A review of theories and models applied in studies of social media addiction and implications for future research

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ABSTRACT

With the increasing use of social media, the addictive use of this new technology also grows. Previous studies found that addictive social media use is associated with negative consequences such as reduced productivity, unhealthy social relationships, and reduced life-satisfaction. However, a holistic theoretical understanding of how social media addiction develops is still lacking, which impedes practical research that aims at designing educational and other intervention programs to prevent social media addiction. In this study, we reviewed 25 distinct theories/models that guided the research design of 55 empirical studies of social media addiction to identify theoretical perspectives and constructs that have been examined to explain the development of social media addiction. Limitations of the existing theoretical frameworks were identified, and future research areas are proposed.

1. Introduction

Social media use has grown exponentially. For example, Facebook and YouTube attract 68% and 73% of the adult population in the U.S. respectively (Smith & Anderson, 2018). Overuse of social media is associated with low work performance (Kuss, Griffiths, Karila, & Billieux, 2014; Xanidis & Brignell, 2016), less healthy social relationships (Fox & Moreland, 2015; Müller et al., 2016), sleep problems (Koc & Gulyagci, 2013; Wolniczak, Cáceres-DelAguila, Palma-Ardiles, Arroyo, Solís-Visscher, Paredes-Yauri, & Bernabe-Ortiz, 2013), low life satisfaction (Blachnio et al., 2016; Hawi & Samaha, 2016), and feelings of jealousy, anxiety, and depression (Elphinston & Noller, 2011; Pantic, 2014).

Terms, such as social media addiction, problematic social media use, and compulsive social media use, are used interchangeably to refer to the phenomenon of maladaptive social media use characterized by either addiction-like symptoms and/or reduced self-regulation (Banyai, Zsila, Kiraly, Maraz, Elekes, Griffiths, & Demetrovics, 2017; Casale, Rugai, & Fioravanti, 2018; Klobas, McGill, Moghavvemi, & Paramanathan, 2018; Marino, Gini, Vieno, & Spada, 2018; Tarafdar, Maier, Laumer, & Weitzel, 2020). Among these terms, social media addiction (including its variations, such as, Facebook addiction, SNSs addiction, and addictive SNSs use) is most commonly used and is defined as a maladaptive psychological dependency on SNS to the extent that

behavioral addiction symptoms occur (Cao, Gong, Yu, & Dai, 2020; Chen, 2019; Turel & Serenko, 2012). However, due to the historical connection between the term "addiction" and substance use disorders, some researchers worry that the term "social media addiction" may undermine the severity of traditional psychiatric disorders and that it is premature in pathologizing this issue (Carbonell & Panova, 2017). Some scholars, therefore, advocate for the term "problematic use" to distinguish such maladaptive Internet uses from formal clinical conditions (Caplan, 2010; Lee, Ho, & Lwin, 2017). However, defining and measuring problematic social media use is by no means consistent in the literature. Some researchers measured problematic use according to the purpose of use (e.g., social comparison and impression management) or the context (e.g., during driving and attending classes; Flynn, Noone, & Sarma, 2018; Turel & Qahri-Saremi, 2016); some adopted the definition and measurement from Caplan's generalized problematic Internet use (GPIU) model (Assuncao et al., 2017; Caplan, 2010; Casale & Fioravanti, 2017; Marino et al., 2016); and others adopted measurements based on the paradigm and symptoms of behavioral addictions (Chen & Kim, 2013; Huang, Hsieh, & Wu, 2014; Lee-Won, Herzog, & Park, 2015; Mérelle et al., 2017). Moreover, "problematic social media use" is such a broad term that it can refer to using social media for illegal, unethical, or socially unacceptable activities (e.g., online stalking, cyberbullying, and spreading scams and false information).

To align with the majority of the literature, we used social media

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addiction (SMA) or addictive social media use (in a non-clinical sense) in the remainder of this review, with a recognition of the controversies associated with the term. Exceptions were made when it is more precise to use the other terms (e.g., when referring to prior literature). For the purpose of the current review, we define addictive social media use as being overly concerned about social media, strongly motivated and having been devoting a great amount of time and energy to use social media, to the degree that an individual's social activities, interpersonal relationships, studies/jobs, and/or health and well-being are impaired (Andreassen & Pallesen, 2014).

Currently, there is an inconsistency in theorizing SMA, especially how it develops. Several reviews on theoretical frameworks to explain SMA existed, but none examined the theoretical frameworks applied in the empirical studies of SMA. Specifically, one review briefly mentioned three highly-cited Internet addiction models (Griffiths, Kuss, & Demetrovics, 2014). One surveyed several general theoretical perspectives (e. g., neurobiological perspectives and cognitive perspective) without mentioning specific theories or models (Andreassen & Pallesen, 2014). The other review summarized several existing theoretical frameworks, discussed their limitations, and laid out opportunities for theoretical improvements (Lee et al., 2017); however, it seldomly mentioned how empirical studies of SMA apply these theoretical frameworks and the specific constructs in these frameworks. Moreover, new studies on SMA are emerging at an impressively fast pace; there is a lack of updated review of relevant theoretical frameworks.

To fill these gaps, we reviewed theories and models adopted in the existing empirical studies of SMA. We intended to answer two research questions: What are the theories and models used in the existing empirical studies to explain the development of SMA? What factors inferred by these theories and models are identified to be significantly associated with SMA? Answers to these questions can help us build a clearer understanding of how SMA was explained, identify theoretical gaps, and explore opportunities for future investigations.

2. Method

To identify relevant literature, we searched databases most likely to contain SMA research, including Communication and Mass Media Complete, Library and Information Science Source, Web of Science, and PsycInfo. The search was conducted in June 2020 and limited to studies published after 2010 when such research started to emerge (van den Eijnden, Lemmens, & Valkenburg, 2016). Keywords, including social media, social network, social networking sites (SNS), and Facebook, combined with addiction-related terms, such as addiction, addictive use, problematic use, and dependency, were searched. Search results were screened to include studies that 1) are peer-reviewed journal articles written in English, 2) focus on the development of SMA and factors related to this process, and 3) explicitly applied existing theories or models to guide research design in predicting SMA. A study were excluded when 1) the study adopted a theoretical framework only to measure SMA, 2) the study did not include any key concepts/constructs from the theories/models they draw upon, and 3) addictive social media use was examined as an independent variable only to predict other concepts (e.g., task distraction and work performance).

The initial search returned 905 unique articles. Reviewing titles and abstracts identified 63 relevant articles, eight of which were excluded after reading the full texts. The final sample included 55 articles.

For the included articles, we extracted information about the theories/models applied, theory-related variables, and the results reported regarding these variables. Next, we analyzed the basic characteristics of the identified theories/models (e.g., premises, focuses, and major constructs) for similarities and grouped those of similar focuses into categories. When a theory/model contains elements that could fit multiple categories, we placed it into a single category based on its primary characteristics or core assumptions. For example, the Needs-Affordances-Features (NAF) Model of Technology Use (Karahanna, Xu, Xu, & Zhang, 2018) contains the element of needs satisfaction (motivational perspective); however, since this model emphasizes these needs in the context of technology use, relating to the affordances and features of a technology, we place this model in the technology specific category.

We referred to the original publications of these theories/models when needed. Numerous group meetings were held to discuss the assigned categories and the synthesis of these theories/models. The analysis process was facilitated by MAXQDA 2018 (VERBI Software GmbH, Berlin, Germany).

3. Results: Theories and models that guide social media addiction research

We identified 25 theories/models from the 55 articles and grouped them into 8 categories. Table 1 lists these theories/models by category and the variables related to these theories/models examined in the included studies.

3.1. Dispositional difference perspective

Some theories attribute addictive social media use to dispositional differences, presuming that people with certain types of dispositions are more likely to develop addictive use. In this category, the attachment theory was cited the most.

The attachment theory states that individuals form various attachment orientations based on interactions they had with primary caregivers in early childhood. These early attachment experiences can continue to influence how people perceive and approach social relationships throughout their life span (Bowlby, 1973). A common approach to characterize one's attachment follows the two-dimension model of attachment anxiety and attachment avoidance (Fraley, Waller, & Brennan, 2000). Attachment anxiety refers to a hyperactivated attachment system that is characterized by extreme fear of rejection by others and excessive needs for closeness and approval; whereas attachment avoidance represents a deactivated attachment system manifested as being resistant to intimate relationships and overly self-reliant.

As technologies that support social interactions, social media can be used by anxiously attached people to maintain constant connections with friends, as well as seeking attention and reassurance online (Hart, Nailling, Bizer, & Collins, 2015). Recent studies have consistently found a positive association between levels of attachment anxiety and SMA (e. g., Flynn et al., 2018; Worsley, McIntyre, Bentall, & Corcoran, 2018). Preoccupied attachment style and need for approval style (both high in anxiety) also contribute positively to SMA (Demircioglu & Goncu Kose, 2020; Eroglu, 2015). However, results regarding avoidant attachment and SMA are mixed, with some reporting their relationship to be negative (e.g., Worsley et al., 2018), and others reporting positive (Blackwell, Leaman, Tramposch, Osborne, & Liss, 2017; Liu & Ma, 2019a) or not significant (Liu & Ma, 2019b). On the one hand, people with high attachment avoidance (e.g., dismissing attachment) may limit their social media use to avoid closeness and social interactions (Eroglu, 2015). On the other hand, avoidant individuals who are also high in attachment anxiety (e.g., fearful attachment style) may become highly engaged in social media to keep a safe distance from others but stay connected (Monacis, de Palo, Griffiths, & Sinatra, 2017b).

In addition to attachment styles, time perspectives (Zimbardo & Boyd, 1999) and identity styles (Berzonsky, 1989) were also related to social media use. Specifically, past negative (i.e., constantly having negative attitudes and evaluations towards past events) and present fatalistic (i.e., focusing on the present believing that one has no influence on the future) predicted SMA positively, whereas future time perspective (i.e., goals and future plans oriented) showed a negative effect (Przepiorka & Blachnio, 2016). Moreover, individuals with informational identity style (i.e., actively seeking out and processing identity-relevant information) or diffuse-avoidant style (i.e., ignoring identity conflicts and problems until being forced to make a choice)

Table 1
Theories and Models that Guide SMA Research.

Theory/Model	Summary	No. of studies	Variables measured	Empirical studies of SMA
Category 1: Dispositional Difference Perspective				
Attachment Theory (Bowlby, 1969)	Individuals' early interactions with parents and other significant figures would shape their expectations, cognitions, and behaviors regarding interpersonal relationships throughout adulthood.	N = 16	• Anxious attachment • Avoidant attachment	(Blackwell et al., 2017; Chen, 2019; Flynn et al., 2018; Liu & Ma, 2019a, 2019b; Marino et al., 2019; Vaillancourt-Morel, Daspe, Lussier, & Giroux-Benoît, 2020; Worsley et al., 2018)
			• Secure attachment styles • Preoccupied attachment styles – high anxiety and low avoidance • Dismissive attachment styles – high avoidance and low anxiety • Fearful attachment styles – high anxiety and high avoidance	(Demircioglu & Goncu Kose, 2020; Eroglu, 2015)
			• Confidence – secure attachment • Discomfort with closeness – avoidant attachment • Need for approval – anxious attachment • Preoccupation with relationship – anxious attachment • Relationship as secondary – avoidant attachment	(Monacis, De Palo, Griffiths, & Sinatra, 2017a, 2017b)
			• Trust • Quality of communication • Feelings of alienation	(Assunção et al., 2017a, 2017b; Badenes-Ribera, Fabris, Gastaldi, Prino, & Longobardi, 2019; Marino et al., 2019)
			• Inhibition of exploration and Individuality • Quality of emotional bond • Separation anxiety	(Assunção et al., 2017a, 2017b)
			• Functional attachment (to social media) • Emotional attachment (to social media)	(Cao et al., 2020)
Time Perspective Theory (Zimbardo & Boyd, 1999)	Individuals' perceptions of different time dimensions (past, present, and future) influence their cognitions, emotions, and actions.	N = 1	• Past negative • Past positive • Present hedonistic • Present fatalistic • Future	(Przepiorka & Blachnio, 2016)
Social Cognitive Perspective of Identity (Berzonsky, 1989)	Identity is conceptualized as a cognitive structure or self-theory, which provides a personal frame of reference for interpreting self-relevant information, solving problems, and making decisions. It is also viewed as a process that governs and regulates the social-cognitive strategies used to construct, maintain, and/or reconstruct a sense of personal identity.	N = 1	• Informational identity • Normative identity • Diffuse-avoidant identity	(Monacis et al., 2017a)
Category 2: Motivational Perspective				
Uses and Gratifications Theory (Katz, Blumler, & Gurevitch, 1973)	Users seek gratifications from media and technology use based on their individual needs or motivations (Huang et al., 2014).	N = 14	Social gratifications(e.g., maintaining social networks, communicating and interacting with others, and receiving online social support)	(Casale & Fioravanti, 2018; Chen & Kim, 2013; Huang et al., 2014; Kircaburun et al., 2018; Koc & Gulyagci, 2013; Masur et al., 2014; Sofiah, Omar, Bolong, & Osman, 2011)
			Self-presentation	(Balakrishnan & Shamim, 2013; Casale & Fioravanti, 2018; Chen & Kim, 2013; Kircaburun et al., 2018; Masur et al., 2014; Tamir & Mitchell, 2012)
			Informational motives (e.g, keeping up with daily news, following events, and sharing academic and educational information)	(Balakrishnan & Griffiths, 2017; Balakrishnan & Shamim, 2013; Chen & Kim, 2013; Hong & Chiu, 2016; Kircaburun et al., 2018; Klobas et al., 2018; Leong, Hew, Ooi, Lee, & Hew, 2019; Masur et al., 2014; Ponnusamy, Iranmanesh, Foroughi, & Hyun, 2020; Sofiah et al., 2011)
			Entertainment (e.g., relaxing and having fun, passing time, and escaping from pressures, problems or negative emotions)	(Balakrishnan & Griffiths, 2017; Balakrishnan & Shamim, 2013; Chen & Kim, 2013; Hong & Chiu, 2016; Kircaburun et al., 2018; Klobas et al., 2018; Leong et al., 2019; Masur et al., 2014; Ponnusamy et al., 2020;

Table 1 (*continued*)

Theory/Model	Summary	No. of studies	Variables measured	Empirical studies of SMA
				Punyanunt-Carter et al., 2017; Sofiah et al., 2011; Wegmann, Stodt, & Brand, 2015)
Self-Determination Theory (Ryan & Deci, 2000)	Human behaviors are driven by two main types of motivation - intrinsic and extrinsic - to fulfill three basic psychological needs, i.e., autonomy, competence, and relatedness.	N = 3	• Need for autonomy • Need for competence • Need for relatedness • Need for assertiveness – autonomy • Need for self-presentation - competence • Need to belong - relatedness • Perceived enjoyment – intrinsic motivation • Social interaction – extrinsic motivation	(Masur et al., 2014) (Casale & Fioravanti, 2015) (Cao et al., 2020)

Flow Theory (Csikszentmihalyi, 1988)	Flow refers to a fully immersed mental state (of high involvement, energy and joy) people experience when performing an activity.	N = 1	• Online flow
			  o Interaction
			  o Arousal
				(Huang et al., 2014)

Belongingness Theory (Baumeister & Leary, 1995)	People are self-motivated to establish social connections with others to fulfill their need for belonging.	N = 1	• Sense of belonging	(Gao et al., 2017)
Self-Escape Theory (Baumeister, 1990)	When individuals perceive a discrepancy between their current situations and expectations, they seek to escape from the self (i.e., self-awareness) to eliminate negative reactions/emotions.	N = 1	• Suicidal ideas • Burnout	(Walburg et al., 2016)
Category 3: Neurobiological Perspective				
Incentive-Sensitization Theory of Addiction (Robinson & Berridge, 1993)	Addictive behavior is due largely to progressive and persistent neuroadaptations (i.e., changes in neural system responsible for attributing incentive salience to stimuli) caused by repeated drug use (i.e., sensitization process).	N = 2	• Past use • Focused immersion • Growth in past system use	(Seo & Ray, 2019) (Turel, 2015)
Dual System Theory (Evans, 2008; Kahneman, 2011)	Decisions to engage in (or avoid) a behavior are guided by a "tug-of-war" between two structurally and conceptually different types of brain systems: an impulsive, mostly automatic reflexive system, and an inhibitory, controlled reflective system.	N = 2	• Cognitive-emotional preoccupation - reflexive system • Cognitive-behavioral control - reflective system • SNS habit - reflexive system • Social self-regulation - reflective system	(Turel & Qahri-Saremi, 2016) (Osatuyi & Turel, 2018)
Category 4: Decision-Making Perspective				
Rational Addiction Theory (Becker & Murphy, 1988)	An increase in an intrinsically rewarding behavior changes an individual's utility assessment by reducing one's attention to future negative outcomes and increasing one's expectations for future rewards, to an extent that addiction develops.	N = 2	• Past increases in Facebook use (use intensity) • Habit	(Turel, 2015) (Wang et al., 2015)
Theory of Planned Behavior (Ajzen, 1991)	People's actual behavior is influenced by their intention to perform the behavior, which is further predicted by three key antecedents: attitude, subjective norms, and perceived behavior control.	N = 1	• Attitude • Subjective norms • Perceived behavioral control	(Ho et al., 2017)
Category 5: Learning Perspective				
Classical Conditioning of Learning (Pavlov, 1897)	A type of learning that associates environmental cues with unconditioned stimuli and the subsequent responses.	N = 1	• Use habit • Use intensity	(Wang, 2019)
Operant Conditioning of Learning (Skinner, 1938)	A type of learning that employs rewards and punishments. Rewards for certain behaviors encourage more similar behaviors in the future, whereas punishments discourage individuals from taking further actions.	N = 1	• Psychological enhancement • Playfulness	(Wang, 2019)
The Stimulus-Response-Reinforcement Framework (SRR; Hull, 1943)	A response will be reinforced upon repeated presentation of a rewarding stimulus.	N = 1	• Positive affect (resulting from gratification seeking) – positive reinforcer • Negative affect (resulting from withdrawal symptom) – negative reinforcer • Interactivity of mobile SNS - incentive stimulus • Compulsive use - response	(Wang & Lee, 2020)
Social Learning Theory (Bandura, 1977)	Individuals' behaviors are socially learned through observing and interacting with others.	N = 1	• Social enhancement • Social influence • Social identity • Social support	(Wang, 2019)

Table 1 (*continued*)

Theory/Model	Summary	No. of studies	Variables measured	Empirical studies of SMA

Social Cognitive Theory (Bandura, 1989)	Learning is a result of a triadic reciprocal interaction among person (individual with a set of learned experiences), environment (external social context), and behaviors (responses to stimuli to achieve goals).	N = 4	• Positive outcome expectancies of SNS use
			• Internet self-efficacy
			• Expected outcomes (results from factor analysis)
			  o Self-reactive outcome
			  o Status outcome
			  o Novelty outcome
			• Deficient self-regulation
			• Outcome expectancies regarding reducing Internet use
			• Self-efficacy regarding reducing Internet use
			• Self-reactive outcome expectations
			• Deficient self-regulation
			  o Deficient self-observation
			  o Deficient self-reaction
				(Wu et al., 2013)
				
				(Xu et al., 2015)
				
				(Yu et al., 2016)
				
				(LaRose et al., 2010)

Category 6: Technology Use Focused				
Theory of Technology Frames (Orlikowski & Gash, 1994)	Users hold certain cognitive representations towards various technologies, which further shape their uses of those technologies.	N = 1	• SNS can be framed as stressor or distractor under different use - cognitive representation	(Tarafdar et al., 2020)
Technology Acceptance Model (TAM; Davis, 1989)	An individual's intention to accept a new technology is influenced by two primary factors: perceived ease of use and perceived usefulness.	N = 1	• Perceived ease of use • Perceived usefulness • Perceived irreplaceability • Perceived enjoyment	(Wang et al., 2015)
Needs-Affordances-Features (NAF) Model of Technology Use (Karahanna et al., 2018)	Individuals' psychological needs motivate their use of certain technologies, and the specific features a system offers, in turn, provide affordances that satisfy these basic needs.	N = 1	• Need for relatedness • Need for self-presentation • Need for autonomy	(Chen, 2019)
Category 7: Social Network Focused				

Social Influence Theory (Kelman, 1959)	Individual cognition and behavior can be affected by three social processes: compliance (normative influence of others' expectations), internalization (congruence of one's goals with those of other group members), and identification (conception of one's self in terms of the group's defining features).	N = 1	• Subjective norms - compliance
			• Group norms - internalization
			• Social identity - identification
			  o cognitive social identity
			  o affective social identity
			  o evaluative social identity
				(Marino et al., 2016)

Social Capital Model (Nahapiet & Ghoshal, 1998)	Social capital refers to the sum of the actual and potential resources embedded within, and derived from the network of relationships, which can be measured with three dimensions: structural, cognitive, and relational.	N = 1	• Social interaction ties – structural • Social identification – relational • Social supports – cognitive	(Yang et al., 2016)
Category 8: Internet Specific Models				

Davis' Cognitive-Behavioral Model of Pathological Internet Use (PIU; Davis, 2001)	Symptoms of PIU are results of maladaptive cognitions (the proximal sufficient cause), preceded by psychopathology, introduction of the Internet, and situational cues (distal necessary causes). In addition, an individual's social context (i.e., lack of social support and/or social isolation) also contributes to generalized PIU.	N = 3	• Social anxiety – psychopathology
			• Loneliness - social isolation/lack of social support
			• Maladaptive cognition
			  o Perceived enjoyment
			  o Perceived ease of use
			  o Perceived usefulness
			  o Perceived irreplaceability
				(de Berail et al., 2019)
				(Yu et al., 2016)
				
				(Wang et al., 2015)

Caplan's Social Skill Model of Problematic Internet Use (PIU; Caplan, 2003) & Caplan's Updated Cognitive-Behavioral Model of GPIU (Caplan, 2010)	Individuals who suffer from psychosocial problems (e.g., deficient social skills) may develop preferences for online social interactions (POSI) and use Internet to regulate their moods, which further lead to deficient self-regulation over PIU that brings negative outcomes.	N = 5	• Loneliness – mood regulation
			
			• Social anxiety – social skill deficiency
			• Deficient social skills
			• Preference for online social interaction (POSI)
			• Negative consequences – negative outcomes
			• POSI
			• Mood regulation
			• Deficient self-regulation
			  o Cognitive preoccupation
			  o Compulsive use
			• Negative outcomes
				(Shettar, Karkal, Kakunje, Mendonsa, & Chandran, 2017)
				(Lee-Won et al., 2015)
				
				(LaRose et al., 2010)
				
				(Assuncao et al., 2017; Moretta & Buodo, 2018)

Interaction of Person-Affect-Cognition-Execution (I-PACE) Model of Specific Internet-use Disorders (Brand et al., 2016)	Specific Internet-use disorders are considered to be the consequence of interactions between predisposing factors (e.g., neurobiological factors and	N = 1	• (Attentional) trait impulsivity – predisposing factor • General executive functions • Specific inhibitory control	(Wegmann et al., 2020)

Table 1 (*continued*)

Theory/Model	Summary	No. of studies	Variables measured	Empirical studies of SMA
	personalities), moderators (e.g., coping styles and Internet-related cognitive biases) and mediators (e.g., affective and cognitive responses to situational triggers in combination with reduced executive functioning/inhibitory control), strengthened by conditioning processes.			

were found to have a higher risk in developing addictive use; however, normative style (i.e., internalizing the expectations and values held by significant others) was a negative predictor of SMA (Monacis, de Palo, Griffiths, & Sinatra, 2017a).

3.2. Motivational perspective

Individuals driven by certain motivations and psychological needs may end up using social media excessively. A number of studies were guided by motivation-related theories, such as the uses and gratifications theory and the self-determination theory. In these studies, social gratifications (e.g., maintaining relationships, interacting with others, and receiving social support) and sociopsychological needs (e.g., need to belong and need for relatedness) are major types of motivations predicting addictive social media use (e.g., Casale & Fioravanti, 2018; Gao, Liu, & Li, 2017).

Individuals may use social media exclusively for information acquisition (e.g., Balakrishnan & Griffiths, 2017) and self-presentation (e.g., Kircaburun, Alhabash, Tosuntaş, & Griffiths, 2018), both of which may contribute to SMA. People with low senses of autonomy and competence are especially vulnerable to addictive use when seeking these gratifications from social media (Casale & Fioravanti, 2015; Masur, Reinecke, Ziegele, & Quiring, 2014).

Being on social media is also entertaining and relaxing which predict SMA (e.g., Klobas et al., 2018; Punyanunt-Carter, De La Cruz, & Wrench, 2017). Furthermore, it can become a (maladaptive) coping mechanism adopted by individuals to temporarily escape from pressures and negative perceptions of the self (e.g., school-related burnout and suicidal ideas) but in the long term, it contributes to addictive social media use (Masur et al., 2014; Walburg, Mialhes, & Moncla, 2016).

3.3. Neurobiological perspective

Addictive behaviors are related to changes in neurobiological activities and brain structures. The incentive-sensitization theory of addiction implies that repeated exposure to highly pleasurable stimuli (e.g., pass increase in social media use) leads to hypersensitizing of certain reward systems in the brain that generate incentive salience towards addiction-related cues (Seo & Ray, 2019; Turel, 2015). The dual system theory, on the other hand, proposes that two structurally and conceptually different brain systems coordinate human behaviors and that addictive social media use was positively associated with variables representing the reflexive system and negatively with those representing the reflective system (Osatuyi & Turel, 2018; Turel & Qahri-Saremi, 2016).

3.4. Decision-making perspective

Several studies viewed addictive social media use as a decision-making process. For example, the rational addiction theory implies that individuals decide to continuously engage in excessive social media use after evaluating the benefits and drawbacks of the behavior; however, they may hold biased perceptions when making judgements and overestimate the value of social media, especially when social media use become intensive and habitual (Turel, 2015; Wang, Lee, & Hua, 2015).

Based upon the theory of planned behavior, positive attitudes and subjective norms towards social media predict addictive use, whereas high levels of perceived behavioral control reduce the chance to develop addiction (Ho, Lwin, & Lee, 2017).

3.5. Learning perspective

SMA was also understood from a learning perspective, highlighted in the behaviorist learning theories (e.g., classical conditioning, operant conditioning, and SRR) and Bandura's social learning and social cognitive theories. Among studies that applied these theories, SMA was considered a behavior (i.e., response) learned from repeated presentation of the same stimulus, which was reinforced when one experiences positive affect and psychological enhancement over the use (Wang, 2019). This learning process may be further mediated by individuals' social and cognitive perceptions, such as their social identities, outcome expectations and self-efficacy (LaRose, Kim, & Peng, 2010; Wu, Cheung, Ku, & Hung, 2013; Xu, Lin, & Haridakis, 2015; Yu, Wu, & Pesigan, 2016).

3.6. Technology use focused

A couple of studies investigated SMA through the technology use perspective. Social media, being a feature-rich information technology, can render a high level of perceived usefulness and ease-of-use (Wang et al., 2015), afford users with various needs (Chen, 2019) and be framed differently in different use contexts (Tarafdar et al., 2020). For example, one's experiences of social overload, disclosure, and invasion on social media may lead them to frame social media as a stressor; however, to cope with these stresses, individuals may choose to use other features of the same social media application to distract themselves from negative experiences (as a distractor). In fact, researchers found that framing social media as both stressor and distractor predicts addictive use (Tarafdar et al., 2020).

3.7. Social network focused

An individual's social network plays a vital role in shaping one's social media behavior. Individuals in a social group that favors social media use tend to conform to this subjective norm (i.e., compliance) and internalize the group's value as their own believes (i.e., internalization) to foster addictive use (Marino et al., 2016). Social ties people maintain online (i.e., structural social capital) and the social support they expect to receive (i.e., cognitive social capital) may also motivate them to use social media frequently (Yang, Liu, & Wei, 2016).

3.8. Internet specific models

Among the reviewed studies, three Internet use models were mentioned as the theoretical bases to examine problematic/addictive social media use. Davis' cognitive-behavioral model emphasizes the proximal effect of maladaptive cognitions and the distal effect of psychopathology (e.g., depression and anxiety) on the formation of pathological Internet use; whereas Caplan (2003), building upon Davis' work, generated a social skill model of problematic Internet use which

stresses the roles of psychosocial problems (e.g., deficient social skills and social anxiety) as well as one specific cognitive construct, preference for online social interaction (POSI). An updated version of Caplan's model (2010) incorporates two other constructs (i.e. mood regulation and deficient self-regulation), and this model was verified in the context of problematic social media use (Assuncao et al., 2017; Moretta & Buodo, 2018).

The interaction of person-affect-cognition-execution (I-PACE) model of specific Internet-use disorders (Brand, Young, Laier, Wölfling, & Potenza, 2016) presents a more inclusive view of predisposing and cognitive factors than that of Davis' and Caplan's models. For example, the "person" dimension of the I-PACE model includes not only psychopathology and social cognitions, but also personality and biopsychological conditions. These personal characteristics would further predict the developments of maladaptive cognitions (i.e., Internet-related cognitive bias) and maladaptive coping styles (e.g., regulating one's mood through excessive Internet use) which contribute to the feeling of urge and craving for using Internet. One unique perspective of the I-PACE model is the integration of neurobiological factors such as reduced executive functions and inhibitory control which are proposed as mediators in the pathway towards Internet use disorder. However, the application of the I-PACE model in SMA studies is still limited given that testing the model may require a study to follow a neuropsychological paradigm (e.g., Go-NoGo tasks) while measuring the constructs (Wegmann, Müller, Turel, & Brand, 2020).

4. Discussion: Theoretical gaps and future directions

The reviewed theories and models contributed to a better understanding of SMA. Nevertheless, there remains space to further enhance our understanding of the phenomenon.

4.1. Theoretical integration

Even though the reviewed theories/models exhibit a diverse range of perspectives and focuses, not one alone is sufficient to explain the complexity of SMA, and they are rarely integrated to cover all potentially significant aspects of how SMA develops. For example, the effects of predisposing factors (e.g., attachment styles and psychopathologies) on SMA can be further mediated by motivational factors such as psychological needs and gratification seeking (Blackwell et al., 2017; Cao et al., 2020; Chen, 2019). The satisfaction of one's psychological needs, along with the influence of social (e.g., social norm and social identity) and cognitive (e.g., attitude and outcome expectation) factors, may lead to a strong intention to use social media (Ajzen, 1991). Nevertheless, none of the included studies integrated the dispositional perspective (e. g., attachment theory) with theories of motivations (e.g., uses and gratifications theory) and those of decision-making (e.g., theory of planned behavior). Future research is needed to further explore how these general theories/models may relate to or complement each other to develop a more comprehensive view of SMA.

As another example, Caplan's model of GPIU (Caplan, 2010) posits that people who have social skill deficits prefer online social interactions and use the Internet excessively to compensate for offline social relationships. This model can possibly be integrated with the self-determination theory as people's deficient social skills may lead to decreased perceived autonomy, competence, and relatedness, which further prompt a preference for online social interactions and problematic social media use.

4.2. Social, cultural and technological context

Most of the highly cited theories/models in the sample focus on personal-level factors, such as dispositional differences and cognitive factors. Social, cultural and technological factors that may have significant contributions to SMA are less touched upon (Lee et al., 2017).

The influence of one's social environment on the development of SMA can be exerted through two distinct mechanisms. First, people who have unmet psycho-social needs (e.g., need for relatedness) may turn to social media for compensation and eventually lead to addictive use. This social aspect is addressed in several studies, following theoretical frameworks such as attachment theory and self-determination theory. Second, people may develop addictive social media use due to the prevalence of this technology in their social networks (i.e., compliance to subjective norms) or a shared group value in using social media (i.e., internalization). This mechanism was demonstrated in only a few studies (e.g., Ho et al., 2017; Yang et al., 2016) and was seldom integrated with other perspectives such as theories of dispositions and motivations.

Other than individuals' social contexts, the cultural (and political) environment they live in can also contribute to SMA. For example, a geopolitical environment with high stresses and few opportunities for open socialization may push citizens to seek refuge in social media (Mahamid & Berte, 2019). In addition, cultural differences (e.g., individualism vs. collectivism) have also been found to relate to SMA (Blachnio et al., 2017; Mérelle et al., 2017). These factors also merit further investigation and theorizing.

Last but not least, technology-focused theoretical frameworks also offer a special lens to understand SMA. On the one hand, users may form different perceptions towards a technology, which impacts how they utilize it (Tarafdar et al., 2020). On the other hand, the affordances that the technology offers can enhance such perceptions and motivate subsequent actions. For example, people may position Twitter as a news hub or a place to follow pop culture but consider Facebook as a self-presentation tool or a platform to join interest groups. These perceptions may be a result of the distinct affordances provided by these two platforms, due to different feature design, settings, and platform cultures (Karahanna et al., 2018). Currently, very little is known about how platform affordances and user perceptions may influence SMA. Hence, future studies can adopt and integrate theories from the human–computer interaction (HCI) literature (e.g., technology affordance; Kaptelinin & Nardi, 2012) and the information system (IS) literature (e. g., theory of technology frames; Orlikowski & Gash, 1994) to construct a more holistic view of addictive users, technologies (i.e., social media), and the sociocultural environment.

5. Conclusion

The adoption of social media is growing. The consequences of addictive social media use are damaging. To provide effective interventions, a holistic theoretical understanding of how SMA develops is much-needed. This review contributes to this understanding by analyzing 25 theories and models that guided the research design of 55 empirical studies of SMA and identifying theoretical gaps and future research directions. This review, to our best knowledge, is the first review that extensively examined the theories and models used to guide empirical SMA research. However, this review also has limitations. First, we only summarized the results related to the constructs in the identified theories and models. Future review can be more inclusive in literature selection and results inclusion. Second, we placed a theory/model in a single category based on its primary perspective/focus; however, some theories/models include constructs that are relevant to multiple perspectives. These connections are less explicit in the result, and future review can synthesize and relate these theories/models in a more extensive way. Third, we discussed only a couple of possible ways to integrate different theories/models in this review. Future research is needed to verify these speculations and explore the potential to develop a holistic theoretical explanation for SMA.

agencies in the public, commercial, or not-for-profit sectors.

Contributors

Both authors have contributed to this research and the manuscript writing. Roles for each author are described as follow. Yalin Sun designed the study and searched the literature. Both Yalin Sun and Yan Zhang involved in the analysis and synthesis of the theories/models. Yalin Sun wrote the first draft of the manuscript, and Yan Zhang reviewed and revised the manuscript. Both authors then discussed and resolved any discrepancies. Both of them have approved this final manuscript.

CRediT authorship contribution statement

Yalin Sun: Conceptualization, Methodology, Investigation, Data curation, Writing - original draft. **Yan Zhang:** Methodology, Validation, Writing - review & editing, Supervision, Resources.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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