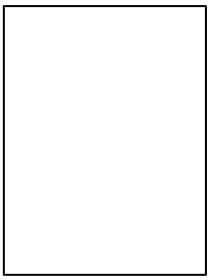

Tug of war between social self-regulation and habit: Explaining the experience of momentary social media addiction symptoms

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Abstract

Addiction-like symptoms in relation to social networking site (SNS) use are prevalent and can adversely affect users. This paper seeks to theorize on and examine the etiology of such symptoms. Relying on the dual system theory (DST) with a specific focus on social aspects, this manuscript develops a research model positing that the momentary experience of SNS addiction symptoms is driven by tug-of-war between social self-regulation (a reflective process) and habit (a reflexive process), the effect of which is mediated via SNS use. It then tests the hypotheses through analyzing survey data from 161 SNS users, using structural equation modeling techniques. Results support the dual system perspective we take. They show that (1) habit (a reflexive system manifestation) drives SNS use and the experience of addiction symptoms, (2) social self-regulation (a reflective system manifestation) inhibits use and the experience of addiction symptoms and, (3) dual system effects on momentary SNS addiction symptoms are mediated through SNS use. This study introduces and validates a model that explains the experience of momentary SNS addiction symptoms. In particular, the proposed model extends prior dual system models by examining an overlooked, yet important, reflective process (social self-regulation) in the context of SNS use; and by focusing on an important, prevalent, yet relatively disregarded outcome (momentary symptoms rather than full-fledged addiction). The findings point to interesting theoretical and practical implications.

Keywords: dual-system theory, social networking sites, social media, social self-regulation, habit, addiction

Introduction

The rising use of social networking sites (SNSs) (Coren, 2016; Greenwood, Perrin, & Duggan, 2011; Stewart, 2016) has gained research interest leading to studies that explore use patterns and motivations across different use contexts (Leonardi, 2015; Oh & Syn, 2015). However, it has been revealed in recent years that such sites can also have a "dark side" (Tarafdar, D'Arcy, Turel, & Gupta, 2015; Tarafdar, Gupta, & Turel, 2013), as their users can develop negative feelings (Krasnova et al., 2015), engage in impulsive, risky, deviant and disadvantageous behaviors, and ultimately present addiction-like symptoms (Turel, 2015; Turel et al., 2014). Without discounting the importance of other adverse outcomes of SNS use, in this study we focus on the momentary addiction-like symptoms, including salience, withdrawal, relapse, conflict, and mood modification (Turel, Serenko, & Giles, 2011) SNS users experience during a specific period of time. We do so because these symptoms are prevalent and in many cases that they even meet common addiction classification criteria: the global prevalence rate of people who do not only feel such symptoms but also meet common addictions classification

criteria has been estimated to be around 6% and can range from 10.9% in the Middle East to 2.6% in Northern and Western Europe (Cheng & Li, 2014).

Prior research has implicated a tug-of-war between two brain systems that govern behavior in the etiology of use behaviors that lead to technology addiction symptoms (Brand et al., 2016). Specifically, it has been shown in behavioral (Turel & Bechara, 2016b; Turel & Qahri-Saremi, 2016) and neuroscience (Turel et al., 2014) studies that addiction symptoms emerge when people use SNS compulsively in various situations in which they are better off not using SNS; this happens when they have strong automatic drives to engage in rewarding SNS use (i.e., strong reflexive, impulsive, "system 1") and simultaneously have weak inhibition abilities when they are exposed to SNS-related stimuli, for instance when seeing a computer (i.e., weak reflective, inhibitory, "system 2").

While this literature has substantially advanced our understanding of addiction predictors and outcomes, it is lacking in at least two areas, which we address in the current study. First, it has become apparent that it is fruitful to examine addiction outcomes or momentary symptoms separately from addiction (Soror et al., 2015). This is important since the outcomes (e.g., mood modification), may depend on many other factors and may not be driven solely by addiction. Second, prior research has focused mostly on drivers of stable addiction levels (Gil, Chamarro, & Oberst, 2015; Kayis et al., 2016; Lee, Cheung, & Chan, 2015), and here we focus on dual-system drivers of momentary addiction symptoms. This distinction is important since addiction symptoms may fluctuate and be influenced by many factors; yet, they are more proximal determinants of one's momentary psychological wellbeing and behaviors. For instance, while overall conflict with other activities may be one indicator of addiction, its strength during different time periods may fluctuate (e.g., during exam periods it may be up); this momentary conflict can be a better predictor of negative mood and aversive states during the examined week than one's general level of addiction. Furthermore, symptoms may emerge without an underlying addiction. For instance, mood regulation using SNS may be high during very emotional periods in one's life and fluctuate back to normal levels afterwards. Hence, specific momentary instances of SNS addiction symptoms are presumably more prevalent compared with actual persistent addictions. We further extend prior research by theorizing on the unplanned, spontaneous and often irrational roots of such use behaviors. Prior research has largely assumed that users engage in a rational decision-making process to inform their information systems (IS) use behaviors. However, motivations for compulsive use of SNS have been shown to be largely automatic, irrational and momentary (Turel, 2015; Turel & Bechara, 2017), suggesting the need to take a perspective which is not fully rational for understanding such phenomena.

In a recent study, Turel and Qahri-Saremi (2016) demonstrated that the use of a dual-system perspective that accounts for rational and irrational processes simultaneously outperformed the traditional planned behavior perspective in explaining the problematic use of SNSs. This study therefore uses dual-systems perspective to investigate the determinants of momentary SNS addiction symptoms. Dual-system theories posit that human behavior is guided by two processes, reflective and reflexive, that may work in accord or against each other. The resultant behavior would typically reflect the dominant process. Details of these processes will be

discussed in the literature review section. This study treats SNS addiction symptoms as the result that is determined, in part, by the tug-of-war between the two systems. We specifically posit that the emergence of such symptoms is reduced by social self-regulation (a central reflective process) and increased by habit (reflexive process). We further posit that these processes are mediated through SNS use, which represents the proximal outcome of the tug-of-war and provides the required conditions for the emergence of momentary SNS addiction symptoms.

We operationalize the reflexive/automatic/impulsive system in this study as SNS use habit, defined as automatic learned responses to SNS stimuli (Ouellette & Wood, 1998). This choice is consistent with other dual system studies that employed habit as a key manifestation of the impulsive system (Soror et al., 2015). We operationalize the reflective/inhibitory system in this study as social self-regulation, which describes one's ability to refuse or resist the pressure from one's social network to use SNS (Bandura et al., 2003; Clayton, Cattarello, & Johnstone, 1996). This choice was made given the social nature of SNS and the lack of research on social pressure resistance abilities in this area. Even though peer pressure on SNS is immense (Cavazos-Rehg, Krauss, Sowles, & Bierut, 2015), and ability to resist peer pressure has been shown to be a key reflective ability that deters addiction symptoms in other contexts (Royce, Corbett, Sorensen, & Ockene, 1997; Wild, Cunningham, & Ryan, 2006), this emphasis has been lacking in prior research in the social media context. This study partially bridges this gap. Lastly, post-hoc analyses provide additional insights on how user characteristics can inform approaches to design interventions to improve users' social self-regulation while controlling their SNS use habit (Muraven, 2010; Muraven & Baumeister, 2000).

Theoretical Background

Dual System Theory and SNS Use

Rooted in behavioral studies, researchers have developed models referred to as dual system theories to describe two conceptually different systems used to inform social behaviors (Devine, 1989; Strack & Deutsch, 2004). The first system, referred to as reflective system, uses syllogistic rules to make noetic decisions (Strack & Deutsch, 2004). These systems avail the individual the control needed to evaluate, monitor and regulate current behaviors in reference to higher order goals (Baumeister, Gailliot, DeWall, & Oaten, 2006; Strack & Deutsch, 2004). Reflective systems therefore enable a person to engage in reasoned actions that may override an existing action to achieve a rational objective (Carver & Scheier, 2001). Nevertheless, their use is effortful and they are relatively slow.

The second system, referred to as reflexive system is also described as automatic, impulsive, and reactive since it combines affective and cognitive impulses to prompt an instantaneous behavioral response (Strack & Deutsch, 2004). The reflexive system favors the activation of preexisting behavioral schemata with less emphasis on cognitive evaluation of the current situation to inform desired behavioral responses that are tied to immediate rewards (Lieberman, 2007; Strack & Deutsch, 2004). In the context of SNS use, reflexive systems match the manifestation of habits, defined as the extent to which people tend to automatically perform

learned [SNS use] behaviors (Limayem, Hirt, & Cheung, 2007).They were indeed often operationalized as IS use habit in prior research (Soror et al., 2015; Turel & Bechara, 2016b). This system is fast and is activated automatically, sometimes without awareness, in response to relevant cues (e.g., a cellphone beep, or a new message notification).

The use of the dual system perspective in this study reflects the view that healthy[1] or addictive use of SNS (or social technologies in general) depicts a social behavior that is informed by mechanisms that may function synergistically or antagonize each other. The constant connectivity and access afforded by SNS expose users to a perpetual set of cues (e.g., new message, friend requests, internal desires, good memories from prior use instances). These often lead to dilemma regarding responding to such stimuli on SNS platforms as the stimuli often appear during inappropriate times (e.g., while driving, see Turel & Bechara, 2016a). On the one hand, a user is tempted to automatically enact the learned response of engaging the habitual tendency to respond to those stimuli (e.g., to check the posted status update from a friend, view a wall post and associated comments about an event) with less attention to the conditions surrounding the response behavior (e.g., in the presence of friends, at a work meeting, in class, while driving, while crossing a street with busy traffic, or alone). On the other hand, the reflective system will trigger the need to consider the appropriateness of responding to the stimuli (or exhibiting the habitual behavior) and act accordingly in favor of the higher order goal (e.g., to succeed in school in case of messages received during class time). With a focus on neuroscience perspective, recent studies have shown the efficacy of the dual system approach to explaining addictive (Turel, 2015) and problematic use of SNS (Turel & Qahri-Saremi, 2016). Findings from these studies demonstrate that although users exhibit high levels impulsive tendencies based on the reflexive system, they were often capable of managing these tendencies by engaging the reflective system. Nevertheless, when the impulsive system wins in this tug-of-war, a range of problematic use behaviors emerge, that can lead to addiction symptoms (Turel & Bechara, 2017).

[Social] Self-Regulation

Social self-regulation refers to a user's ability to resist the automatic stimuli to use SNS generated from social situations (or actions) in both online and offline environments. Based on the definition of self-regulation as "overriding one's action tendency in order to attain another goal" (Carver & Scheier, 2001, p.3), social self-regulation involves the ability to override one's action that is socially motivated (e.g., SNS use in a social setting) in order to attain a higher order goal (Strack & Deutsch, 2004). In the SNS context, an SNS use stimulus can be [externally] triggered in an offline setting (e.g., meeting at a bar, during work meetings or at dinner with friends) as well as in an online setting (e.g., via notifications of friend requests, chat messages or comments on one's status updates).

Failure to regulate the use of SNS in response to situations that promote SNS use, leads to one's preoccupation with SNS to the point of showing addiction symptoms (Turel, 2015) as well as to excessive use (Soror et al., 2015). Inability to regulate one's SNS use has been shown to be associated with SNS addiction (Kuss & Griffiths, 2011; Turel et al., 2014). Furthermore,

[1] Healthy technology use refers to the use of technology that does not reflect any of the addictive symptoms including conflict, withdrawal, relapse and behavioral salience.

previous dual-systems studies show that the development of addiction symptoms associated with the use of cell phones (Soror et al., 2015) and SNSs (Turel & Qahri-Saremi, 2016) are related to the users' inability to control their automatic impulsion to use those systems. Previous studies focus on the individual's ability or inability to resist the use of a target technology based on the self-judgment evaluation in the self-regulation process that compares one's performance to his or her standards (Bandura, 1977). However, in the context of SNS, an individual is exposed to numerous performance standards to compare with for the evaluation process. It is possible for a person to evaluate his or her SNS use in reference to others with lower standards in which case, the positive outcome of the evaluation will be socially acceptable but personally unacceptable and vice versa. Hence, a personal higher order action in the context of other possible actions on SNS, presents a unique efficacy to choose one's standard over the alternative. This study therefore uses social self-regulation as a manifestation of a user's reflective system in the dual-systems perspective of the etiology of excessive use and the emergence of symptoms of SNS addiction.

SNS Use Habit

Habits are "learned sequences of acts that become automatic responses to specific situations which may be functional in obtaining certain goals or end states" (Verplanken, Aarts, & Van Knippenberg, 1997, p. 540). SNS habit is defined as the extent to which people use SNS automatically rather than focusing on a specific use context (Limayem et al., 2007). Habits can be viewed from the perspective of a reflexive system where behavioral schemata are formed from repeated past experiences to keep track of cognitive, affective and behavioral responses to specific actions. Stored behavioral schemata or cognitive structures (Aarts & Dijksterhuis, 2000) are connected through associative processes when similar actions are encountered in future. The process of recalling stored behavioral schemata occurs spontaneously, making it seem automatic without engaging long-term memory or serial processing of information (Lieberman, 2007). This means that as one uses SNS [in our case] repeatedly, one's brain develops a cognitive structure of triggers and actions that surround the use behaviors and associated responses. For instance, if a person checks his or her Facebook profile each time he or she receives a notification from Facebook and learns that this is enjoyable, then over time the user would have formed the habit of checking every notification that is received from Facebook. Consequently, the user will automatically check his or her Facebook profile the next time a notification comes in without paying any regard to the appropriateness of the action.

Indeed, habits drive addictions symptoms (LaRose, Kim, & Peng, 2010) and are required for developing SNS addictions (Turel & Serenko, 2012). Studies show that habits influence technology use directly (Bhattacherjee, 2001; Limayem et al., 2007) as well as indirectly between behavioral intentions and use behaviors (Limayem et al., 2007). Previous dual-system studies (Soror et al., 2015; Turel & Bechara, 2016b) have also found support for the direct and indirect effect of habit on addictive technology use and negative outcomes associated with that use. Hence, SNS use habit is used in this study as a manifestation of reflexive system in the dual-systems perspective.

SNS addiction symptoms

A growing research stream in IS tagged the "Dark Side of IS use" (D'Arcy, Gupta, Tarafdar, & Turel, 2014; Tarafdar et al., 2013) focus on investigating the adoption and use of IS beyond the traditional optimistic view that IS always leads to positive outcomes. This new research stream allows for a critical examination of the negative outcomes that are likely due to excessive use of IS across several use contexts. For instance, the rising use patterns of social media sites including SNS in particular has been shown to lead to negative outcomes in users' homes and workplaces (Turel, Serenko, & Bontis, 2011). Other related studies have found evidence of negative outcomes associated with SNS addiction including low academic performance (Turel & Qahri-Saremi, 2016), poor quality of life (Turel & Bechara, 2016a), strain on social relationships (Turel, 2015) and lack of concentration ; negative emotions associated with SNS use has also been observed (Krasnova et al., 2015; Turel, 2015; Turel, 2016). Accordingly, this study focuses on users' perceptions of the negative consequences (i.e., symptoms) associated with their use of SNS (Charlton, 2002). Our understanding of the mechanisms through which these symptoms may manifest can provide insights into how to design interventions to manage them.

According to previous research (Turel, Serenko, & Bontis, 2011; Turel, Serenko, & Giles, 2011), the core symptoms through which SNS addiction can manifest include: (1) conflict (i.e., the use of SNS interferes with other tasks); (2) withdrawal (i.e., the presence of negative emotions due to a lack of using SNS); (3) relapse and reinstatement (i.e., the inability to reduce the usage of SNS voluntarily); (4) mood modification (i.e., the use of SNS to alter one's mood); (5) tolerance (i.e., a person feels a need to increase SNS use); and (6) behavioral salience (i.e., the use of SNS dominates user thoughts and behaviors).

Research Model

The research model in this study presents a dual systems perspective to explain SNS use and addiction symptoms among SNS users (see Figure 1). This model suggests that while habit as a key manifestation of the reflexive system drives SNS use and momentary addiction symptoms, social self-regulation (measured as social pressure self-efficacy) as a key manifestation of the reflective system reduces SNS use and momentary SNS addiction symptoms. The hypotheses based on this conceptual model are presented in what follows.

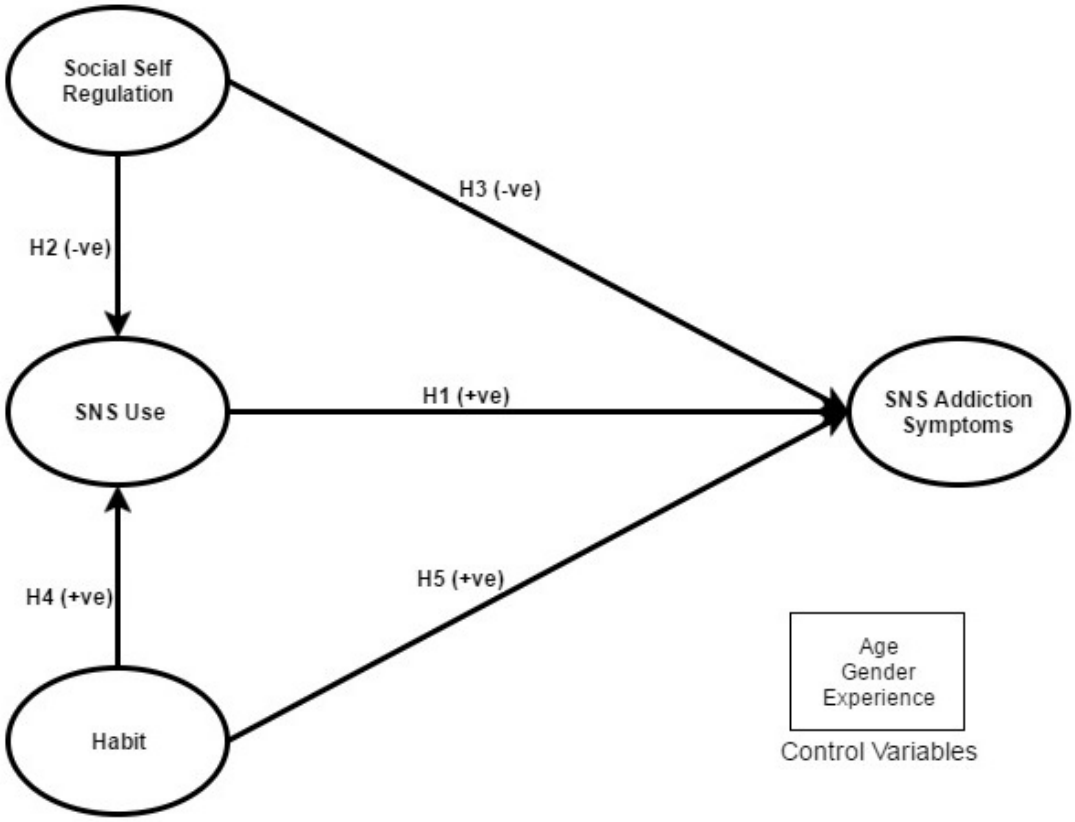

Figure 1. Conceptual Model

SNS use and SNS addiction symptoms

Based on the documented negative outcomes associated with the use of technology (Caplan, 2002; Charlton, 2002), this study posits that SNS use can increase SNS addiction symptoms. The benefits associated with the use of SNS include constant connectivity, enjoyment, sense of community and self-presentation (James, Warkentin, & Collignon, 2015). These benefits induce a psychological dependence on SNS, a desire to continue this behavior even when inappropriate, and consequently limit the ability to regulate time spent on SNSs (Mauri et al., 2011). The mental rewards SNS use provide drive excessive SNS use resulting in a significant negative influence on quality of life (Andreassen, Torsheim, Brunborg, & Pallesen, 2012; Caplan, 2002; Schou Andreassen & Pallesen, 2014).Hence, SNS use is at the base of addiction formation and as it grows and is associated with more rewards, addiction symptoms can emerge (Turel et al., 2014; Turel & Serenko, 2012). This view extends beyond SNS; for instance, video gaming is a key driver of videogame addiction symptoms (Xu, Turel, & Yuan, 2012). Hence:

H1: SNS use is positively associated with SNS addiction symptoms.

Social self-regulation and SNS addiction symptoms

Social self-regulation in this study is operationalized as social pressure self-efficacy, which measures the ability for a person to refuse or resist the pressure from significant people in one's

social network to use SNS. This study posits that individuals with high levels of social self-regulation are likely to be less susceptible to potential negative consequences associated with SNS symptoms. This is because such individuals to begin with, have set goals on their SNS use behavior and have ways to evaluate their use behavior relative to their set goals (Soror et al., 2015). Owing to the reflective mechanisms at play in individuals with high social self-regulation, when they receive external pressures from peers, colleagues or family members, they simply take a break to reflect on their [SNS use] behavior and adjust it to better align with their target [SNS use] goals (Bandura, 1977). Such a precautious approach will prevent efficacious users from becoming dependent on using SNS to the point of showing negative symptoms. In other contexts it has been shown that people who can fend off social pressures will not let the use of substances dominate their lives (Ausems, Mesters, Van Breukelen, & De Vries, 2003), will avoid relapse (Ramo, Anderson, Tate, & Brown, 2005), and present fewer addiction symptoms (Casale, Fioravanti, Flett, & Hewitt, 2014; Storbjork, 2012).

Furthermore, although mimicking the behavior of a referent group is a natural tendency for users in social environments (Kim, 2011; Lapinski & Rimal, 2005), individuals with high levels of social self-regulation (i.e., social pressure self-efficacy) can manage the extent to which the referent group can influence their SNS use behavior. Specifically, the more efficacious a user is to refuse or resist social pressure to use SNS, the less likely the user will use SNS even on situations that may encourage the use of SNS, such as the extension of friend requests after meeting new friends at a social event. These discussions suggest that the impact of social self-regulation on the symptoms of SNS addiction will be partially mediated through SNS use.

H2: Social self-regulation is negatively related to the development of SNS addiction symptoms.

H3: SNS use partially mediates the relationship between habit and the SNS addiction symptoms.

SNS habit and SNS addiction symptoms

SNS use habits can directly or indirectly through SNS use, lead to SNS addiction symptoms. Habits have been shown to influence the use of a variety of technologies, including SNSs (Turel, 2015) and mobile phones (Soror et al., 2015). Such habits can lead to negative consequences associated with being addicted to SNS, given the automaticity and lack of reflection associated with habits (Turel, 2015). As noted in previous research (Turel, 2015), the processes of cognitive-rational and neuroplasticity causes the habituation of SNS use to drive the user to underestimate long-term risks and exaggerate short-term enjoyment associated with its use, leading to addiction symptoms. Furthermore, SNS use habits have been shown to evoke a psycho-physiological state in users which signals high positive valence and arousal (Mauri et al., 2011) that the user seeks to experience through repeated and automatic use sessions. Finally, according to the ideo-motor principle described by James (as cited in (Strack & Deutsch, 2004, p.222)), “a behavior may be elicited without the person’s intention or goal.” Consequently, biological signals from the habituation of SNS use trigger reflexive responses in the form of enactments that are considered irrational, such as intensely browsing friends’ profiles and liking comments and posts while mindlessly crossing a street in heavy traffic.

The indirect influence of habit on developing SNS addiction symptoms follows the logic that as SNS habit increases, SNS use will also increase, which will eventually increase the addiction symptoms one experiences (Soror et al., 2015). This happens especially when the habitual behavior with the use of technology (SNS in our case) expends, in which case the habit becomes dysfunctional (Turel & Serenko, 2012). For instance, the habit of constantly checking one's Facebook page for posts and updates can promote automatic use and produce addiction symptoms when this use interferes with normal functioning (Turel et al., 2014). This implies that the impact of SNS habit on SNS addiction symptoms will be partially mediated through SNS use.

H4: SNS use habit is positively associated with SNS use.

H5: SNS use partially mediates the relationship between SNS use habit and SNS addiction symptoms.

Methodology

Sample

Participants were Facebook users who were also undergraduate students in the college of business at a university in a Southern state in the Unites States. These participants were recruited via class announcements sent to students in the college of business in disciplines such as Finance, Marketing, Economics, Information Systems, Accounting and Management. Prior studies (e.g., Soror et al., 2015; Turel, 2015) have validated the use of this sample since they make up a significant population of Facebook users. In addition, addiction symptoms in relation to the use of Facebook have been found to be prevalent among the college student population (Janković, Nikolić, Vukonjanski, & Terek, 2016; Turel & Qahri-Saremi, 2016). In exchange for their participation in this study, instructors agreed to give participants 5 extra credit points for participating in each wave of the study points toward their final grade. Across both data collection waves, a total of 202 students were invited for the study. A total of 182 students provided complete data for wave 1 and 170 of them returned for wave 2. Overall, a total of 161 (79.7%) valid two-wave responses were collected. The descriptive statistics of the final sample are summarized in Table 1.

Table 1. Sample Descriptive Statistics

Variable	Description	N	%
Age (years)	18 – 20	52	32.3%
	21 – 30	79	49.1%
	31 – 40	21	13.0%
	41 – 50	7	4.3%
	51 +	2	1.3%
Race/Ethnicity	White	13	8%
	Asian	10	6%
	Hispanic or Latino	132	82%
	White and Hispanic or Latino	6	4%

Table 1. Sample Descriptive Statistics

Variable	Description	N	%
Gender	Male	92	57.1%
	Female	69	42.9%
Employment Status	Part-Time	60	37.3%
	Full-Time	55	34.2%
	Unemployed	46	28.5%
SNS usage frequency (per week)	1 day or less	33	20.5%
	2 – 3 days	30	18.6%
	3 – 5 days	21	13.0%
	Almost daily	77	47.9%
	Mean	**Range**	**Standard Deviation**
# of friends on the SNS	408.61	0 – 3000	410.57
SNS experience (years)	8.41	1 – 12	2.43

Procedure

An online survey methodology was used for data collection in this study. Following the IRB guidelines at the first author's institution, the survey was administered using an online survey tool named Qualtrics. Antecedent and dependent variables were collected at different times (waves) in order to minimize biases and reduce common method bias. Specifically, demographic variables and antecedents were gathered in the first survey and the second survey that captured the dependent variables was administered a week later. Emails gathered during the first wave of the survey were used to contact participants for a follow up study. No indication was provided to the participants during the first wave of data collection regarding the follow up survey objectives in order to avoid any bias in the data collection process. Upon approval of the study by IRB at the first author's institution, this procedure was pilot tested with a sample of 25 students prior to the final data collection to ensure clarity of instructions. It was shown to work well and the scales used were shown to be valid and reliable (all $\alpha s > 0.8$). Students that did not participate in the study were given the option to write a paper on factors responsible for promoting and inhibiting addiction to social networking systems to earn extra credit points.

Measurement Items

The items used to measure the research variables were all adapted from reliable instruments as illustrated in Table 2. Social self-regulation items were based on the social pressure self-efficacy subscale from part II of the drinking refusal self-efficacy questionnaire (DRSEQ) that was originally designed to measure people's efficacy to refuse or resist alcohol consumption in different situations where alcohol is consumed (Young & Oei, 1996). To adapt the questionnaire to this study, we changed references from "drinking alcohol" to "using Facebook." The adapted items measured a person's self-efficacy to refuse to use Facebook while the person's friends are using it in different social events. The full version of the DRSEQ contains two other dimensions of self-efficacy (emotional and opportunistic), but they measure qualities that are outside the context of the current study's social pressure dimension. Items for measuring SNS habit were adapted from Limayem et al. (2007)). This adaptation has been validated in the SNS context in IS research (e.g., Soror et al., 2015; Turel, 2015).

In the second wave of the data collection, SNS use and SNS addiction symptoms were gathered in relation to the previous week. Participants were asked to reflect on their SNS use in the past week based on items from (Turel & Bechara, 2016b). SNS addiction symptoms during the last week items were adapted from Charlton (2002). This scale has been tested and validated in other SNS studies (e.g., Turel, 2015). Finally, for control purposes and descriptive analyses, demographic variables such as age, gender, and experience were measured.

Table 2. Measurement Items

Variables	**Items**
Wave 1	
Experience	For how many years have you been using this social networking site? [open ended]
*Gender	What is your sex? [Male = 0, Female = 1]
Age	What is your age? [open ended]
Social self-regulation (Young & Oei, 1996)	The following items ask your ability to handle SNS use situations. Please use the provided scale to rate each statement that best describes how much you could resist using SNS in each case. [1 = "very sure I would use SNS" to 6 = "very sure I would not use SNS"]
	How sure are you that you could resist using your social media website when you are out at dinner?
	How sure are you that you could resist using your social media website when you see others on their social networking website?
	How sure are you that you could resist using your social media website when you are at a party?
	How sure are you that you could resist using your social media website when someone asks you to add him/her on this social networking website?
	How sure are you that you could resist using your social media website when you want to feel more accepted by friends?
	How sure are you that you could resist using your social media website when your spouse or partner is on this social networking site (e.g., Facebook)?
Habit (Turel, 2015)	Please rate each of the following statements using the scale provided. [1 = "strongly disagree" to 7 = "strongly agree"]
	Using this social networking website has become automatic to me
	Using this social networking website is natural to me
	When I want to interact with friends and relatives, using this social networking website is an obvious choice for me
Wave 2	
SNS Use (Turel & Bechara, 2016b)	Please rate each of the following statements using the scale provided. [1 = "very low" to 7 = "very high"]
	Over the last week, what was the extent of your use of your social networking website in terms of time you spend on it?
	Over the last week, what was the extent of your use of your social networking website in terms of the frequency (how often) you use it?
	Overall, how do you consider the extent of your social network website use over the previous week?
SNS Addiction Symptoms (Charlton, 2002)	Please rate each of the following statements using the scale provided. [1 = "strongly disagree" to 7 = "strongly agree"] Over the last week……
	I sometimes neglected important things because of my interest in this social

Table 2. Measurement Items	
Variables	**Items**
	networking website.
	My social life has sometimes suffered because of me interacting with this social networking website.
	Using this social networking website sometimes interfered with other activities.
	When I was not using this social networking website I often felt agitated.
	I have made UNsuccessful attempts to reduce the time I interact with this social networking website.
	I was sometimes late for engagements because I interacted with this social networking website.
	Arguments have sometimes arisen because of the time I spent on this social networking website.
	I think that I was addicted to this social networking website.
	I often failed to get enough rest because I interacted with this social networking website.

*We use the label "Gender" to refer to the biological sex of the respondent for simplicity rather than its epistemological meaning.

Preliminary Analyses

Reliability assessments of the study variables were conducted to ensure that the measurement items used are reliable and consistent. As outlined in Table 3, all constructs demonstrated internal consistency and reliability in accordance with common cutoffs (Fornell & Larcker, 1981). The average variance extracted scores for all the variables were above the 0.50 cut-off value.

Table 3. Reliability and Validity Results

Variable	Mean (SD)	CR (CA)	AVE	1	2	3	4	5	6	7
1. Social self-regulation	4.44 (1.29)	0.90 (0.87)	0.60	**0.78**						
2. Habit	4.53 (1.34)	0.89 (0.82)	0.74	-0.34	**0.86**					
3. SNS Use	3.53 (1.50)	0.96 (0.94)	0.89	-0.24	0.32	**0.94**				
4. SNS addiction symptoms	2.43 (1.33)	0.92 (0.90)	0.66	-0.39	0.38	0.34	**0.82**			
5. Age	-	-	-	0.06	-0.15	-0.23	-0.13	1		
6. Gender	-	-	-	-0.12	0.16	0.09	0.02	-0.19	1	
7. Experience	-	-	-	-0.01	0.12	-0.05	-0.05	0.09	-0.06	1

NOTE: CA=Cronbach's Alpha, CR=Composite Reliability, AVE=Average Variance Extracted. Entries in the diagonal are square root of the AVE scores for each construct on that row.

The data demonstrates discriminant validity in accordance to common guidelines (Fornell & Larcker, 1981). First, the square root of the AVE scores for each construct was higher than the

inter-correlations with other constructs. Second, the loadings and cross-loadings illustrated in Table 4 indicated that the items for each construct loaded consistently under the appropriate factor with loadings above 0.70. Furthermore, all the correlations are in the right direction.

Table 4. Loadings and cross Loadings

Items	Social self-regulation	Habit	SNS Use	SNS addiction symptoms	Age	Gender	Experience
SSR1	**0.804**	-0.192	-0.176	-0.337	0.044	-0.058	0.034
SSR2	**0.827**	-0.260	-0.246	-0.268	-0.017	-0.055	-0.032
SSR3	**0.822**	-0.247	-0.208	-0.408	0.075	-0.075	-0.013
SSR4	**0.752**	-0.300	-0.042	-0.369	-0.008	-0.043	0.048
SSR5	**0.702**	-0.277	-0.219	-0.162	0.050	-0.162	-0.023
SSR6	**0.748**	-0.363	-0.216	-0.215	0.153	-0.236	-0.075
Hab1	-0.252	**0.918**	0.342	0.363	-0.155	0.081	0.108
Hab2	-0.286	**0.887**	0.282	0.289	-0.190	0.118	0.108
Hab3	-0.370	**0.765**	0.165	0.322	-0.026	0.233	0.105
SUS1	-0.130	0.315	**0.939**	0.326	-0.259	0.059	-0.067
SUS2	-0.291	0.316	**0.962**	0.327	-0.204	0.081	-0.039
SUS3	-0.242	0.256	**0.921**	0.295	-0.192	0.102	-0.032
SAC1	-0.372	0.247	0.303	**0.832**	-0.034	0.038	-0.103
SAC2	-0.209	0.233	0.181	**0.827**	0.083	-0.109	0.084
SAC3	-0.315	0.279	0.198	**0.796**	-0.172	-0.018	0.098
SAC4	-0.278	0.273	0.285	**0.855**	-0.180	0.014	-0.095
SAC5	-0.362	0.330	0.298	**0.819**	-0.155	0.020	-0.059
SAC6	-0.331	0.430	0.323	**0.757**	-0.129	0.074	-0.089
Age	0.062	-0.150	-0.232	-0.133	1.000	-0.191	0.085
Gender	-0.124	0.157	0.085	0.015	-0.191	1.000	-0.056
Experience	-0.010	0.124	-0.049	-0.048	0.085	-0.056	1.000

Although several attempts were made to minimize common method bias in the research design, we test whether such bias is pertinent in the data. First, Harman's one-factor test (Harman, 1976) was conducted. The procedure produced four factors that explained 70.5% and the first factor explained only 22.9% of the variation, which indicates that common method bias does not pose a threat to the study data or model. Second, we used the latent common method factor procedure (Podsakoff, MacKenzie, & Podsakoff, 2012). Comparing loadings with and without the common method factor yielded differences that were below the recommended 0.20 value (with an absolute difference of 0.021). Overall, common method did not seem to pose a threat to the study data.

Results

Research Model Estimation

The two-step approach (Anderson & Gerbing, 1988) was used to conduct structural equation modeling (SEM), which includes a confirmatory factor analysis (CFA) followed by a structural model estimation. Meeting recommended threshold values (Hu & Bentler, 1999) for assessing model fit, both the CFA (χ^2/(df) = 1.50 (<3.0), CFI = 0.95 (>0.90), IFI = 0.95 (>0.90), RMSEA = 0.05 (<0.06) with p-close = 0.255). and structural model (χ^2/(df) = 1.41 (<3.0), CFI = .96 (>0.90), IFI = 0.96 (>0.90), RMSEA = 0.05 (<.06) with p-close = 0.466) demonstrated good fit to the data. The results of the structural model used to test the hypothesized paths are illustrated in Figure 2. The model explained 41% of the variability in SNS addiction symptoms over the previous week and 18% of the variability in SNS use.

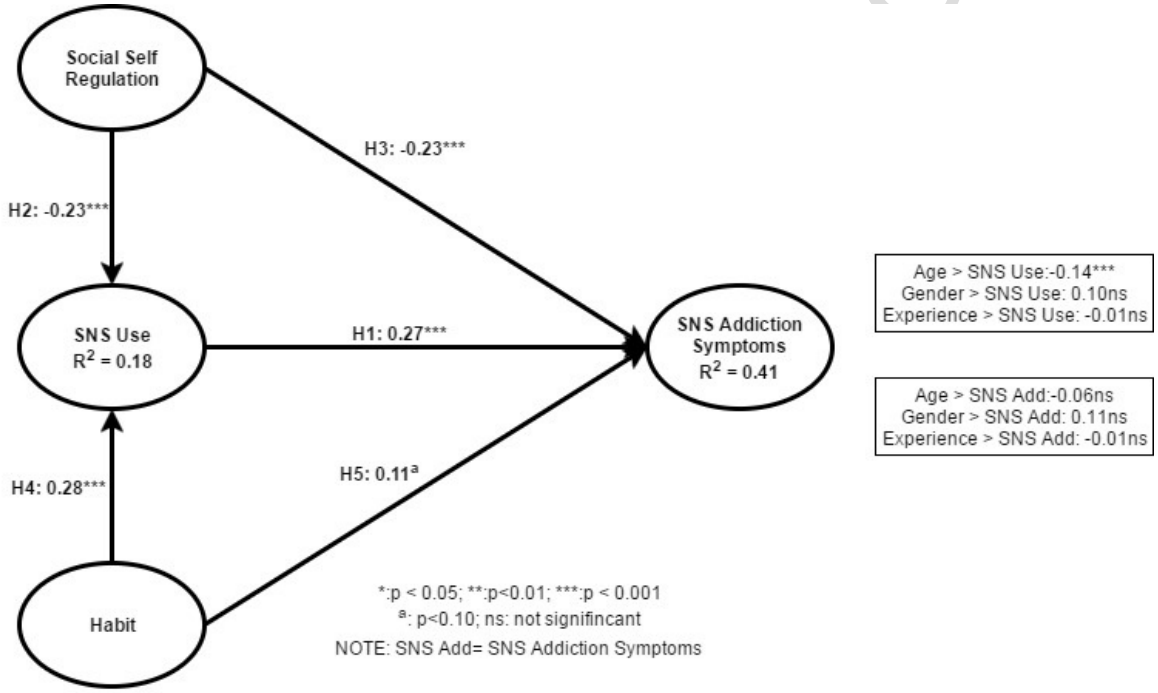

Figure 2. Structural Model (Model 1)

Age, gender and experience were mostly not significant predictors of use and addiction symptoms, except for a negative effect of age on SNS use (-0.14, p=.021). This result suggests that younger users tend to use SNS more than older users which is consistent with prior studies (Turel, 2015; Turel, 2016; Turel & Bechara, 2016b, 2017). All the hypothesized paths were significant at the .05 level except the path from habit to SNS addiction symptoms, lending support for Hypotheses 1-5. This implies that SNS use fully mediates the relationship between habit and SNS addiction symptoms. We performed the mediation test following the four steps in Baron and Kenny (Baron & Kenny, 1986). Results of the hypothesized mediation effects of SNS use illustrated in Table 5 indicate that it fully mediates the relationship between habit and SNS addiction symptoms and partially mediates the relationship between social self-regulation and SNS addiction symptoms.

Post-hoc analysis A: Additional Mediation test

In addition, we employ the bootstrapping procedure described in (Preacher & Hayes, 2008) with 500 re-samples to examine the indirect effects of social self-regulation and habit through SNS use on SNS addiction symptoms. Using this procedure, we produced 95% confidence intervals for the indirect effects of social self-regulation and habit on SNS addiction symptoms. These intervals ranged from 0.01 to 0.13 for social self-regulation and 0.12 to 0.22 for habit. The confidence interval for both effects on SNS addiction symptoms exclude zero, indicating significant support for the indirect mediation effect (Preacher & Hayes, 2004; Preacher & Hayes, 2008). This result provides additional support of the indirect effects of social self-regulation and habit on SNS addiction symptoms.

Table 5. Mediation test

			Step 1	**Step 2**	**Step 3**	**Step 4**	
					IV + M ->DV		Full or partial mediation ?
IV	M	DV	IV->DV	IV->M	IV->DV	M->DV	
Social self-regulation	SNS use	SNS addiction symptoms	-0.22***	-0.23***	-0.18***	0.27***	Partial
Habit	SNS use	SNS addiction symptoms	0.20***	0.28***	0.11 ns	0.27***	Full

*p=.05; **p=.01; ***p=.001; ns=not significant

Post-hoc analysis B: Exploring an alternative model

An alternative model was estimated that used the 'average number of hours of Facebook user per day' as a measure of SNS use as done in previous research (e.g., Turel, 2015). The model demonstrated good fit ($\chi^2/(df)$ = 1.50 (<3.0), CFI = 0.95 (>0.90), IFI = 0.95 (>0.90), RMSEA = 0.056 (<0.06) with p-close = 0.259). The model accounted for 30% of the variability in SNS addiction symptoms and 12% of the variability in SNS use. This model supports all the study hypotheses except for Hypothesis 2. Age and gender were also significant control factors. Compared to the main research model (i.e., Model 1), age had a negative and significant effect but this time on SNS addiction symptoms indicating that the older participants had lower perceptions of SNS addiction symptoms during the previous week. The model also suggested that the use of SNS use time per day only partially mediates the relationship between habit and SNS addiction symptoms. Gender had a positive relationship with SNS use (0.13, p=.000) and a negative relationship with SNS addiction symptoms (-0.11, p=.000). This result indicated that women (M=2.91, SD=1.37) spend more time [in hours] daily on SNS than males (M=2.27,

SD=1.40) and men (M=2.40, SD=1.33) are more susceptible to exhibiting SNS addiction symptoms than females (M=2.37, SD=1.24).

Post-hoc analysis C: Relative total effect of dual system manifestations

To estimate the dominant system (focusing on the limited manifestation we have for each system) in the dual systems model, we conducted an effect size analysis (Aguinis, Beaty, Boik, & Pierce, 2005). The results indicated that social self-regulation has a total effect of -0.12 ($p<.001$) on SNS use and -0.45 ($p<.001$) on SNS addiction symptoms whereas habit has a total effect of 0.22 ($p<.001$) on SNS use and 0.44 ($p<.001$) on SNS addiction symptoms. Difference tests showed that habit has a stronger effect ($t=2.364$, $p=.019$) on SNS use than social self-regulation but there is no significant difference ($t=0.070$, $p=.945$) in the effect of both systems' manifestations on SNS addiction symptoms.

Total effect test was repeated for the alternative model (i.e., Model 2) and the results are as follows. Social self-regulation had a total effect of -0.06 ($p=.745$) on SNS use and -0.31 ($p<.001$) on SNS addiction symptoms whereas habit had a total effect of 0.23 ($p<.001$) on SNS use and 0.28 ($p<.001$) on SNS addiction symptoms. Difference tests showed that habit had a stronger effect ($t=2.016$, $p=.045$) on SNS use than social self-regulation but there is no significant difference ($t=0.209$, $p=.835$) in the effect of both systems on SNS addiction symptoms. Taken together, these results indicate that habit and social self-regulation have equal but opposite influence on SNS addiction symptoms, confirming the conceptualization of SNS addiction symptoms as a tug-of-war between both reflective (i.e., social self-regulation) and reflexive (i.e., habit) systems identified in this study. This is reasonable, since our sample included presumably relatively mentally healthy users (functional students). In samples with clinical addictions one may observe stronger impulsive system effects than reflective system effects (Turel & Bechara, 2016b; Turel et al., 2014)

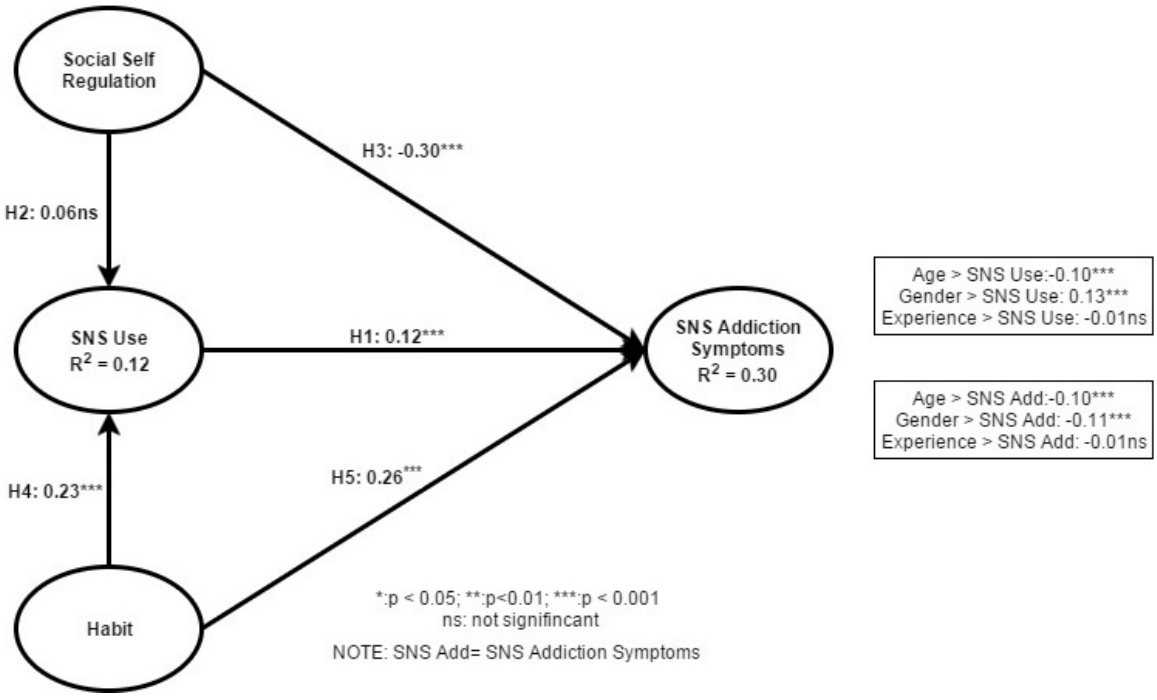

Figure 3. Alternative Model (Model 2)

Discussion

In line with recent conceptualizations of the mental processes that IS users follow to determine system use, at least in hedonic contexts, (Soror et al., 2015; Turel & Qahri-Saremi, 2016) this study takes the view that users experience a constant tug-of-war between rational and irrational systems in their brain to drive (or inhibit) IS use behaviors. The extant literature are increasingly including such models, which presented an opportunity for increasing the generalizability of such models and extending them in order to better understand how momentary addiction symptoms emerge in the SNS use context. One extension this study sought to make is in focusing on momentary addiction symptoms, which can be transient yet disturbing, rather than on the emergence of addiction, which is a lengthy process leading to stable and persistent problems and discomfort. This distinction is important because many user behaviors and states can presumably be better explained by proximal momentary addiction symptoms than by general addiction. For instance, one may not be addicted at all to SNS use, but present during a particular week strong salience, since he or she is expecting important information on the SNS. In this case, this momentary salience will determine his or her behavior during this week more so, presumably, then his or her level of addiction. This proposition, though, merits further research, through for example longitudinal designs.

A second extension of the literature this study sought to make is to focus on a social aspect of the reflective system, through our choice of reflective system construct, namely, social self-regulation. Given the social nature of SNS sites and the social pressure people feel to use them (Cavazos-Rehg et al., 2015), the role of social pressure in promoting problematic and excessive behaviors (Royce et al., 1997; Wild et al., 2006), it was surprising to surprising to see that the ability to fend off such social pressures was not yet considered as a key manifestation of the reflective system in the dual system perspective in IS research. This study sought to make first strides in this direction and account for social pressure self-efficacy (social self-regulation ability) as a key deterrent of SNS use and ultimately SNS addiction symptoms.

The findings based on data from 161 SNS users support the dual system perspective we take and illuminate the roles of social self-regulation (a reflective system) and habit (a reflexive system), mediated through SNS use, on momentary SNS addiction symptoms. The findings regarding the reflective system (with social pressure focus) specifically showed, as predicted, that social self-regulation is negatively associated with SNS use. Consistent with ideas expressed in other domains (Lu & Wang, 2008), individuals that perceived that they are able to control their behavior in the presence of social pressure were less likely to experience addiction symptoms during the examined week. This means that individuals that can reflect on their SNS use behavior as a response to direct or indirect pressure from their social network and compare their behavior with their set SNS use goals, tend to regulate their SNS use and report less SNS addiction symptoms. Consistent with prior research on the impulsive system that used habit as its key manifestation (Soror et al., 2015; Turel & Bechara, 2016b), our findings demonstrated that habit is a prime driver of use and that it promotes, directly and indirectly through use, the experience of addiction symptoms. This further reinforces the ideas that some habits can

become bad habits and that habit is a prerequisite to the experience of addiction symptoms (Turel et al., 2014; Turel & Serenko, 2012)

Implications for research

First, this study conceptualized and tested the momentary symptoms of SNS addiction as a tug-of-war between two opposite systems i.e., reflective and reflexive systems measured as social self-regulation and habit respectively. The results provide support for the conceptualized dual systems mechanisms that influence the unplanned behaviors that is characteristic of SNS use. Our findings echo a recent study (Turel & Qahri-Saremi, 2016) that found dual systems theory to provide a deeper explanation for SNS addiction symptoms compared to motivational theories such as theory of planned behavior. More importantly, this study provides empirical evidence from post-hoc analyses that SNS addiction symptoms emerge, in part, from a tug-of-war between two competing systems in an individual's mind. Our findings not only reinforce this perspective, but also extend it by focusing on an overlooked, yet important, social aspect of the reflective system, namely one's ability to fend off SNS use under social pressure. Given the validated role of this concept in SNS use and experiencing SNS addiction symptoms, we call for future research to further examine this, and other social aspects, of SNS use as important manifestations of one's reflective system. Our findings imply that such a social pressure focused dual system conceptualization may be efficacious in explaining other dark side phenomena related to SNS use, such as cyberbullying (Cassidy, Faucher, & Jackson, 2013) or swearing (Turel & Bechara, 2017). This is a promising avenue for future research.

Second, previous research (Strack & Deutsch, 2004) highlighted the importance of understanding how reflective and reflexive purposes interact at different stages of the decision making process. This call was premised on the notion that the cognitive effort required for the different stages in the decision-making process may reinforce one of the systems [reflective or reflexive] over the other leading to outcomes that support the predominant system. In this study, however, the effect of both systems were equal and opposite suggesting a neutralizing (or cancelling out) effect on the target behavioral outcome (SNS addiction consequences). This may be responsible for the overall low SNS addiction symptoms (M=2.39, SD=1.29) reported by our study sample. Future research can develop outcome typologies based on the extent to which outcomes are in accordance, conflict or interact with both systems. Such an endeavor can be useful in understanding boundary conditions and triggers for the systems when making decisions about social behaviors. Future research may also compare healthy subjects (likes the ones we presumably had) with people with diagnosed addictions, to further illuminate the role of potential imbalance between the systems.

Third, this study tested the mediating role of SNS use amidst both competing systems to reveal specific use patterns that can provide additional insights into how these systems lead to SNS addiction symptoms. Post-hoc analysis of an alternative SNS use measure (i.e., average number of hours of Facebook use per day) confirms the conclusion from other tests indicating that habit is a slightly stronger predictor of SNS use than social self-regulation. On the other hand, the result also suggests that individuals can regulate the urge from significant members of their social network to use SNS to the point where it has a marginal effect on their use behavior. Taken together, the ability to resist or even refuse the use of SNS when the stimuli are triggered

directly or indirectly by members of one's social network enables an individual to reduce possible negative consequences of SNS use. In this study these were measured as momentary SNS addiction symptoms. In future research these adverse outcomes can be expanded to include, for instance, negative emotions, reduced academic performance, diminished health, and elevated stress (Maier, Laumer, Eckhardt, & Weitzel, 2015; Maier, Laumer, Weinert, & Weitzel, 2015).

Implications for practice

Findings from this research present several practical implications. First, the finding that social self-regulation reduces SNS addiction symptoms presents opportunities for the design of intervention programs. Prior research (Bandura, 1977) shows that an individual can learn to develop efficacy to control his or her behavioral response to both internal and external sources of stimuli through self-regulation. Social self-regulation can therefore be learned. Intervention programs can be developed to teach individuals, for instance incoming college students, to mitigate the tendency to automatically use SNS and prevent the experience of SNS addiction symptoms. Such programs may also be used for curbing automatic tendencies to check social media while driving (Turel & Bechara, 2016a); this can possibly reduce major harm to users and others around them. Third party programs that ask individuals for the reason of their SNS use every time they try to login (e.g., Focustimeapp.com) can also help people activate their reflective system and exercise control over their automatic use tendencies. The capacity of such approaches to improve social self-regulation, though, should be examined in future research.

Second, this study also found that young adults who use SNS are more prone to experience SNS addiction symptoms compared to the older adults. Consequently, age-appropriate social self-regulation interventions might be required for effective awareness and internalization given their mode of delivery. For older adults, interventions can take the form of workshops, seminars, and self-development classes to help individuals with low social self-regulation. To create awareness in the young adult population, campaigns about the benefits of building social self-regulation capacities can be posted on social media platforms to sensitize their awareness. Since younger adults have also been shown to enjoy playing games (Wouters, Van Nimwegen, Van Oostendorp, & Van Der Spek, 2013), gamifying (Lu, Baranowski, Thompson, & Buday, 2012) interventions to teach social self-regulation skills may be more effective for this user population compared to the older adults. The efficacy of such approaches, though, should be examined in future research.

Third, consistent with prior studies, this study found that the habitual use of SNS is an important predictor of the momentary symptoms of SNS addiction. This finding also stresses the importance of monitoring one's SNS use in order to develop self-regulation against the automatic habitual use of SNS. Habits can be trained personally, institutionally or facilitated by technology design. First, research on goal-setting (Earley, Northcraft, Lee, & Lituchy, 1990) shows that an individual can develop specific, measurable, attainable, realistic and time-based objectives around his or her SNS use behavior to improve the overall use behavior with the goal of practicing healthy SNS use behaviors. Second, users can use the help from clinical interventions in the form behavioral therapy sessions to address the psychosocial mechanism responsible for the excessive use before it results in problematic symptoms. Finally, digital

monitors can be designed to track habits and warn users accordingly. SNS use limits can be set by users to prevent excessive usage. Setting achievable, though difficult goals within a short time frame has been shown to increase the motivation to complete the goal-oriented tasks (Earley et al., 1990; Shalley, Oldham, & Porac, 1987). Hence, systems designers can design benchmarks with finer levels of granularity (e.g., hourly usage chart) to instigate commitment to the goal of maintaining healthy SNS use behaviors.

Limitations

Results from this study should be considered carefully before generalizing across use contexts or population. First, the sample of student participants used in this study was from a Northern American university that is designated as a Hispanic serving institution, which explains the large number of Hispanic respondents in our sample. Cross cultural investigations can reinforce and extend our findings, since different cultures respond differently to social pressures (Hofstede, Hofstede, & Minkov, 2010). Second, data used for analysis is self-reported. Future studies can gather more objective data (e.g., actual use) in order to further substantiate our finding. Third, data in this study were cross sectional. Nevertheless, there is evidence that self-regulation capacities deplete over time (Muraven & Baumeister, 2000). Hence, our findings can be extended through longitudinal designs. Although recruitment for this study was limited to students, future studies should explore other user groups including working professionals. Lastly, dual system processes are influenced by many contextual variables (e.g., sleep quality)(Muraven & Baumeister, 2000). Hence, our model can be extended through the inclusion of relevant moderators in future research.

Conclusion

This paper developed a social pressure self-efficacy focused dual systems model to demonstrate the tug-of-war between social self-regulation and habit that influence the experience of momentary SNS addiction symptoms through SNS use. Findings from this study provided support for the use of the dual system perspective to investigate IS use and the occasional consequent addiction-like symptoms. More importantly, findings from this study identified some approaches that SNS users, developers and policy makers can adopt in order to minimize the experience of “dark side” phenomena.

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Highlights:

- habit (a reflexive system manifestation) drives SNS use and the experience of addiction symptoms
- social self-regulation (a reflective system manifestation) inhibits use and the experience of addiction symptoms
- dual system effects on momentary SNS addiction symptoms are mediated through SNS use.