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## **Self-regulation strategies of smartphone use during university self-study**

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### **Abstract**

The role of smartphones within education has received a lot of media and academic attention. This has typically focused on their use in the classroom, within tutor-directed sessions. However, less has been focused on how smartphone use is negotiated within self-study. Using semi-structured interviews, the current study sought to explore final year undergraduate students' ( $N = 6$ ) strategies for smartphone self-regulation during self-study time and the extent to which these strategies were effective. IPA revealed three main themes: "Urgency, Context and Consistency", "Learned Helplessness" and "Fear of Missing out (FoMO)". The findings extend our understanding of how conceptual frameworks such as self-regulation apply to smartphone regulation during self-study and provide insight into the barriers for effective regulatory behaviour. Implications for both self-study efficacy and smartphone regulation are discussed.

### **Keywords**

Smartphones; self-regulation; self-study; higher education; social media

## Introduction

More than half of the world's adult population rely on smartphones in day-to-day life (Andrews, Ellis, Shaw & Piwek, 2015) and this has since influenced a new generation of technology-related research. A large proportion of this research lends itself to young users, often who represent student populations, who are often referred to as the "net generation" (Worley, 2011). This generation is often said to possess an above average multitasking and partial attention ability, and to access a magnitude of information at a high speed (Chen & Yan, 2016). Indeed, David, Kim, Brickman, Ran and Curtis (2014) suggest that the versatile nature of smartphones has contributed to a life of simultaneous work, play, and socialisation for many and this is commonly found amongst students. Therefore, understanding how smartphones function within the academic lives of students is an area of interest. Particularly it is pertinent to understand how smartphones are used by university students when involved in self-study, which arguably constitutes a large proportion of their overall learning time. Self-study has been defined as "a way of learning about a subject that involves studying alone at home, rather than in a classroom with a teacher" (Cambridge Dictionary, 2020). Although the role of smartphones has been well explored in education, there is a paucity of research exploring their use during self-study periods, highlighting a pertinent area of enquiry.

The use of technology and smartphones within education has grown exponentially and has adapted based on how this corresponds to generational uses and preferences. For example, smartphones have developed in respect of increased screen size, touch responsiveness, processing ability and internet connectivity, and this has allowed them to be successfully integrated into both classrooms and self-directed learning (Camargo, Bary, Skiba & Boly, 2012; Davis, Compton, Farris & Love, 2015). University students themselves have reviewed the use of smartphones during studying to be positive and important (Hassain & Ahmed, 2015), although other work demonstrates that students reflect how their smartphone use (when unrelated to current classroom work) can reduce note-taking quality (Kuznekoff, Munz & Titsworth, 2015) and take time and attention away from work in a self-study environment (Furst, Evans & Roderick, 2018). This has also found to be applicable to high school students, in which it has been found that they use their smartphones in lessons to simply pass the time (Jenks, 2015) and overall find it difficult to refrain from interacting with their device when completing homework (Xu, 2013). Worryingly, these findings have also been observed in primary school children (Haddon & Vincent, 2015). For the sake of specificity, the current study is exclusively focused on university students and smartphone use during self-study (rather than classroom learning).

The extent to which a student will be effective in self-study is largely reliant on their level of self-regulation. This is described as the regulation or ability to control one's self, and internal states to become parallel with chosen standards (Baumister & Vohs, 2004; Posner & Rothbart, 2000). Many of the conceptual insights in self-regulation derive from the work of Bandura (1982, 1989), in which behavioural and emotional regulation are the central focus, alongside motivation and self-efficacy as additional facets. Importantly, regulatory functioning emphasises the interaction between the individual, their environment and their behaviour (Bandura, 1977). In a university self-study context, self-regulation is more typically referred to as self-regulated learning, within which a student maintains the appropriate behaviours necessary for their learning and achievement (Zimmerman & Schunk, 2011). Thus, Zimmerman and Schunk (2001) suggest that self-regulated learning is successful when a student has shown their ability to adapt, to be persistent and to be resourceful. Therefore, effective self-regulated learning helps us recognise positive impacts on self-motivation and initiative in learning (Tekkol & Demirel, 2018), and how this is achieved by ignoring or managing environmental distractions. In relation to smartphone use during self-study, smartphone presence can be considered as one of the environmental factors of self-regulation, which form a part of the reciprocal interaction model for a student and their behaviour.

Previous work has highlighted key factors which are likely to influence the extent to which smartphones may cause distractions in self-study. These include factors such as task importance, urgency and interest (Deng, 2020). Interestingly, most of this previous research exploring smartphone use during (self) study time has focused more exclusively on multitasking as the conceptual basis (e.g., Chen & Yan, 2016). Indeed, Deng (2020) explored the internal and external drives of multitasking in university students when using smartphones during self-study and identified common sources of interruptions. This highlighted the dynamic interplay of the individual, task and device. Multitasking is an individual's ability to address individual tasks simultaneously and switch between them (Judd & Kennedy, 2011; Zhang et al, 2013). In the case of self-study, this may consist of multitasking between using a PC for assignment work and a smartphone for other tasks (Yeykelis, Cummings & Reeves, 2014). Importantly, this differs from the concept of task-switching, whereby the individual changes between tasks, but this takes place within the same device, such as switching between tabs (Yeykelis et al., 2014). Regrettably, it has been found that the multitasking efforts made by students usually have unfavourable impacts on learning (Willingham, 2010; David et al, 2014; Calderwood, Ackerman & Conklin, 2014; May & Elder, 2018). For example, frequency of multitasking between activities such as texting has been found to be relate to interference in learning, which has detrimental impacts on academic performance (Lepp, Barkley & Karpinski, 2014). This makes conceptual sense given that attentional resources and working memory capacity will be reduced on learning tasks (Hazeltine & Witfall, 2011), which in turn limits the effect of any self-regulation efforts made by students during self-study (May & Elder, 2018).

Arguably, multitasking as a conceptual basis affords a more exclusive focus on the cognitive processing efficacy and learning impacts from dual demands of smartphone use and self-directed study. However, self-regulation theory does not seek to explain how environmental factors such as smartphones hinder (or help) the cognitive learning process, rather is more broadly concerned with their role in behaviours associated with self-study in this case. This is perhaps more helpful as a conceptual basis to explain the behavioural affordances rather than more exclusively the cognitive processes and impacts.

When further exploring how smartphones operate as an environmental factor in self-regulation during self-study, it is important to note the particular features of these which are influential. In the case of smartphones, this may often be attributed to the ease of accessibility they afford (Gökçeşlan, Mumcu, Haşlamam & Çevik, 2016). This includes behaviours such as regular checking, interacting and potential to use for extended periods of time, many of which are prompted by smartphone notification alerts, which can typically occur anywhere, anytime. Therefore, these notifications have the potential to interrupt many social situations, including self-study environments where students attempt to concentrate on specific tasks but often become affected by habitual notification responses (Du, Kerkhof & Koningsbruggen, 2019). The primary behaviours towards notifications follow four steps as suggested by Turner, Allen and Whitaker (2015), these being; react, focus, read and act. In an effort to understand why checking and interacting with notifications has become somewhat habitual to many smartphone users, Pielot and Rello (2017) undertook a study in which they asked participants to disable their push notifications for a 24-hour period. This resulted in participants experiencing stress and worry and escalated feelings of being socially excluded, often described as "Fear of Missing Out (FoMO). Therefore, although smartphones themselves may not inherently be problematic for self-regulation, features such as notifications may be a cause for disruption or distraction in self-study contexts (Park, Lim, Kim, Lee & Lee, 2017).

Notifications often are attributed to updates from social networking site apps (e.g., Instagram, Facebook). Social networking sites are tools, in which content is shared, produced and consumed by users (Davis, Compton, Farris & Love, 2015). Because a lot of smartphone use relates to using social networking sites, it is important to explore how the experiences with these may relate to distraction during self-study. The infinite ability to share and receive information over a variety of contexts enabled by social networking sites, has been argued to positively contribute to the degree of freedom and autonomy learners have during self-study (Lu, Hao & Jing, 2016).

This, alongside social networking sites being primarily social settings also can be a suitable platform for supporting group or collaborative work (Bunus, 2010), as well as positively impacting on peer relationships as students transition in and out of the classroom (DeAndrea, Ellison, LaRose, Steinfield & Fiore, 2012). However, the term “academic quicksand” has also been used when referring to the use of social networking sites when used in conjunction with academic studying (Flanigan & Babchuk, 2015). This has stemmed from its ability to strengthen habitual usage, disrupt attention and lower academic expectations and motivation (Fries & Dietz, 2007; Flanigan & Babchuk, 2015). However, a critical issue here relates to whether social media use is being used to fulfil academic purposes and thus support self-study, or whether it is being used purely for social uses (Smith, 2016). Whilst the latter may indeed have positive social impacts as noted previously, this may concurrently be a distraction and limit self-regulatory capacity. Evidence suggests that students often report social networking sites to provide little or no assistance during studying, as usage is primarily social (Dabbagh & Kitsantas, 2012; Guy, 2012; Hrastinski and Aghae (2012). Therefore, it is conceivable that social networking use via smartphones will undoubtedly be a cause of academic distraction rather than enrichment.

Although the existing literature provides evidence to highlight the role of smartphones (and as an extension to this, social networking sites) within university self-study provision, there is a paucity of evidence available to document how students themselves seek to self-regulate their smartphone usage during self-study. This may include exploring what strategies students may use to reduce the distraction caused when studying outside the classroom environment (Hartley & Bendixen, 2019). Arguably this would be pertinent information to provide a basis for supporting students to become self-regulated and autonomous learners. Based on this limitation, the current study aims to explore the smartphone regulation strategies used by undergraduate university students during their self-study. Specifically, we sought to address two research questions (RQs):

- RQ1: To what extent are undergraduate students distracted by their smartphone during self-study?
- RQ2: What regulation strategies do students use to minimise smartphone distraction during self-study, and how effective are these?

This was achieved through a series of semi-structured interviews with undergraduate students which adopted an interpretative phenomenological analysis (IPA) approach.

## **Method**

### **Participants**

Six participants were recruited via opportunity sampling to take part in this study. Each participant was enrolled as a third-year undergraduate on a degree programme relating to social science (e.g., psychology, sociology) at Edge Hill University. Participants age ranged from 20 to 21 (mean age: 20.16 years old) and this sample contained an equal gender mix. In order to fulfil requirements, all participants confirmed they owned a smartphone with one or more social media profiles installed.

### **Procedure**

The research was reviewed and approved by the Department of Psychology Research Ethics Committee at Edge Hill University. An advert to the research was made available to potential participants on social media, and upon expressing an interest, they were contacted by the researcher via a private message. A mutually convenient time and neutral place was agreed for their interview to take place. On arrival, participants were asked to read a participant information sheet and to sign a consent form prior to the interview commencing. Once consent had been confirmed, participants were assigned a participant number, which was then used for the remainder of the study.

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The interview format was semi-structured in nature. Initial questions aimed to gather some background information about general smartphone use and self-study habits. These included, 'How many hours per week would you say you spend on your smartphone?' and 'How do you take a break during your self-study time?' As the interview progressed, the focus of interview questions shifted in order to explore the extent to which smartphones may cause distraction during self-study. Questions included: 'If a notification comes up on your smartphone whilst you are studying, how do you react to it?' A large proportion of interview questions aimed to discover what strategies participants used to try and limit this distraction such as, 'Do you have any strategies that limit the extent to which you reach for your smartphone?' and 'How consistent are these strategies across various contexts?'

Interviews were audio recorded and on average, lasted between 20-25 minutes. These were audio recorded using a Dictaphone to allow a full written transcription to be made to ensure an accurate account of the interviews. Interviews ended with participants being asked to give an overall assessment of the degree to which the quality of their self-study has been compromised by smartphones. All interviews took place in a quiet and private environment. Debrief sheets were distributed upon completion, alongside thanks to the participants for their time. Helplines were included on the debrief sheet in case participants wished to seek additional support which may have been prompted by taking part in the research.

## **Analysis & Discussion**

In line with IPA, data was transformed into emergent and cluster themes within the analytic process. From this, three cluster themes were devised with a number of emergent themes within these. The cluster themes were: "Urgency, context and consistency", "Learned helplessness" and "The fear of missing out (FOMO)". These will be discussed in the following sections.

### **Urgency, context and consistency**

#### ***Urgency***

Urgency of work demands was a critical factor in determining participants' smartphone regulation strategies during self-study. All participants explained how the temptation to use their smartphone during self-study was heightened when the task at hand had little urgency, leading to boredom. As a result, self-regulatory smartphone strategies became almost non-existent, as highlighted by Participant 1; *'I procrastinate rather than writing the words because I still think the deadline is ages away'*. Alternatively, if self-study tasks were urgent, participants discussed that this was when regulation strategies were implemented. Participant 3 explains how the strategies have to become more disciplined than normal, *'A lot of the time when I'm studying and doing assignments that need to get done that day, I have to turn my phone off because when I get a notification I get very distracted.'* Similarly, Participant 4 expressed a need for minimal distractions when time is limited, with a variety of strategies that could be used:

*'I use an app called Flora, it stops you going on your phone so you can pick how long you can pick 25 minutes, 50 minutes, 1 hour and 25 minutes or 1 hour and 50 minutes and then you press start and can't go on your phone till that time is up... Either that or I put my phone in a different room or leave it with my friends if I really need to get an assignment done, instead of getting distracted, going on my phone and wasting 20 minutes'* [P4, lines 148-161].

These accounts would suggest task urgency to be an influential factor, in determining both how distracting smartphones are during self-study and consequently to what extent strategies are then implemented in response to that distraction. This relates to both the type of strategy used and also how seriously it is then adhered to.

## Context

As well as task urgency, the place in which self-study was taking place was influential to participants when selecting to implement certain strategies. As Participant 1 describes:

*'My main strategy is actually getting out of bed and going to sit at my desk cause if I'm sat in bed with my laptop I'm most likely to take a nap or end up scrolling through my phone with my laptop in front of me. On my desk I can sometimes put my phone to one side'* [P1, lines 155- 159].

This would imply that adopting a more formal learning environment is one of the key strategies for self-study success amid smartphone distractions. Participant 6 strengthened this idea when asked about the proximity of their smartphone during self-study to which they replied, *'I don't have a desk at home so I just sit on my bed but that means it is always within 2 feet of me'*.

Furthermore, participants expressed a difference in the use of strategies depending on whether they were completing their self-study at home or on the university campus, such as the library. Participant accounts suggest that these strategies are not consistent over these two contexts, especially the use of the, "Do not disturb" iPhone feature. This feature allows users to elect to block notifications to their smartphone for their select duration of time. Participants who admitted to using this at home, describe a struggle when it comes to using it in a public place such as the library. This was evidenced by Participant 2 who said, *'I've used them more at home, I feel like at the library I sometimes use my phone a lot more.'* The response from Participant 3 indicates as to why this might be the case:

*'In the library it is difficult not to have my phone on me simply because in the library there's a lot of people so my friends may possibly ask me where I'm sitting or ask me this that and the other and I like to be available so I can respond to them quicker'* [P3, lines 194-198]

Therefore, an additional facet of self-regulatory behaviours is the context in which these behaviours are taking place. In this case, it seems that an environment such as a library which is more situated as a formal or focused learning environment is critical for more effective self-study.

Context also referred to the people self-study may consist of. That is, self-study contexts with others appeared to be helpful in encouraging adherence of smartphone regulation strategies, whereas lone working was not:

*'My phone is a worse distraction when I'm on my own though, no one is judging me and I'll just be on my phone playing a game, scrolling through Facebook, scrolling through Instagram and there's no one to be like stop now you need to write your dissertation.'* [P1 lines 67-71]

Participant 5 also alluded to a similar notion:

*'During group work I don't go on my phone at all cause I think it's just rude when working with other people, but when I'm on my own I'm my own worst enemy. I'll go on my phone, know I shouldn't be on it, but I will just do it anyway.'* [P5 lines 76-80]

### Consistency

In addition to urgency and context, the consistency of using smartphone strategies during self-study were important to the overall effectiveness of these. Participant 5 provided a good example of how consistent strategies benefitted their self-study, *'I always log myself out as well so I'll go on Instagram and just can't be bothered to log myself in, so it has reduced my screen time significantly.'* In comparison Participant 4 showed the consequences in the absence of a consistent strategy:

*'If I don't use the app or leave it another room it just takes me a lot longer to do my work I know I could write 500 words in like 30 minutes or something but like sometimes if I've got my phone with me it can take me like an hour or two hours.'* [P4, lines 198-202]

Participant accounts also demonstrated how individuals' self-regulation ability played a key role in how consistent they were able to adhere to these strategies. Most participants showed to have rather low levels of this ability and the impact was evident in their accounts. Participant 6 in particular, showed a blasé attitude with regards to smartphone usage during self-study, *'If time has elapsed and I've spent hours on it that's completely fine by me.'*

It also became apparent that having little to no self-regulation ability prevented participants from adopting new approaches or strategies to focus during self-study. With reference to a possible new strategy, Participant 5 said, *'I like the idea, but I don't know if it would stop me and I think you have to be quite focused.'* Not only is this evidence of this participant limiting themselves but leads us to question how consistent strategies can be if attitudes towards them are as cynical as suggested.

Although there was evidence in participants' account of strategies such as using "Do Not Disturb" features on their smartphones, these appeared to be used more consistently for non-academic purposes. Some participants highlighted how they like to use the, "Do not disturb" function to help with their sleep. Participant 1 said, *'Putting do not disturb on whilst having a nap is the best thing in the world'*, further emphasised by Participant 2, *'I do quite like it when I'm going to sleep to avoid noises.'* Although a good quality of sleep is associated with better academic performance (Okano, Kaczmarzyk, Dave, Gabrieli & Grossman, 2019), this demonstrates how potential strategies to limit smartphone distractions are being better utilised consistently, in other aspects of life rather than study.

There are some interesting conclusions to be drawn from the current findings in respect of this cluster theme. Largely there are discussions around self-regulation theory and the extent to which the different factors in the current findings align with individual, environmental and behavioural facets as outlined by Bandura (1977). Whilst there is not specific evidence yet of individual-level factors, there are environmental factors operationalised through task urgency as well as self-study context (home or university) and the people who reside in this. In respect of behaviours, the use of consistent smartphone regulation strategies and using "Do not disturb" appeared to be behaviours related to efficacy of self-regulation here. These findings extend those previously found by Deng (2020) in respect of multitasking of smartphone use during self-study. Namely, key facets here were found to be task urgency, importance and interest. Whilst we found evidence to corroborate these facets (particularly participants made clear reference to the notion of urgency), what we found in addition was that self-regulation was greatly influenced by context, as well as consistency.

This suggest that models of smartphone self-regulation may be better framed from a wider contextual and behavioural perspective to more fully explore the factors which facilitate and inhibit effective regulation. This is currently omitted from mainstream models of smartphone use. Indeed, these tend to seek a pathological explanation for excessive use as an individual concern (see Carvalho, Sette & Ferrari, 2018 for review). Clearly more is needed to account for a social explanation in understanding the conditions under which smartphone regulation is likely to be more (or less) viable (whether this relates to understanding academic use or not). Making greater use of theoretical framework such as self-regulation theory would be a significant advancement to this literature to more fully explore account for these issues.

## Learned Helplessness

Participants' accounts were largely reflective of the notion of a helplessness in changing their behaviour. This was somewhat characteristic of Seligman's (1974) notion of learned helplessness. This is described as a process within which an individual learns that their attempts to withdraw themselves from a negative situation, are no longer working. As a result, their behaviour becomes passive and they do little to further help themselves (Seligman, 1974). Participant accounts demonstrate some applicability of this when it comes to smartphone usage during self-study. Namely, participants made it clear that they were aware of the consequences associated with excessive smartphone use during study yet saw little point in making a change in either their attitudes or behaviours. For example, Participant 4 described their attitude towards "screen-time":

*'With screen time sometimes I find it quite funny how much I'm on my phone but then if it's over like ten hours I'm like that is a little bit worrying but I don't go oh I can't go on my phone today cause it's too high, I'm just going to go on it. Everyone does it, it's not like it's just me who's always on their phone... it doesn't really worry me enough to make a difference.'* [P4 lines 69-77]

Also as suggested by Participant 1, when asked about the impact of their smartphone on their concentration said, *'It's quite a big one...the best thing to do is probably turn my phone off, but we both know that's not happening.'* This leads to the question of how students are supposed to successfully implement strategies when they are not motivated to change their mind-set.

Participants also demonstrated how this so-called learned helplessness can occur as a result of poor study habits that are too habitual to break. This became evident when participants were asked about taking breaks from self-study. Participant 6 responded, *'When I've done a minute's work I'll think that's good enough to take an hours break to be honest.'* They then proceeded to describe any changes they would or wouldn't make in order to improve this:

*'I'm so far away from a first that it doesn't really matter to me. I'm just going to sail through and continue doing what I'm doing, with my smartphone I don't think I have to change anything at this point'* [P6, lines 210-214]

It seems therefore that this is far more than just about smartphone regulation strategies and more about self-regulatory approaches to study more generally. However, smartphone notification seemed to be a particular issue. Participant 5 demonstrated they were aware of how their notification behaviour has developed negatively:

*'I am the worst when I get a notification I'm on it straight away I would never let notifications rack up on my phone screen, if it pops up and I'm doing some work I have to look at it, I wish I didn't.'* [P5, lines 30-33]

A similar outcome could be seen with several other participants including Participant 2 who said, *'I will just leap for my phone if it makes a noise cause I am just not engaged.'* Both Participant 5 and Participant 2 mentioned no further strategies in place to try and minimise this impact as Participant 2 later described, *'Do not disturb doesn't stop it from coming on your screen...so I'll still be tapping the screen.'* From this, it can be inferred that participants tend to see little purpose in correcting these checking and interacting behaviours, when previous attempts have not induced a change.

These findings speak to the individual-level factors of self-regulation relating primarily to attitudinal factors. It is widely considered that attitudes explain at least a certain proportion of subsequent associated behaviours (Padin, Emery, Vasey & Kiecolt-Glaser, 2017) therefore, recognising how attitudes may be modified to be more forward-focused and malleable may be an important issue here. Namely, if attitudes surrounding one's own smartphone use are less fixed and can be modified to allow the user a sense of efficacy in changing their own behaviours, this may be fruitful in encouraging more successful self-regulation behaviours.

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## The Fear of Missing Out (FoMO)

Participants not implementing effective smartphone regulatory strategies was found to be driven by the fear of missing out (FoMO). This was evident in a number of reported behaviours which participants identified, including: proximity of a smartphone, and checking and interacting behaviours. These will be discussed in the following sections.

### *Proximity of smartphone*

In order to determine why study strategies may not work, each participant was asked how close in proximity their smartphone is to them during their self-study time. Participants' accounts revealed these to be largely equivalent and in all cases, within reaching distance. Examples of responses included: Participant 1, *'It's always in front of me'*; Participant 2, *'Arm's length'*; and Participant 3, *'Directly next to me.'* When asked why, the answers provided suggest a fear of missing out that develops into paranoia to be the reason, such as that of Participant 3:

*'When I'm by myself I feel I almost have a guilty conscience what if something has happened right now and my phones off, so I'd rather have my phone near me just in case something happens so I'm able to respond to it and see what's going on.'* [P3, lines 102-106]

Participant 2 further emphasises this suggesting that it becomes harder to concentrate on studying when their smartphone is out of sight: *'It's like a paranoia thing, if you leave your phone at the other side of the room anything could be happening so you can't really leave it.'* Similarly, Participant 1 suggests that distancing themselves from their smartphone during self-study, only makes them more inquisitive about what they are potentially missing, and more likely to break any strategies that are in use:

*'There is not one time that I've been studying and I've not touched my phone it's always there. I can't just put it in my bag or my pocket because it's still there and it will still vibrate or I'll be able to hear it and I'm like "ooo wonder what that is".'* [P1, lines 54-58]

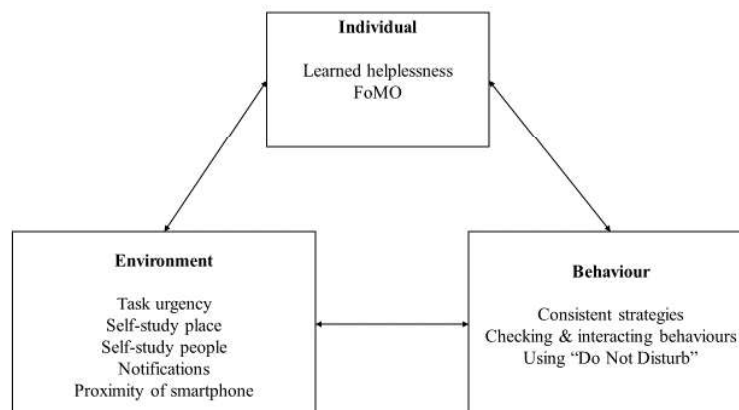
### *Checking and interacting behaviours*

A further way FoMO transpired in smartphone behaviour was through checking notifications and interactions. This particular derived from social media notifications. Participant 4 highlighted how unknown notifications present more temptations and so the likelihood of interacting with them and disrupting self-study is increased, *'Cause you can't read it if it's from Snapchat... it's like ooo what have they said I need to open it now.'* Participant 2 relates this specifically to students who may be potentially missing out if living away from home, *'I feel like at uni I'm like "oh let me see what my friends at home are doing let me see what my boyfriend's doing" and I'm checking my phone a lot.'* It also became evident that if participants were trying not to interact with their notifications, they felt as though they still had to check them to ensure that it was not urgent and that they were not missing out. For example, with reference to Snapchat, Participant 5 said, *'I'll look who it is and if it's someone I'm not too bothered about I'll just leave it.'*

In the context of internet connectivity and the likelihood of social networking site applications being prevalent in students' smartphone, it is important to acknowledge how this relates to self-study strategies. Indeed, the current findings suggest that notifications via smartphones which relate to social media activity are a key detrimental factor on efficacy in self-study regulation. In line with previous evidence, social media is primarily a social rather than academic tool for students (e.g., Dabbagh & Kitsantas, 2012; Guy, 2012; Hrastinski & Aghaee, 2012), therefore is a distraction rather than facilitator of self-study. Close proximity of devices and habitual checking appeared to be behaviours largely driven by FoMO. Therefore, the issue is not with smartphones per se, but perhaps with the way notification settings are being used by users.

From a theoretical point of view, notifications and proximity of devices feature as environmental factors, which interact with individual-level factors of FoMO, which also concurrently interacts with behavioural factors such as checking. This illuminates the efficacy of self-regulation theory as a conceptual basis to understand the complex interplay of these three facets of smartphone use during self-study. Figure 1 provides a visual representation of the current findings in line with the principles of self-regulation theory.

**Figure 1. Visual summary of the current findings in relation to the individual, environmental and behavioural factors of smartphone regulation during self-study**



## Limitations

As with all research, this study is not without limitation. Firstly, all participants were students enrolled on all third-year undergraduate students on social science-related degree programmes. Matching participants on this basis was useful for avoiding any confounds between course types and year yet make it difficult to generalise a broad demographic of student. That is, students enrolled on professional or vocational courses may experience differences in self-study time and approaches and therefore the findings may be only applicable to a certain sub-sample of the student body. Understanding the smartphone regulation strategies for a broader demographic of student is therefore useful to extend this work further. This could help inform any interventions, particularly in what may be successful self-regulation strategies with smartphones during different types of self-study or other activities. Developing effective self-study strategies may be best positioned at an early stage of young people's education, particularly during earlier stages of adolescence, given the current findings highlighting that smartphone uses during study seemed rather ingrained at the point of their university-level education (final year).

## **Conclusion**

To conclude smartphones have undoubtedly become an integral part of everyday life, due to the ease and accessibility they provide, by allowing leisure and work amenities to be in one place simultaneously. However as demonstrated by the current findings, the integration of academic and social functions can be problematic to students in self-study, at least in some cases. Our findings evidence the range of individual, environmental and behavioural factors which operate in determining effective self-regulatory smartphone use during self-study and illuminate the dynamic interplay these afford. We advocate the merits of self-regulation frameworks for future work which seeks to understand smartphone use, irrespective of whether or not this is in academic contexts. This can help provide a more socially situated explanation for smartphone behaviours to extend the existing mainstream rhetoric of (pathological) smartphone use being an individual concern.

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## **Disclosure statement**

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