagram stickiness is strongly correlated with compulsive use.

Importantly, stickiness has been found to fully mediate the relations of the four gratifications to the compulsive use in testing H3. Taken together, the proposed model extending from the I-PACE model explains the process on Instagram by addressing the compulsive use-creating effect of specific gratifications via stickiness. Moreover, the model reflects that without stickiness-specific gratifications, in terms of self-documentation, entertainment, passing time, and self-expression, the process cannot lead to long-term adverse behavioral outcomes, i.e., compulsive Instagram use.

Andreassen (2015) noted that immediate gratifying effects could not ensure the avoidance of long-term excessive and compulsive SNS use, consequently leading to adverse outcomes of SNS addiction, e.g., unhealthy and emotional difficulties. In this regard, for those with compulsive Instagram use, Instagram usage may serve as a means of reducing and disconnecting emotional problems, such as anxiety and distress. By using Instagram to gratify entertainment and passing time, one may temporarily feel relief from emotional discomfort. Once they detach from the specific favorite Instagram usage, the negative feeling, e.g., anxiety, may surface again. To find relief again and compensate for a diminishing gratifications-specific effect, they revisit Instagram and prolong the time use. The above description of the process of Instagram compulsive use with addictive features is consistent with the notion of Andreassen (2015) and the assumption of the I-PACE model.

As discussed above, in the long run, stickiness-specific gratification is related to the creation of Instagram stickiness, resulting in some emotional problems and being associated with the strength of the problematic behaviors of compulsive use. Here, the trait of mindfulness is a personal ability to control impulses and emotional disturbances, allowing Instagram users to face and decrease their compulsive usage. Mindfulness associated with reduced compulsive use of Instagram was confirmed (H4), which is somewhat consistent with the finding of Apaolaza et al. (2019). As Apaolaza et al. (2019) revealed, the trait of mindfulness had a negative (lessening) impact on compulsive social media use, which is achieved through a mediating process via improving users' self-esteem and then weakening their emotional discomfort in terms of social anxiety. Differently, mindfulness was included in the research model and acted as a moderator in the development of compulsive SNS use (confirmed H5), which corresponds to the perspective of Turel and Osatuyi (2017). However, they only investigated the moderating effect of mindfulness in the development of compulsive SNS use, but without considering the interacting impact of mindfulness and stickiness on compulsive SNS use.

For those with the behavioral tendency of Instagram stickiness, that's where mindfulness allows them to focus on the present moment and its obligation(s): when they have the behavioral tendency of adhering to Instagram but have work, e.g., homework for college students to do, the controlling potency of mindfulness can suppress their compulsive use. The compulsive control effect of mindfulness suggested that mindfulness, one of the unique temperamental features, could be treated as a potency offering potential control over specific addictive behavior, that is, compulsive use. In sum, involving the underlying formation process of compulsive Instagram

use, the present study disclosed two interacting pathways, one enabling path and another hindering path. Taken together, the findings and discussion here can lead to several following research implications and practical implications.

Conclusion

As Montag et al. (2019) noted, most apps' current successful business model is to attract users to use apps freely but prolong their stay on the provided application in exchange for their data for marketing. To this end, the app commonly comprises some potentially addictive features to drive users to use the app continuously and to be immersed into social media cyberspace, e.g., offering the social reward mechanism ("thumbs up" by clicking "Like") and interactive communication tools for the users to feel a sense of social presence in the platform, thus making it hard for them to detach from it (Montag et al., 2019). As we can see, in those for social media with the stickiness feature and the numerous business opportunities that arise from it (Huang & Su, 2018), the success of an apps' business model is to make it easier for users to stick to the application/site. But, its design features with reward systems as outlined by Montag et al. (2019), are assumed to easily bring SNS users into the dysfunctional use pattern (Sherman et al., 2018), e.g., compulsive Instagram use. Nevertheless, compulsive Instagram use may be suppressed by the user's personal traits, e.g., mindfulness, in a direct way and/or an indirect way (c.f., Apaolaza et al., 2019; Turel & Osatuyi, 2017). To conclude, this study incorporated mindfulness trait as a moderator, stickiness as a mediator, and U&G theory into the I-PACE model to explore the underlying process of developing compulsive use in Instagram. The findings of the present study offer insights into compulsive use development in the Instagram context and further lead to the following theoretical implications.

Research Implications

First, U&G theory simply explains why users actively select and use SNS to satisfy their personal needs. However, it cannot entirely explain how compulsive SNS use develops as users attach to a specific SNS and intensive use arises. Here, stickiness and the trait of mindfulness were incorporated into the research model to address the above issues and provide meaningful contributions and research implications to U&G research and SNS literature.

Second, the study based on U&G theory, on the one hand, explains and confirms the role of specific SNS gratifications in indirectly facilitating the distal compulsive SNS use development via fostering proximal stickiness. Specifically, the notion of stickiness incorporated into the research model has bridged the missing linkage of current research between U&G theory and compulsive use.

Finally, on the other hand, this study disclosed the ability of mindfulness to associate with the reduction of compulsive use (Apaolaza et al., 2019) and further lessen the effect of SNS stickiness on compulsive use. In summary, based on the I-PACE model, this present study combined the two perspectives of U&G theory and mindfulness into a whole. It contributed to the understanding of two opposite forces acting on the compulsive use of SNSs, which stickiness stimulates. Still, mindfulness is correlated with attenuation of the compulsive SNS use, particularly in the use of Instagram. These critical findings were not considered in the relevant research on the compulsive use of SNSs and lead to several managerial implications.

Managerial Implications

Several practical implications and suggestions for SNS operators, educators, and SNS users are elaborated as follows. First, the operators must enhance the functional availability of self-documentation, entertainment, passing time, and self-expression. SNS services with these four available features can attract the users to revisit the SNS, thereby stimulating the users to be active on and attach to the site, thereby maintaining the SNS's competitiveness. Nevertheless and second, the enabling effect of stickiness on compulsive use should be considered. Thus, by law and regulation, the government should protect the users and request or require that the SNS operator fulfill social responsibility. For example, the SNS operator should provide a practical option built into the notifications services for users to set up a use time interval whereby a notice reminds them to take a break for their health. Users aiming for self-help intervention on excessive SNS use can install freemium apps (e.g., ColdTurkey, Flipd, and Freedom) on their smartphones, which reminds and shortens the time spent on the

SNS. Also, they can set the amount of time used for automatic notification; in their existing profile on Instagram, they also can see and use the Reminder function to know how much time they've spent on it. Finally, mindfulness can serve as a beneficial personal trait in hindering the positive impact of stickiness on compulsive use. For users, having a higher level of mindfulness is critical for them to avoid compulsive SNS use. Researchers have also found mindfulness training programs are helpful to cultivate mindfulness (Zoogman et al., 2015). In this way, delivering a course for training mindfulness is practical and beneficial for human health and should receive respect from government and educational practitioners.

Limitations and Direction Further Research

Some limitations should be set out as follows. First, the relation of mindfulness to compulsive use may differ in other populations and needs to be investigated among other populations in future research. Second, users' gratifications are context-specific (McGuire, 1974; Zhang et al., 2011). Future studies can explore other types of gratifications in connection to stickiness and compulsive use of different SNSs. Third, the samples were from university students, thus constraining the external validity and generalizability. Thus, samples from adults and other populations should be considered in future research to enhance generalizability.

Lastly, the research approach to this study can be questioned by the following deficiencies. The cross-sectional design, rather than the longitudinal design of the research, may be questioned as lacking solid justification to support the links between gratifications, stickiness, mindfulness, and compulsive use as causal pathways. Next, self-reported data may be questioned as introducing bias in the analysis result, even though the result of a post-remedy, Harman's single factor testing, suggested that common method variance in this study could be excluded. Also, the items measuring Instagram gratifications, Instagram stickiness, and compulsive use are adapted from previous research. Nevertheless, these measures have not been widely reported in the SNS context, especially in the use of Instagram. The PLS approach's analytic technique is appropriate for conducting a minor sample size analysis without normal distribution. However, the generalization of this study is still questionable due to the smaller sample size. As for improving the research design, a longitudinal study extending the proposed model is necessary and should collect larger samples to re-examine and validate their associations.

Acknowledgements

Conflict of Interest

The Author(s) declare(s) that there is no conflict of interest.

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Appendix

Appendix Table 1. *Item Cross-Loadings and Confirmatory Factor Analysis*.

Variable / Item	SD	ET	PT	SE	ST	MI	SA	CU
SD1	**0.927**	0.373	0.349	0.615	0.509	0.150	0.064	0.253
SD2	**0.893**	0.401	0.434	0.665	0.558	0.128	0.072	0.323
SD3	**0.904**	0.425	0.347	0.629	0.466	0.148	0.015	0.254
ET1	0.505	**0.918**	0.648	0.558	0.631	0.044	0.064	0.353
ET2	0.336	**0.913**	0.689	0.453	0.571	0.086	0.104	0.438
ET3	0.375	**0.941**	0.740	0.521	0.686	0.035	0.157	0.424
PT1	0.391	0.719	**0.852**	0.484	0.609	0.047	0.145	0.364
PT2	0.260	0.390	**0.720**	0.360	0.489	-0.188	0.143	0.435
PT3	0.375	0.716	**0.901**	0.517	0.607	0.016	0.086	0.491
SE1	0.521	0.571	0.573	**0.863**	0.644	-0.070	0.160	0.496
SE2	0.682	0.508	0.474	**0.928**	0.577	0.088	0.144	0.375
SE3	0.709	0.457	0.480	**0.937**	0.574	-0.013	0.096	0.446
SE4	0.665	0.480	0.486	**0.927**	0.562	-0.002	0.151	0.424
ST1	0.551	0.572	0.553	0.556	**0.793**	-0.038	0.133	0.469
ST2	0.455	0.643	0.599	0.545	**0.844**	0.049	0.236	0.495
ST3	0.488	0.574	0.634	0.561	**0.868**	-0.008	0.226	0.477
ST4	0.482	0.629	0.583	0.564	**0.869**	-0.062	0.278	0.557
ST5	0.439	0.470	0.518	0.518	**0.794**	-0.169	0.101	0.574
ST6	0.435	0.550	0.582	0.514	**0.858**	-0.125	0.159	0.574
MI1	0.129	0.113	-0.014	0.023	-0.012	**0.869**	0.102	-0.227
MI2	0.096	0.000	-0.064	0.004	-0.107	**0.850**	0.066	-0.223
MI3	0.175	0.039	-0.026	-0.041	-0.087	**0.909**	0.126	-0.327
MI5	0.126	0.056	-0.031	0.034	-0.022	**0.858**	0.197	-0.187
SA1	-0.030	0.045	0.054	0.080	0.165	0.082	**0.926**	0.091
SA2	0.115	0.243	0.232	0.216	0.261	0.162	**0.877**	0.038
SA3	0.146	0.115	0.199	0.175	0.230	0.166	**0.864**	0.053
CU1	0.250	0.394	0.498	0.422	0.561	-0.179	0.023	**0.873**
CU2	0.218	0.414	0.477	0.414	0.524	-0.211	0.061	**0.880**
CU3	0.264	0.333	0.399	0.380	0.518	-0.352	0.048	**0.818**
CU4	0.273	0.283	0.368	0.365	0.491	-0.253	0.084	**0.841**
CU5	0.304	0.438	0.458	0.460	0.574	-0.227	0.112	**0.857**

Notes. SD, Self-documentation; ET, Entertainment; PT, Passing Time; SE, Self-Expression; ST, Stickiness; MI, Mindfulness; SA, Satisfaction with university life; CU, Compulsive Use. MI4, SA4, SA5, and CU6 were dropped from the table due to their lower values of factor loading (< 0.7).

About Author

Yu-Hsun Lin is an Assistant Professor of the Department of Business and Management at The Ming Chi University of Technology. He received his PhD from the Department of Information Management, National Central University, Taiwan. Dr. Lin has published articles at Computers in Human Behaviors, Online Information Review, Sage Open, International Journal of Services Technology and Management, and others. His current research interests include: mindfulness and behavior in social media, team learning and cognition, social network analysis and digital content marketing, and live streaming commerce.

✉ **Correspondence to**

Yu-Hsun Lin, Department of Business and Management, Ming Chi University of Technology, 84 Gungjuan Rd., Taishan Dist., New Taipei City 243303, Taiwan, yslin@mail.mcut.edu.tw