



The dark side of social media platforms: A situation-organism-behaviour-consequence approach

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ABSTRACT

Research indicates that social media platform (SMP) use may adversely influence university students' academic performance (AP)—a phenomenon broadly known as the *dark side of social media* (DoSM). Our study applies the Situation-Organism-Behaviour-Consequence (S-O-B-C) framework to explicate pathways through which situational triggers (loneliness and self-presentation) lead to students' experience of cognitive (information and communication) overload, addiction (SMA), and consequentially, reduced academic performance (RAP). Methodologically, we deploy a mixed-methods approach comprising three studies—a qualitative study (Study A, n = 48) and two quantitative, cross-sectional studies in India (Study B: n = 479, Study C: n = 618)—through convenience sampling to develop and test a conceptual model through PLS-SEM. Our results provide evidence that loneliness and students' self-presentation significantly influence overload and SMA, which strongly influence RAP. Additionally, a partial moderating effect of demotivation due to social comparison was found in Study C, lending nuanced insight into the effects of personal tendencies on students' SMP use. Our study is limited to an emerging country context, but the results raise practical implications for students across the globe. In addition, our study suggests that future scholars should further investigate the personal and situational factors that can affect students' DoSM experiences like cognitive overload.

1. Introduction

Social media platforms (SMPs) are deeply ingrained in society, involving more than four billion global active users, who are estimated to spend at least two hours daily on these platforms for varied purposes such as connecting with peer groups and browsing exchanged content (Kemp, 2022b; Statista, 2022). Scholars have established that some SMP use leads users to reap benefits like building social capital (Phua et al., 2017) and promulgating innovative ideas (Bhimani et al., 2019). However, over the past years, research has progressively introduced many negative experiences of SMP users, including social media addiction (SMA) (Andreassen et al., 2017), fatigue (SMF) (Dhir et al., 2019; Tandon et al., 2021b), exhaustion (Luqman et al., 2021), fear of missing out (FoMO) (Tandon et al., 2022), and fake news sharing (Talwar et al., 2020). Such adverse experiences, often cumulatively called as the *dark side of social media* (DoSM) (Tandon et al., 2022; Tandon et al., 2021a),

have been increasingly implicated in creating detrimental consequences in the personal and professional lives of SMP users (Dhir et al., 2021; Islam et al., 2022; Nusrat et al., 2021; Tandon et al., 2021b).

Reduced academic performance (RAP) is one such consequence of the DoSM that has drawn particular attention from scholars (Datu et al., 2018; Malik et al., 2020). Generation Z, young adults (Statista, 2020; Wan Pa et al., 2021), and university students in particular (Nti et al., 2022) are among the most prolific users of SMPs (Kemp, 2022b). Owing to their increasing ownership of various digital devices as access points for SMPs (Abbasi et al., 2021; Kemp, 2022b) and their propensity to use SMPs for both academic and non-academic purposes, university students have made these platforms an inextricable part of their lives (Malik et al., 2020; Nti et al., 2022). However, this demographic cohort is also among the most vulnerable to experiencing SMP use's adverse effects (Swain and Pati, 2019), i.e., DoSM. Thus, we contend that for these students, RAP, as a DoSM experience, raises critical implications for

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their future lives and the sustainable functioning of society itself (Sheldon et al., 2019; Tandon et al., 2020).

While prior research has offered evidence that SMPs have a detrimental impact on academic performance (AP) (e.g., Malik et al., 2020; Turel and Qahri-Saremi, 2016; Whelan et al., 2020a, 2020b), it has been constrained due to specific knowledge gaps, which we identify here. First, relatively few studies have concentrated on the association of SMP use with AP in the context of a developing economy, such as the case of India (e.g., Malik et al., 2020). Furthermore, the majority of these studies are limited to specific contexts such as the academic discipline (Bhandarkar et al., 2021) and in-class SMP use (Sharma et al., 2022). This is a significant lacuna and justifies India (as a case for our study), as India accounts for the second-largest number of SMP users (467 million) in the Asia-Pacific (APAC) region after China (983 million) (Statista, 2022). Additionally, the amount of daily time spent by Indians on SMPs (approximately 2 h and 36 min) is higher than the global average (Kemp, 2022b). Moreover, a recent report determined that Generation Z users, particularly males, were among the most active users of SMP platforms like Meta (Kemp, 2022a). The recognizance of the high activeness of young SMP users in India has spurred mainstream discussions about its impact on AP (Sain, 2020). However, the lack of academic research in the context of this economy severely constrains the understanding of the factors, mechanisms, and situations that explain how SMP use translates into RAP.

Second, the existing literature offers inconsistent and fragmented evidence of the influence of SMPs use on AP. For example, while Datu et al. (2018) and Giunchiglia et al. (2018) determined that students' SMP use negatively influenced AP, Khaola et al. (2022) found the association to be insignificant. Another recent study (Nti et al., 2022) determined that SMP use was only partially accountable for RAP among students. This suggests that evidence on the influence of SMP use on AP is both insufficient and insignificant, leading to overall inconsistency in understandings of the phenomenon. One reason for such inconsistency could be the limited theoretical grounding of prior studies on DoSM (Cao and Sun, 2018; Malik et al., 2020; Whelan et al., 2020a), which limits the generalizability and theoretical understanding of the mechanisms by which the DoSM and other negative effects of SMP use arise. We believe that adopting a solid theoretical framework may resolve the prevalent inconsistency in associations found between SMP use and AP.

Third, scholars have acknowledged that young adult SMP users' situational and personal attributes, such as their desire to alleviate perceived isolation, loneliness, social comparison, and enhanced self-presentation, can influence SMP usage behaviour and subsequent experiences (Berezan et al., 2020; Wang et al., 2018). However, existing studies have predominantly focused on explicating the influence of these factors in the context of consequences like usage engagement or frequency (Reer et al., 2019; Yang, 2016) and FoMO (Hunt et al., 2018; Xie et al., 2018). Contrarily, the connotations of such situational attributes for students' perceived overloads, SMA, and RAP has been largely understudied (Whelan et al., 2020a, 2020b). This is a crucial research gap, as young adults, particularly university students, are at a greater risk of experiencing loneliness (MacDonald and Schermer, 2021; Vasi-leiou et al., 2019). They often engage in excessive SMP use to alleviate it, and follow perceived social norms of being permanently online (Vorderer et al., 2016) to the extent that they can even prioritize SMP use over essential physiological functions such as sleep (Scott et al., 2016; Tandon et al., 2020). Hence, it is critical to understand if these situational attributes stimulate students' SMP usage such that it detrimentally affects their AP. Our supposition is aligned with prior studies, which have called for more research into the complex pathways through which personal and situational attributes affect students' SMP usage and, consequently, their well-being and cognitive performance (e.g., Almarzouki et al., 2022; Dontre, 2021; Nti et al., 2022).

We address the knowledge gaps outlined above by adopting the Situation-Organism-Behaviour-Consequence (S-O-B-C) framework (Davis and Luthans, 1980) as a theoretical foundation and lens. We

investigate how situational stimuli of loneliness and self-presentation (S) cause students to be exposed to information and communication overload (O), which in turn leads to them to become addicted to SMP usage (B). Further, we explore whether users' individual tendencies to engage in social comparisons while using SMPs, indirectly influences (i.e., moderates) the associations between the stimuli and the organism's (i.e., user's) state. We thus address the following research questions (RQs):

RQ1: How are situational attributes (S) of loneliness, and self-presentation, organismic state of SMP overload (O), correlated with students' SMA usage (B) and the consequence of RAP (C)?

RQ2: Does demotivation due to social comparison on SMPs mitigate the associations between students' situational stimuli (loneliness and self-presentation) and their subsequent experienced states (overload)?

We adopted a mixed-methods research approach and conducted three studies. In the first study (Study A), we obtained responses from 48 students in India through an open-ended qualitative survey to explicate appropriate constructs for our S-O-B-C-grounded framework. To test the model, we collected two sets of cross-sectional survey data (Study B: $n = 479$; Study C: $n = 618$) from SMP users studying in two Indian colleges and analysed them through partial least squares structural equation modelling (PLS-SEM).

Our findings contribute to the existing literature in four ways. First, by examining the hypothesised association and pathways through which the students' situational stimuli correlate with their students' experienced state (overload), behaviour (SMA), and consequence (RAP), we contribute to the literature on (i) the associations between SMP use and AP (Evers et al., 2020; Whelan et al., 2020a), (ii) SMP overload (Whelan et al., 2020b; Whelan et al., 2020a), and (iii) SMA (Andreassen et al., 2017; Tandon et al., 2021a). Additionally, as an overload is an essential element of SMF (Dhir et al., 2019; Tandon et al., 2021b), our findings also add to the extant knowledge of SMF's drivers.

Second, by concentrating on India as a study context, we add to current knowledge on the negative impacts of SMP use on students' AP in this economy. As India encompasses an expansive cohort of SMP users, including young adults (Kemp, 2022a; Statista, 2022), our findings add more nuanced insights into the DoSM experiences of young adults in this geography. Our contribution is especially relevant as loneliness is now discussed prolifically in the mainstream media as an emergent and chronic mental health issue that requires focused attention (Banerjee, 2021; Vasudeva, 2019).

Third, our use of a mixed-methods approach allows for a deeper investigation and more thorough conceptualization of the tested framework through which an individual's situational triggers (i.e., stimuli) may translate into DoSM experiences and adverse real-life consequences, like RAP, for vulnerable SMP user groups—namely, young adult students.

Fourth and finally, we respond to recent calls (Whelan et al., 2020a) to apply the S-O-B-C framework to explore different SMP behaviours and their outcomes. Our theoretical grounding of this framework allows us to draw implications based on sound conceptual knowledge and explain a viable pathway for understanding DoSM experiences, which is a growing field of research (Kaur et al., 2021; Tandon et al., 2021a).

We structure the remainder of our paper as follows. Section 2 explains the S-O-B-C framework and Study A, through which we explicate relevant constructs for our research model. Section 3 is dedicated to hypothesis development. Section 4 describes the research methodology, while Section 5 presents the results. The findings are discussed in Section 6, and the article concludes with Section 7, which summarises our study's implications, research limitations, and avenues for further research.

2. Theoretical background

2.1. S-O-B-C framework

According to the S-O-B-C framework (Davis and Luthans, 1980),

many facets of a contextual situation (S) influence a human being's (i.e., organism's - O) internal states. In turn, these internal states drive behavioural responses (B), which elicit specific individual-level consequences (C) (Talwar et al., 2021). We believe the S-O-B-C framework is a suitable over-arching theoretical framework for this study for two primary reasons. First, it captures the complex mechanism of human behaviour and its consequences by extending the stimulus-organism-response (S-O-R) and stress-strain-outcome (S-S-O) frameworks that have been widely used in prior studies to investigate the negative consequences of SMPs (Luqman et al., 2017; Masood et al., 2020; Whelan et al., 2020b; Yu et al., 2018). Second, the S-O-B-C approach accommodates both covert and overt stimuli as well as behavioural responses to explain the negative impacts of SMP use. In our framework, we capture perceived loneliness as covert and the desire for optimal and enhanced self-presentation on SMPs as overt psychological stimuli. We hold the study of Whelan et al. (2020a) as a conversant (Huff, 1998) and extend their research by adopting different variables as stimuli and behaviour. For example, while Whelan et al. (2020a) considered FoMO as a stimulus, we consider situational stimuli of loneliness and self-presentation. Moreover, we include social comparison as a moderating variable in the study, which is also an addition to the framework of Whelan et al. (2020a).

Based on the framework, we suggest that the situational stimuli (S) of loneliness and self-presentation on SMPs may lead young adult university students to engage with SMPs with amplified rigour. We believe this high SMP use exposes these students to an incessant stream of shared content and communication, exceeding their cognitive processing capabilities and thereby creating an organismic state of information and communication overload (O). When students are overloaded, their self-regulation capabilities deteriorate, and they dive further into SMPs to keep up with the SMP content, which leads them to exhibit behavioural tendencies reflecting addiction—that is, SMA (B). We further contend that students with SMA dedicate more time to SMP-related activities and less time to their studies, eventually decreasing their AP as a consequence (C). However, we also hypothesise that not all students are affected equally in experiencing overload via situational stimuli.

On the contrary, we believe that students' SMP experiences are modulated by social comparison tendencies (Kaur et al., 2021; Malik et al., 2020). The individual tendency to engage in social comparison has been previously identified as a vulnerability factor (Verduyn et al., 2020), and determined as a moderator for the associations between SMP use and its outcomes in many studies (Arroyo and Brunner, 2016; Han et al., 2020; Verduyn et al., 2020). We believe that students who are less motivated to use SMPs owing to their tendencies to engage in social comparison, as well as its aftereffects, would be affected to a lesser extent than others.

2.2. Study A: identifying constructs for S-O-B-C

To identify constructs relevant to the S-O-B-C framework, we leveraged existing literature to develop the protocols for our study and conducted an open-ended qualitative survey. The survey was sent to 100 university students (50 each from the undergraduate and master's levels), adhering to the ethical procedures required for data collection. The students were asked to reflect on why they used SMPs and about one or more situations in which they had negative experiences while using these platforms. Of the 100 students, 48 returned the survey questionnaire, of which 40 % were male with an average age of 24 years. We analysed this data based on the grounded theory approach (Glaser and Strauss, 1999) to develop our research model following prior scholars who used a similar approach (e.g., Jabeen et al., 2022; Talwar et al., 2020).

The analysis revealed that students used SMPs for two main reasons: (a) to eliminate the feeling of loneliness and (b) to present an ideal version of themselves on SMPs to fulfil relatedness needs. For example, some of the responses received were as follows:

'Sometimes, I have nothing to do and nobody to talk to. The only thing then comes to my mind is to check what's happening in my Facebook circle.' [This quote represents loneliness.]

'Online profile is a must, I think. If you don't have a Facebook profile, you don't exist. Social media helps to present yourself to the world. I often put selfies there to show my new dresses to my friends.' [This quote represents the need for self-presentation.]

These findings are in agreement with prior research and supported by the seminal self-determination theory (SDT) (Deci and Ryan, 2000), which suggests that seeking relatedness is a significant psychological need for individuals. Furthermore, prior scholars have confirmed that loneliness (e.g., Berezan et al., 2020) and self-presentation (e.g., James et al., 2017) are critical stimuli that drive SMP usage. Aligning with SDT and prior research, we contend that students' perceived loneliness and desire for optimal self-presentation would stimulate their SMP use. Therefore, we conceptualise loneliness and self-presentation as situational triggers or stimuli (S).

Next, Study A confirmed that information and communication overload are distinct states experienced by students while using SMPs, leading them to maintain a highly frequent connection with these platforms (reflecting SMA), as suggested by the following sample responses:

'Last year, my grade was too poor. When I tried to reflect on what happened, I feel I killed too much time on Facebook, especially chatting with too many friends and reading about what they are up to. Sometimes spent hours without noticing, and felt tired, or even lack of sleep, and my parents were too angry on me.' [This quote represents poor AP, too many communication requests (communication overload), information overload, and SMA.]

'I don't know why I frequently just browse and refresh Facebook news feed without any particular purpose.' [This quote represents SMA.]

Thus, SMA has emerged as a viable behavioural response (B) of students who are inundated and overloaded by SMP-driven information and communication (O). Unable to self-regulate their SMP usage and keep up with the content they are exposed to, such students develop addictive tendencies towards SMPs. Such SMA as a behavioural (B) response, in turn, diminishes students' AP as a consequence (C). Prior research has also examined and determined that such information and communication overload as the organismic state (O) can elicit problematic SMP usage behaviours (Whelan et al., 2020a) that can detrimentally impact their psychological well-being (Miksch and Schulz, 2018) and reduce their AP (Shi et al., 2020).

Lastly, the student respondents were asked how they felt about others' content vis-à-vis their own while browsing on SMPs, reflecting their social comparison tendencies and their aftereffects. The responses suggested that social comparison could influence SMP usage indirectly, as users felt demotivated following their engagement in the comparative process—for example:

'Some days ago, I stopped using Facebook. I see that everyone is enjoying their life, and I am doing nowhere close to them. It is heart-breaking when you see some of your friends are having fun, and you are not able to have it.' [This quote represents demotivation due to social comparison.]

Furthermore, prior studies on the negative consequences of fake news and technology use that adopted allied frameworks like the S-O-R or S-S-O models have also considered moderating factors, such as system trust (Bezbaruah et al., 2021) and IT control (Pirkkalainen et al., 2018). Adding to this literature and based on the findings from Study A, we have employed demotivation (i.e., a negative feeling) due to social comparison as a moderator in our study. Fig. 1 shows the proposed research framework and hypothesised associations as developed through Study A and review of existing research. The operational definitions of the study variables are provided in Table 1.

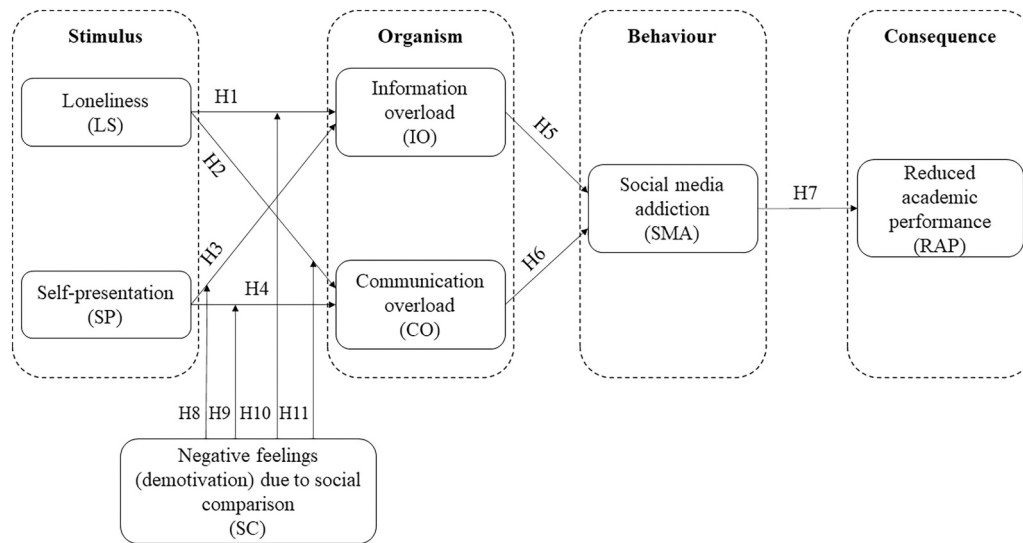


Fig. 1. Research model.

Table 1
Study variables.

Variable	Operational conceptualization	Adapted from
Loneliness (LS)	Unfavourable mental condition about having an inconsistent state of actual and anticipated relationships with social groups and peers	O'Day and Heimberg, 2021
Self-presentation (SP)	An individual's expression of their thoughts and perceived self-image on SMPs through pictures, texts, and other shared content	Chua and Chang (2016)
Information overload (IO)	The situation in which the incoming information from SMPs that needs to be processed crosses the limits of individuals' cognitive processing capabilities as per their subjective perception	Karr-Wisniewski and Lu (2010); Fu et al. (2020)
Communication overload (CO)	Situation wherein communication demands from SMPs exceed individuals' cognitive processing capabilities per their subjective perception	Karr-Wisniewski and Lu (2010); Fu et al. (2020)
Social media addiction (SMA)	Excessive concern with using, psychological dependency on, and/or uncontrollable use of SMPs in a manner that impairs an individual's attention towards other aspects of their life	Dhir et al. (2021); Tandon et al. (2020)
Reduced academic performance (RAP)	The influence of SMP use on an individual's (i.e., student's) holistic performance in academic life and allied pursuits, including their grade point average (GPA)	Malik et al. (2020); Turel and Qahri-Saremi (2016)
Negative feelings (demotivation) due to social comparison (SC)	Individual's experience of negative affective consequences, particularly feelings of demotivation, post-engagement in social comparison with others on SMPs	Lee (2014); Talwar et al. (2019)

3. Hypotheses development

3.1. Loneliness, self-presentation, and overload

Existing research has suggested loneliness to be linked to problematic SMP use, but with inconsistent results about the nature and directionality of the relationship (Nowland et al., 2018; O'Day and Heimberg, 2021). For instance, while Hunt et al. (2018) found that limiting SMP use could lead to a reduced feeling of loneliness; O'Day and Heimberg (2021) found evidence through a systematic literature review that loneliness drove SMP use among individuals seeking the feeling of social inclusion. Additionally, Nowland et al. (2018) have suggested that the relationship between loneliness and individuals' use of digital technology may be bi-directional, and proposed that loneliness could determine how the Internet could be used socially to seek relatedness. Recent scholars (e.g., Islam et al., 2019) have also made similar propositions to suggest that users often view the shared content on SMPs and respond using social feedback in the form of commenting, liking, and sharing, which can help them in potentially avoiding feelings of loneliness. For example, a recent study (MacDonald and Schermer, 2021) found loneliness to be positively related to the usage of SMP apps, communication anxiety, and even nomophobia among young adults.

We leverage these studies and align ourselves with O'Day and Heimberg (2021) to propose that students engage in problematic and excessive SMP use to alleviate their loneliness (i.e., a covert need). Our contention is supported by the Theory of Compensatory Internet Use (TCIU) (Kardefelt-Winther, 2014) which suggests that individuals use the Internet or SMPs to avoid negative feelings or states, which for our study is loneliness. Through such usage, these students are exposed to large amounts of SMP content and information exchange, culminating in their experience of allied overloads. The Limited Capacity Theory (LCM) (Lang, 2000) supports this contention, as it suggests that individuals have only a limited cognitive capacity to process information, and exceeding this capacity would result in an individual's experience of overload. As young adult students are relatively more vulnerable to the effects of problematic SMP use (MacDonald and Schermer, 2021; Tandon et al., 2020), we believe that they are more inclined to engage in both active and passive SMP use to alleviate loneliness, which could create cognitive overload by increasing the amount of shared content they are exposed to. Thus, we present the following hypotheses:

H1. : Loneliness is positively associated with information overload among students.

H2. : Loneliness is positively associated with communication overload among students.

Self-presentation is another important SMP affordance and psychological need (Islam et al., 2019; Mäntymäki and Islam, 2016) that has previously been found to significantly influence individuals' SMP use and experience with DoSM phenomena like overloads. For example, Appel et al. (2020) found that self-presentation had significant associations with users' proclivity to share or post photos and interact with others on SMPs through shares, likes, and comments. In another study, Chua and Chang (2016) suggested that self-presentation is often driven by the desire to present an optimal version of oneself in a manner that pleases the audience. This suggests that self-presentation on SMPs can help users interact with others, which is also supported by the tenets of SDT. However, to present an ideal version of themselves, we contend that users (i.e., students) also have to engage in both active and passive SMP use to understand what would please the audience that views their content. This high SMP use driven by self-presentation could thus create information and communication overload for students.

Our contention is supported by the study by Islam et al. (2020), who found that SMP affordances (including self-presentation) have a significant positive relationship with information and non-significant relationship with communication overload. However, their study mainly included adults and working professionals (average age = 36 years) who have a multitude of personal and professional responsibilities. It is possible that for students, self-presentation may be significantly and positively related to both information and communication overload as this demographic cohort is intensely concerned with the overt need to maintain an optimal image among their peers to gain social inclusion and establish their unique identities (e.g., Yang et al., 2017). Our contention is also supported by recent studies (Liu, 2022; Liu and He, 2021), which determined that young adults who attempt to maintain an idealized self-impression on SMPs through self-presentation strategies can experience SMF. As overload has been determined consistently to precede SMF (e.g., Cao and Sun, 2018; Fu et al., 2020), we propose that self-presentation is also significantly associated with information and communication overload. Hence, we propose the following:

H3. : Self-presentation is positively associated with information overload among students.

H4. : Self-presentation is positively associated with communication overload among students.

3.2. Cognitive overload and social media addiction

A multitude of research has suggested that information and communication (i.e., cognitive) overload are linked to SMF (e.g., Whelan et al., 2020b), which can influence an individual's SMP usage patterns, often leading them to lessen or discontinue accessing these platforms (Fu et al., 2020). However, it is possible that such overload can also lead an individual to expend more effort on managing SMP communication. While there is no prior evidence to support this perspective to our knowledge, our proposition is driven by the tenets of the SDT (Deci and Ryan, 2000), which proposes that individuals self-determine the actions they undertake to fulfil the basic psychological need of relatedness. This is a critical need for students who are attempting to establish their identity during a developmentally transitional phase that encompasses their college years (e.g., Yang et al., 2017). It is possible that due to their situational triggers of loneliness and desire for self-presentation, such students may try to cope with their cognitive overload by putting greater effort into maintaining connectivity with SMPs. This constant connectivity could be a way to cope with the negative state of cognitive overload created by the constant flow of SMP-related content (i.e., information) and communication.

While our supposition is primarily intuitive, we have found support in limited prior research which suggests that excessive SMP use is

significantly related to cognitive-emotional preoccupation (Cao et al., 2018). We posit that such preoccupation may be a manifestation of addictive tendencies that engage students' focus on SMP use. Moreover, Whelan et al. (2020a) determined that both forms of overload were significantly and positively correlated with deficient self-regulation, which they conceptualised as individuals' diminished capacity to alter their behaviour in pursuance of long-term goals. Furthermore, recent studies have suggested that technology may be used to cope with various stressors in life (Mäntymäki et al., 2022). For instance, Tarafdar et al. (2020) suggested that individuals may distract themselves from perceived stressors, such as social overload, by using the same SMPs from which the stressors are derived, albeit in a different way. Such studies imply that to cope with information and communication overload, individuals (in our context, students) may engage more frequently with different SMPs features as a coping strategy. We have adopted a similar stance as Whelan et al. (2020a) and aligned with Tarafdar et al. (2020) to propose that students may cope with their perceived overload by distracting themselves through compulsive and excessive SMP use, reflecting addictive patterns. Based on the above discussion, we intuitively propose the following hypotheses:

H5. : Information overload is positively associated with social media addiction among students.

H6. : Communication overload is positively associated with social media addiction among students.

3.3. Social media addiction and reduced academic performance

Prior literature has consistently confirmed that excessive or compulsive use of social media, i.e., SMA, can have a multitude of detrimental effects on individuals' personal (e.g., problematic sleep) (Dhir et al., 2021; Tandon et al., 2020) and professional lives (e.g., work performance decrement) (Alsharji et al., 2019; Tandon et al., 2021a). Scholars have previously suggested (e.g., see Khaola et al., 2022; Koranteng et al., 2019) and determined that such SMP use also affects students' AP in colleges and schools (Boahene et al., 2019; Busalim et al., 2019). For example, Malik et al. (2020) determined that excessive use of social networking apps like WhatsApp could lead to fatigue, in turn causing RAP among Indian students. According to Whelan et al. (2020a), excessive SMP use driven by FoMO could lead individuals to be unable to self-regulate their SMP use leading to RAP. Similarly, Busalim et al. (2019) determined that Facebook addiction is significantly negatively correlated with students' AP. Table 2 provides a snapshot of prior research on the associations between SMP use and RAP.

Aligned with prior literature, we also contend that addictive SMP use, i.e., SMA, can lead to RAP among students, since excessive usage can preoccupy their minds and divert their attention from academic pursuits. Therefore, we have proposed SMA to be a determinant of decreased AP through the following hypothesis:

H7. : Social media addiction is positively associated with reduced academic performance among students.

3.4. The moderating role of demotivation due to social comparison

The social comparison theory (Festinger, 1954) posits that we evaluate our abilities and opinions by comparing them with others in the absence of objective or non-social criteria for such evaluation. Following this theory, several studies have found social comparison to influence the associations between SMP affordances, use patterns, and the consequent effects on users' well-being (Cramer et al., 2016; Malik et al., 2020; Talwar et al., 2019). Verduyn et al. (2020) reviewed existing research on social comparison, and suggested that it acts as a vulnerability factor that can often determine the degree to which individuals can end up feeling dissatisfied after comparing themselves to others' shared content. Few scholars have investigated, and determined that

Table 2

Highlights of prior literature examining the associations between social media use and academic performance.

Author(s) (year)	Sample (platform)	Theoretical grounding	Findings
Kirschner and Karpinski (2010)	219 students (Facebook)	None	Facebook users reported lower levels of grades.
Junco (2012)	1839 students (Facebook)	None	Time spent on Facebook had a negative impact on the reported GPA.
Lambić (2016)	139 students (Facebook)	None	Facebook use for academic purposes was found to correlate with higher academic performance.
Turel and Qahri-Saremi (2016)	341 students (Facebook)	Dual systems theory	Problematic use of Facebook led to decreased academic performance.
Naghsbandi et al. (2017)	1165 students (Facebook)	Big 5 personality model	Facebook mediated the effects of some personality factors on academic performance.
Giunchiglia et al. (2018)	72 students (social media app)	None	Duration of use of social media apps was negatively correlated with academic performance.
Busalim et al. (2019)	240 students (Facebook)	None	Addicted Facebook users differed in self-esteem from non-addicts. Addiction was found to influence academic performance.
Whelan et al. (2020a)	182 students (social media)	S-O-B-C	Deficient self-regulation reduced academic performance.

social comparison can moderate the associations between SMP use and individual consequences as well. For example, Han et al. (2020) found that social comparison moderated the influence of SMP use on individuals' job burnout. In another study, Alfasi (2019) determined that the general tendency for social comparison moderated the associations between browsing news reels on Facebook and individuals' state of depression.

We extend the existing research by considering whether the affective consequences of such comparative processes affect individual SMP experiences. Cramer et al. (2016) discussed the idea that SMPs are a hyper-personal social environment where people can show what they believe to be their best social image. Such environments may often automatically induce users to compare themselves to others and in turn experience affective consequences in terms of both positive and negative emotions (Cramer et al., 2016; Kim et al., 2021). Such affective consequences have only been limitedly explored in the prior literature in the context of social media environments. For instance, Lee (2014) suggested that a higher frequency of engaging in social comparison on SMPs, particularly Facebook, was correlated with users' increased experience of negative feelings. In a recent study, Kim et al. (2021) speculated that emotions (e.g., sadness, and anger) elicited due to social comparisons on SMPs may provide a better explanation of why users continue to use these platforms problematically despite the experienced negative consequences such as SMA.

Aligning with Kim et al. (2021), we suggest that negative feelings arising from social comparison may indirectly influence SMP users' consequential experience. As young adults and university students are prolific SMP users, some of them may be aware of the extreme positivity bias of the content available on SMPs. Such students may avoid using SMPs after they compare themselves with others considered as superior to them and experience a feeling of demotivation considering their own circumstances vis-a-vis others. We believe that this feeling of demotivation following social comparison on SMPs, an affective consequence, would negatively moderate the associations between the situational stimuli (i.e., loneliness and self-presentation) that trigger students' SMP

use and their consequent organismic state of cognitive (i.e., information and communication) overload. We expect a negative moderation, as such demotivation may be equated with a sense of fatigue (e.g., see Cramer et al., 2016), high levels of which can lead to diminished SMP usage rate or frequency. Our contention is supported by multiple scholars who have established that such a sense of fatigue can lead to the reduced use of SMPs even when they are used to fulfil emotional needs (Islam et al., 2022). Such reduced use has been also posited to lead to better psychological outcomes for SMP users (Hunt et al., 2018). Following this line of thought, we contend that students' high levels of demotivation caused by social comparisons on SMPs weaken the associations between the situational stimuli and cognitive overload.

While, to the best of our knowledge, there is no a priori evidence for the moderating role of social comparison driven-demotivation in our hypothesised associations, we leverage the preceding discussion to intuitively propose the following hypotheses:

H8. : The effect of self-presentation on information overload is negatively moderated by demotivation due to social comparison.

H9. : The effect of self-presentation on communication overload is negatively moderated by demotivation due to social comparison.

H10. : The effect of loneliness on information overload is negatively moderated by demotivation due to social comparison.

H11. : The effect of loneliness on communication overload is negatively moderated by demotivation due to social comparison.

4. Research methodology

4.1. Questionnaire development and data collection

We adapted validated scales from prior literature to develop the questionnaire anchored by a 7-point Likert scale. The construct items and scale references are presented in Appendix A. A pilot was conducted with 15 students from the target population to test the appropriateness of the developed measures. The pilot study suggested that the survey had face validity and that the questions were well understood by the participants. We also solicited the advice of two academic experts from the fields of psychology and information systems science about the viability of the questionnaire in measuring the constructs. The experts suggested modifications in the framing of six items in the final questionnaire, which were incorporated. The survey was directed towards understanding SMP use in the context of Facebook as a platform that is among the most prolifically used SMPs in India, with approximately 329 million active users (Kemp, 2022a) and the highest page traffic (about 58 %) of all SMPs (Statista, 2022).

We conducted two surveys and collected data from two colleges in India using a convenience sampling approach. Oral consent was obtained from respondents by informing them about the details of the research, such as the objectives, procedures, and outcomes. To minimise the possibility of common method variance (CMV), we explicitly informed respondents that participating in the survey was voluntary. The respondents had the option not to participate or to cancel their participation at any time during the data collection. We also informed the respondents that the data would be anonymised, and they would not be identified with their names or other personal information.

The first dataset contained completed surveys from 482 respondents (Study B). Of these, three were deleted because they were incomplete. Therefore, responses from 479 students were used to test the research model. Approximately 61 % of the respondents in the first dataset were male, and the average age of the participants was 24 years. In the second dataset (Study C), 622 students answered the survey, but four responses were incomplete. Thus, we had a sample size of 618 for testing our research model. Approximately 65 % of the respondents in the second dataset were male, and the average age was 23 years. The individual responses obtained in data collection were the unit of analysis, and the

sample size was considered to be appropriate following the results of the G*Power analysis (Ringle et al., 2014). The sample characteristics reflected general SMP user profiles discussed in recent reports (Kemp, 2022a), indicating that Indian SMP users are predominantly male (approximately 74.5 %) and that a significant number of total active users fall between the ages of 18 and 24 years (24.6 % male, 9 % female). Hence, we believe that our sample is viable for yielding useful insights into the tested associations.

4.2. Data analysis

Before the main analysis, we confirmed that the data met the assumptions of multivariate analyses for normality and multi-collinearity. We analysed the two datasets separately through SmartPLS. PLS-SEM has been prolifically used in prior information systems literature (e.g., Maier et al., 2015). Recently, scholars have suggested that PLS-SEM is highly useful for testing models aimed at theory development and are equivalently efficient to covariance-based SEM in detecting actual pathways (Islam et al., 2022). PLS-SEM was considered to be more suitable in our study because (i) our framework is exploratory and aimed at contextualising the S-O-B-C framework and (ii) we focus on predicting and explaining the key variables' associations (Hair et al., 2017a, 2017b; Khaola et al., 2022).

To test convergent validity, we examined the loadings of the items, composite reliabilities (CRs), and the average variance extracted (AVEs) values. We removed the items that did not meet the recommended threshold of 0.70 for CR and 0.50 for AVE (Fornell and Larcker, 1981; Hair et al., 2017a, 2017b). Appendix A shows the factor loadings for the final items taken forward for the analysis, and Table 3 shows the CRs and AVEs for both datasets.

Furthermore, to evaluate discriminant validity in our datasets, we first compared the square roots of the AVEs to the correlations. Tables 4 and 5 show the correlation matrices with the square roots of the AVEs for the first and second datasets, respectively. The square roots of the AVEs for the constructs were larger than the correlations, which suggests sufficient discriminant validity among the constructs in both datasets as per recommended thresholds (Fornell and Larcker, 1981; Henseler et al., 2009). Second, we looked at the heterotrait-monotrait (HTMT) matrix (see Appendix B) for both datasets. The HTMT values were below the 0.90 threshold (Henseler et al., 2015), indicating that the measurements exhibit solid discriminant validity.

We also tested the data for the absence of CMV through Harman's single-factor test (Harman, 1976), which confirmed that a single factor did not explain most of the total variance in both datasets. Next, we performed a common method-factor test proposed by Liang et al. (2007), which showed that the method variance was very small compared to the substantive variance. Thus, we concluded that CMV was not a significant concern for both datasets.

Table 3
Composite reliabilities and AVEs.

Study measures	Composite reliability		Average variance extracted	
	Study B	Study C	Study B	Study C
RAP	0.888	0.842	0.664	0.571
CO	0.898	0.855	0.675	0.597
SMA	0.839	0.782	0.637	0.545
IO	0.870	0.838	0.691	0.632
LS	0.830	0.787	0.620	0.552
SP	0.899	0.880	0.748	0.709
SC	0.859	0.831	0.671	0.620

Note: RAP = reduced academic performance, CO = communication overload, IO = information overload, SMA = social media addiction, LS = loneliness, SP = self-presentation, SC = social comparison.

Table 4
Correlations among the constructs (Study B).

Study measures	CO	IO	LS	RAP	SP	SC	SMA
CO	0.822						
IO	0.485	0.831					
LS	0.183	0.209	0.788				
RAP	0.349	0.461	0.230	0.815			
SP	0.439	0.323	0.095	0.236	0.865		
SC	0.467	0.453	0.226	0.375	0.275	0.819	
SMA	0.419	0.410	0.294	0.699	0.297	0.422	0.798

Note: RAP = reduced academic performance, CO = communication overload, IO = information overload, SMA = social media addiction, LS = loneliness, SP = self-presentation, SC = social comparison.

Table 5
Correlations among the constructs (Study C).

Study measures	CO	IO	LS	RAP	SP	SC	SMA
CO	0.772						
IO	0.489	0.795					
LS	0.195	0.255	0.743				
RAP	0.341	0.366	0.211	0.756			
SP	0.485	0.352	0.115	0.254	0.842		
SC	0.346	0.476	0.272	0.364	0.253	0.788	
SMA	0.430	0.391	0.288	0.624	0.347	0.401	0.738

Note: RAP = reduced academic performance, CO = communication overload, IO = information overload, SMA = social media addiction, LS = loneliness, SP = self-presentation, SC = social comparison.

5. Results

5.1. Structural model

We examined the structural model and tested the hypotheses for both data sets (see Table 6 and Figs. 2 & 3). In Study B, the model explained 26 % variance in information overload, 33 % in communication overload, 23 % in SMA, and 49 % in RAP. In Study C, the model explained 32 %, 30 %, 23 %, and 39 % variance in information overload, communication overload, SMA, and RAP, respectively.

The hypothesis testing provided support for all but one hypothesis for main effects in Study B, with H1 ($\beta = 0.11^*$), H2 ($\beta = 0.07$ ns), H3 ($\beta = 0.21^{***}$), H4 ($\beta = 0.33^{***}$), H5 ($\beta = 0.27^{***}$), H6 ($\beta = 0.29^{***}$), and H7 ($\beta = 0.70^{***}$) supported. The hypothesis testing the association between loneliness and communication overload was unsupported, as the β value was insignificant. In study C, we found statistical support for all hypotheses testing the main effects in the model (H1: $\beta = 0.12^*$; H2: $\beta = 0.09^*$; H3: $\beta = 0.23^{***}$; H4: $\beta = 0.41^{***}$; H5: $\beta = 0.24^{***}$; H6:

Table 6
Results of hypothesis testing.

Hypothesis	Pathway	β		Supported
		Study B	Study C	
H1	LS $\rightarrow$ IO	0.11*	0.12*	Yes
H2	LS $\rightarrow$ CO	0.07 ns	0.09*	Partially
H3	SP $\rightarrow$ IO	0.21***	0.23***	Yes
H4	SP $\rightarrow$ CO	0.33***	0.41***	Yes
H5	IO $\rightarrow$ SMA	0.27***	0.24***	Yes
H6	CO $\rightarrow$ SMA	0.29***	0.31***	Yes
H7	SMA $\rightarrow$ RAP	0.70***	0.62***	Yes
H8	SP*SC $\rightarrow$ IO	-0.04 ns	-0.11**	Partially
H9	SP*SC $\rightarrow$ CO	-0.02 ns	-0.07*	Partially
H10	LS*SC $\rightarrow$ IO	-0.04 ns	0.07*	No
H11	LS*SC $\rightarrow$ CO	-0.03 ns	0.00 ns	No

Note: p -value of $<0.05 = *$, $<0.01 = **$, $<0.001 = ***$, ns = not significant. RAP = reduced academic performance, CO = communication overload, IO = information overload, SMA = social media addiction, LS = loneliness, SP = self-presentation, SC = social comparison.

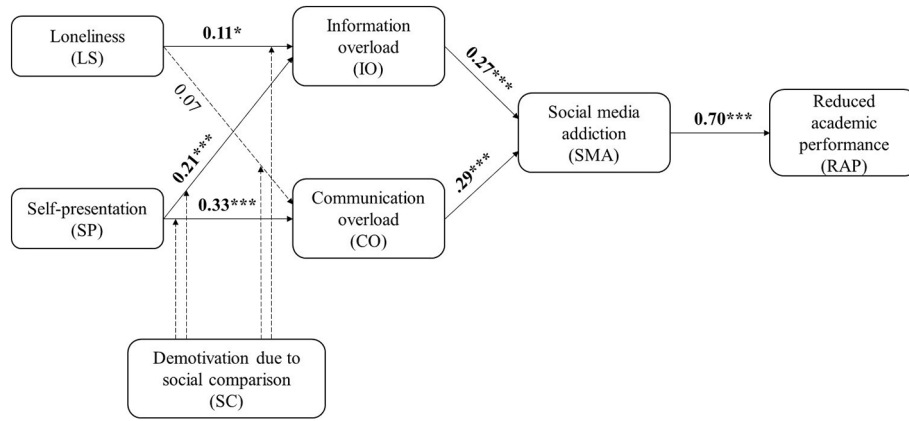


Fig. 2. Final research model (Study B).

Note: * = $p < 0.05$; ** = $p < 0.01$; *** = $p < 0.001$; solid arrows represent significant and dashed arrows represent non-significant associations.

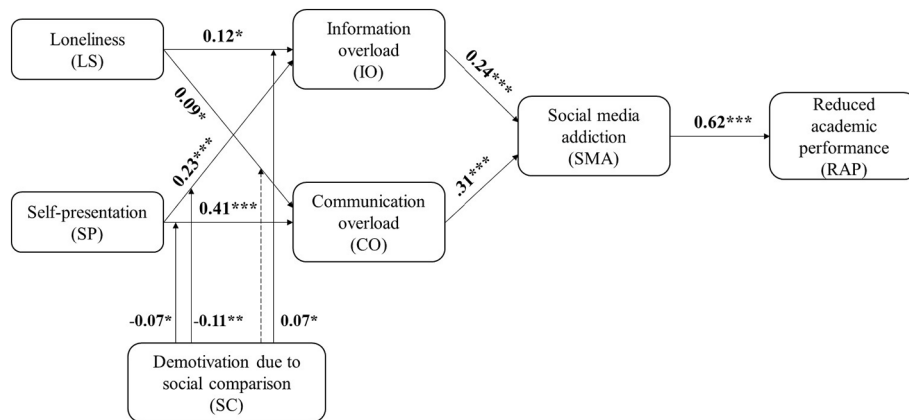


Fig. 3. Final research model (Study C).

Note: * = $p < 0.05$; ** = $p < 0.01$; *** = $p < 0.001$; solid arrows represent significant and dashed arrows represent non-significant associations.

$\beta = 0.31$ ***; H7: $\beta = 0.62$ ***). Thus, the structural model provided full support to six and partial support to one hypothesis in terms of the direct associations. Notable was the small effect of loneliness and the strong effect of self-presentation as situational stimuli in the model, suggesting that for students, the overt need for self-presentation may be a stronger stimulus than the covert need to alleviate loneliness.

5.2. Moderation analysis

The interaction between self-presentation and demotivation due to social comparison ($\beta = -0.11$, $p < 0.01$) had a negative influence on information overload in Study C (see Fig. 4), whereas, in Study B, the effect was non-significant. Therefore, H8 was partially supported. Similarly, the interaction term for self-presentation and demotivation due to social comparison ($\beta = -0.07$, $p < 0.05$) had a negative impact on communication overload in Study C (see Fig. 5) and a non-significant one in Study B. Thus, H9 was also partially supported. H10 was not supported in Study B, as the interaction between loneliness and demotivation due to social comparison had no significant effect on information overload. On the other hand, in Study C, the effect was positive ($\beta = 0.07$, $p < 0.05$) (see Fig. 6). Finally, H11 was not supported, as the interaction between loneliness and demotivation due to social comparison did not have a significant impact on communication overload in both datasets.

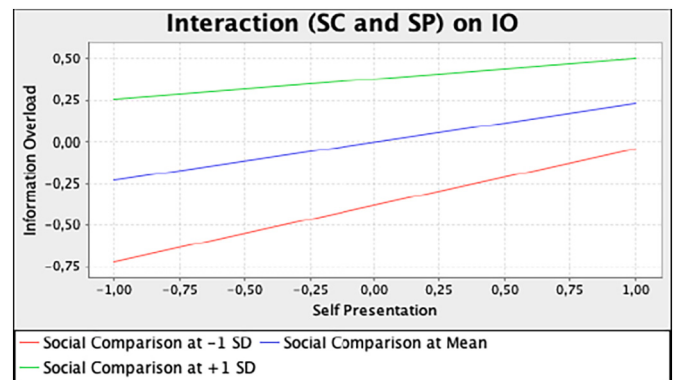


Fig. 4. Interaction effects between self-presentation and social comparison on information overload (Study C).

6. Discussion

Overall, the results supported our conceptualised framework with six of eleven hypotheses fully and three partially supported by the data. We found significant results regarding the relationship between loneliness and information overload in both Study A and B, thus supporting H1. However, contrary to expectations, loneliness was only associated with communication overload in Study C; thus, H2 was partially supported. The results confirmed that loneliness is a situational stimulus that can

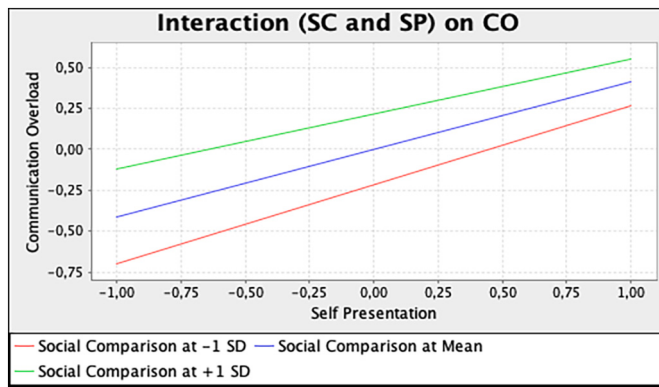


Fig. 5. Interaction effects between self-presentation and social comparison on communication overload (Study C).

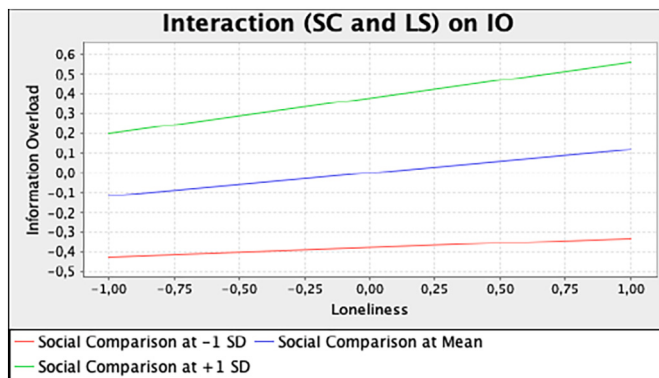


Fig. 6. Interaction effects between loneliness and social comparison on information overload (Study C).

drive students to indulge in excessive SMP use and consequently result in their experience of cognitive overload. However, the results indicated that exposure to SMP information and content may be a more powerful source of overload than communication exchange. One possible reason for this could be students' indelible use of SMPs for engaging in peer and familial communication (Kemp, 2022a; Statista, 2022). It may also be possible that these results have arisen due to sample-related differences and would require further investigation before any generalisations can be drawn. Moreover, our findings are aligned with O'Day and Heimberg (2021) stance on loneliness, providing novel insight into the effects of loneliness as a significant factor (e.g., Vasudeva, 2019) impacting Indian students' SMP usage.

Self-presentation emerged as a stronger predictor for cognitive overloads in comparison with loneliness, as we found statistical support for H3 and H4 in both Study B and C. Our results are aligned with prior scholars who determined self-presentation to be one of the most important SMP affordances attracting users (Appel et al., 2020; Islam et al., 2019). However, our findings are novel in determining the direct associations between self-presentation, information, and communication (i.e., cognitive) overload, as past studies have focused more on explicating young adults' SMF (e.g., Cao and Sun, 2018; Fu et al., 2020) as a consequence of their self-presentation efforts and strategies. These results confirmed that self-presentation is a powerful situational attribute that has a direct relationship with students' experienced DoSM phenomena of overloads, thereby generating nuanced insight into the complex interrelationships between situational factors, DoSM and individual well-being.

Furthermore, we found support for H5 and H6 in both studies B and C, which confirmed that information and communication overload significantly influence students' SMA. This is another novel and

interesting finding pointing to the proclivity of Indian students to be unable to self-regulate their SMP use even in the face of cognitive overload; this finding is similar to those of Whelan et al. (2020a). Instead, these students may be prone to increase their SMP use to compensate for their perceived overload and exhibit a higher cognitive and emotional preoccupation with SMPs (Cao et al., 2018), reflecting addictive usage patterns. It is also possible that such increased usage is adopted as a distraction or coping method, as suggested by Tarafdar et al. (2020), indicating that cognitive overload may be an unpleasant organismic state that falls under the premise of TCIU. It is a promising avenue for further research, as diversionary forms of SMP activities may reveal more nuances of the intricate ways in which these platforms are intertwined with human lives.

In concurrence with prior research, we also found strong evidence that SMA can lead to RAP (H7) in both Study B and C, mirroring the findings of Whelan et al. (2020a). Supported by prior research (e.g., Busalim et al., 2019; Malik et al., 2020), the results confirmed that addiction to SMPs like Facebook can cause students to be preoccupied with maintaining continual connectivity with these platforms rather than focusing on academic goals, thus leading to RAP. Our findings add to the extant literature on the DoSM's detrimental effects on individuals' personal and professional well-being (Tandon et al., 2020; Tandon et al., 2021a), indicating that such effects may be a generalised phenomena, thus highlighting the importance of further research on DoSM experiences.

Lastly, we found divergent results regarding the moderating role of demotivation due to social comparison, wherein only partial support was found for H8 and H9 from Study C. H10 was found to be insignificant in Study B and showed a positive effect in Study C, which meant that this hypothesis was unsupported. H11 was found to be insignificant in both studies. The results indicated that demotivation arising from students' tendency to compare themselves with others on SMPs has a significant negative moderating influence on the association of self-presentation with cognitive overload (H8 & H9). This suggests that when students feel less demotivated following their SMP-driven social comparison, the association between self-presentation and cognitive overloads becomes stronger. This is not an unexpected finding since students are vulnerable to and affected by thoughts of their own accomplishments vis-à-vis their peers. We believe that is affective consequence (i.e., less demotivation) may lead them to engage in greater SMP use (in terms of information sharing and communicative exchange) in order to reaffirm their needs for self-presentation and maintaining an ideal social image—in turn exacerbating their experienced cognitive overload.

Moreover, we found a positive significant moderating effect of demotivation due to social comparison on the association of loneliness with information overload (H10), suggesting that this association is stronger when students' experienced demotivation is higher. Our results thus suggested that lonely students who feel more demotivated after comparing themselves to others may enhance their SMP usage in order to gain more information or follow more content shared by others. A possible reason for this result may be that lonely students may feel less socially excluded while reviewing others' shared content but their high exposure to such content might overwhelm them. However, since these associations have no a priori evidence, more research is needed before any generalisations may be made.

7. Conclusion

We raised and answered two RQs aimed at understanding how a student's situational triggers and addictive SMP use reduce their AP. Having conducted a qualitative study to identify the factors that fit the S-O-B-C framework in terms of the study context—i.e., India (Study A)—we collected data through two cross-sectional surveys (Study B and C) and analysed it through PLS-SEM to test our proposed research model. We raised seven hypotheses for direct and four for indirect effects,

wherein six hypotheses for main effects were fully supported, showcasing the significant impact of situational triggers on students' organismic state that precede their SMA and RAP. We found partial support for the moderating role of demotivation due to social comparison, indicating that this may also be a contextual factor driven by individual tendencies rather than a specific SMP affordance. Our findings present new insights into the DoSM experiences of Indian students and showcase that SMP use can negatively influence their academic, and perhaps even their professional, lives. The results raise significant implications for theory and practice, as they can assist academicians and practitioners like educators in helping students avoid the potential pitfalls of problematic SMP use and DoSM phenomena.

7.1. Theoretical implications

Our study provides four main implications for theory and research on the DoSM. First, by using S-O-B-C, we contribute to the advancement of theoretically grounded research on the DoSM and the adverse impacts of problematic SMP use on students' lives in the context of India. Our results imply that such theoretical frameworks may be able to provide more robust explanations and foundations for explicating the many pathways through which SMPs influence individual lives. Our findings strongly imply the need to advance research in this field by adopting other seminal theoretical frameworks like social cognitive theory (Khan et al., 2021) and the uses and gratifications theory (Abbasi et al., 2021).

Second, we determined that SMP usage can influence individuals' lives in complex and often unprecedented ways by confirming that cognitive overload can lead to SMA in some instances. This is an exciting contribution to the literature as most prior studies have found such overloads to cause SMF (e.g., Islam et al., 2020; Whelan et al., 2020b), SMP discontinuance, or reduction in use (e.g., Fu et al., 2020; Luqman et al., 2018). The results imply the need to conduct more nuanced investigations into DoSM experiences and the myriad ways SMPs can influence users' psychosocial well-being.

Third, we offer new insights into the situational stimuli and organismic states that can trigger Indian students to use SMPs in a manner that adversely affects their AP. Prior literature on this issue has mainly focused on SMP affordances like self-disclosure and privacy concerns (e.g., Malik et al., 2020). On the contrary, to the best of our knowledge, loneliness and self-presentation have not been previously considered as situational antecedents of cognitive overload through the S-O-B-C framework. Further, Indian students' RAP consequent to SMA is a less-investigated research topic. Our findings highlight the need to further investigate the effects of other situational stimuli, such as life satisfaction and phubbing, on Indian students' academic, and professional well-being. This is a critical avenue for further research, as India is home to a significant number of young adult SMP users (Kemp, 2022a), and the psychosocial well-being of these vulnerable SMP users is already a cause for concern among practitioners (Naik, 2022; UNICEF., 2021).

Finally, the divergent effect of demotivation due to social comparison as a moderator in our framework highlights the need to incorporate additional situational, context-based, and personal tendencies as indirect influences in the conceptual frameworks targeted at gaining more in-depth insights into how the DoSM manifests. Such additions would contribute significant value to the existing body of knowledge by further explicating the nuanced ways in which individual tendencies interact with users' stimuli or motivations, and SMP affordances to create adverse effects on individual well-being.

7.2. Practical contributions

Our findings also raise four practical implications for stakeholders like parents, educators, and college counsellors who can help students manage the influence of SMPs in their lives. First, the results suggest that situational triggers can translate into SMA-driven RAP. Therefore, parents, educators, counsellors, and students themselves should focus on

measures that promulgate balanced SMP use with respect to offline interactions, which could also help to alleviate students' loneliness and prevent their over-engagement with SMPs. Educators and parents should assist students in developing continual personal performance-check measures that help them continue using SMPs while also meeting their academic goals and objectives.

Furthermore, students should gain assistance in understanding that not all information or communication requests on SMPs need to be responded to. They should also be made more aware that social comparison does not diminish or enhance one's accomplishments and that each individual has their own path to follow. While this might seem to be a more philosophical implication, we believe that mindfulness towards the self is a key element of good living (Standke-Erdmann and Viehoff, 2020) and personal sustainability (Niehaus et al., 2018). Parents, university counsellors, and educators should help students develop personal strategies to manage the SMP communique, which prevents overload—for example, by setting personal boundaries to filter out unimportant communication requests or setting specific timelines for responding to them. This will help students set the rules of engagement for different information and communication-related SMP affordances.

Second, we believe that SMP service providers can provide proactive and preventive communication to their users to help them balance SMP usage. For example, service providers can inform users about spending too much time on SMPs, which can indicate problematic usage patterns or SMA. Additionally, providers can highlight features like activated communication filters that allow users to filter incoming newsfeeds and others' shared content based on prioritised groups or select SMP friends. Our implication is supported by the recent initiatives taken by service providers such as Facebook and smartphone manufacturers such as Apple and Xiaomi towards placing well-being indicators informing users about their usage patterns.

Third, we suggest that communal stakeholders like social peers and parents should be more active in guiding students in safely navigating their digital and offline lives. For example, parents and friends can encourage more offline interactions among students in campus environments that can help this vulnerable cohort fulfil their needs for self-expression and relatedness. We particularly emphasise the role of social peers or friends in assisting students exhibiting signs of SMA and digital or technostress for example, by encouraging them to participate in more campus-based real-time events that can (i) lessen their experience of detrimental affective consequences arising from social comparison and (ii) enhance their perceived social inclusion and relatedness. It is of particular importance that these peers help individual SMP users modulate and attenuate their experienced demotivation and dissatisfaction due to social comparison, as they may be more relevant sounding boards for university students than, for example, parents. These peers can also guide the vulnerable students towards counsellors and educators in the university ecosystem, who could help the SMA-afflicted students in more formal ways.

Fourth, given that loneliness and self-presentation are significant triggers for cognitive overload, we imply the need for educators to address students' basic psychological needs through the college curricula. We suggest that educators may, as a proactive measure to encourage offline activities, introduce mandatory short courses in the curriculum that emphasise social activities such as theatre or drama clubs, movie nights, and other hobby clubs. It is possible that encouraging more offline social interactions in a supportive and educational environment could allow students to develop a balanced approach to managing their digital and offline lives instead of purely engaging in digital interactions as a compensatory mechanism for meeting psychological needs.

7.3. Limitations and directions for further research

Despite the rigorous processes followed, our study has a few limitations that must be acknowledged. First, our use of cross-sectional

surveys for a specific demographic cohort (i.e., university students) in a singular geographic context (i.e., India) limits the generalisability of our findings. In the future, scholars should try to validate our results by undertaking similar investigations in other countries and conducting cross-cultural studies, which will help yield more generalisable findings.

Furthermore, using a self-report instrument could have caused inherent biases associated with such data collection techniques. Future scholars could use more objective measures to test the research model. For example, scholars may employ neuroscience approaches (e.g., see Meshi et al., 2015; Montag, 2019) to measure students' overload levels. SMA can also be measured objectively, for example, by using log data. Moreover, our sample mainly consisted of male respondents and may have skewed the findings' perspectives in terms of gender. Future scholars should recruit more female respondents or a balanced sample to further refine our understanding of the pathways through which AP is adversely influenced by SMP use.

Third, this investigation is limited to a few constructs that fit the S-O-B-C framework. There are many SMP-related behaviours, like passive or active forms of SMP use, as well as outcomes, such as cyberloafing, that would fit this framework. Future studies can broaden the field of investigation by studying other outcomes and situational triggers. Moreover, SMP behaviours of different types of users (e.g., elderly users or working professionals) may also be investigated using the S-O-B-C lens. Another potential avenue of future research is identifying mitigating factors that reduce the effects of SMP use behaviours on students'

AP—for example, information security awareness, self-esteem, self-efficacy, and satisfaction with digital lives or online subjective well-being.

CRediT authorship contribution statement

Fauzia Jabeen: Conceptualization; Investigation; Methodology; Project administration; Roles/Writing - original draft; Writing - review & editing.

Anushree Tandon: Conceptualization; Investigation; Methodology; Visualization; Roles/Writing - original draft; Writing - review & editing.

Nasreen Azad: Formal analysis; Investigation; Methodology; Resources; Software; Validation; Writing - review & editing.

A.K.M. Najmul Islam: Conceptualization, Formal analysis; Investigation; Methodology; Resources; Software; Validation; Writing - review & editing.

Vijay Pereira: Supervision; Writing - review & editing.

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Data availability

Data will be made available on request.

Appendix A. Study variables, items, and loadings

Study variables (adapted from)	Measurement items	Factor loadings	
		Study B	Study C
Information overload (IO; Karr-Wisniewski and Lu, 2010; Whelan et al., 2020a)	IO1: I am often distracted by the excessive amount of information on Facebook.	0.86	0.79
	IO2: I am overwhelmed by the amount of information that I process daily on Facebook.	0.80	0.80
	IO3: I find it difficult to synthesise too much information on Facebook.	0.83	0.80
Social media addiction (SMA; Andreassen et al., 2012)	SMA1: I have spent a lot of time thinking about or planning the use of Facebook.	–	–
	SMA2: I have felt an urge to use Facebook more and more.	0.84	0.74
	SMA3: I have used Facebook in order to forget about personal problems.	0.70	0.70
	SMA4: I have tried to cut down on the use of Facebook without success.	–	–
	SMA5: I become restless or troubled if I am prohibited from using Facebook.	0.85	0.78
Reduced academic performance (RAP; Kubey et al., 2001; Malik et al., 2020)	RAP1: My studies have been hurt because of the time spent on Facebook.	0.80	0.77
	RAP2: I am too tired to go to college the next day because I spent too much time on Facebook.	0.78	0.73
	RAP3: My college percentage been hurt because of time spent on Facebook.	0.84	0.75
	RAP4: I have not completed homework because of time spent on Facebook.	0.84	0.77
	CO1: I receive too many messages from friends/family through Facebook.	0.81	0.77
Communication overload (CO; Cho et al., 2011)	CO2: I have to send many more messages to friends on Facebook than I would send.	0.82	0.78
	CO3: I get too many notifications of Facebook postings and messages.	0.85	0.79
	CO4: I receive more messages, news from Facebook friends than I can digest.	0.80	0.75
	LS1: I feel like an outsider.	0.72	0.78
Loneliness (LS; Russell, 1996; Hawkins-Elder et al., 2018)	LS2: I'm isolated from others.	–	–
	LS3: I'm unhappy because I'm isolated.	0.83	0.74
	LS4: I feel that I'm lonely even though I have people around me.	0.81	0.72
	SP1: I have a detailed profile on Facebook.	0.85	0.82
Self-presentation (SP; Krasnova et al., 2010; self-disclosure items)	SP2: My Facebook profile tells a lot about me.	0.87	0.86
	SP3: I reveal a lot of information about me on Facebook.	0.87	0.85
	SC1: I feel less motivated to use Facebook as I compare myself to others during Facebook use.	0.85	0.80
	SC2: I feel less motivated to use Facebook to avoid comparing myself to others.	0.87	0.80
Demotivation due to social comparison (SC, Cramer et al., 2016; Talwar et al., 2019)	SC3: Sometimes, I have negative feelings when others post on Facebook.	0.73	0.76

Note: '–'. items were removed due to low loadings.

Appendix B

HTMT matrix (Study B)

Study measures	CO	IO	LS	RAP	SP	SC	SMA
CO							
IO	0.601						
LS	0.236	0.277					
RAP	0.417	0.564	0.294				
SP	0.523	0.401	0.135	0.281			
SC	0.585	0.585	0.312	0.479	0.353		
SMA	0.524	0.529	0.416	0.881	0.392	0.574	

HTMT matrix (Study C)

Study measures	CO	IO	LS	RAP	SP	SC	SMA
CO							
IO	0.660						
LS	0.277	0.392					
RAP	0.445	0.502	0.314				
SP	0.612	0.468	0.162	0.323			
SC	0.468	0.675	0.417	0.504	0.337		
SMA	0.645	0.608	0.495	0.891	0.503	0.615	

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