



The interplay among digital distraction, self-regulation of learning tendencies, and motivational influences: A transnational investigation[☆]

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ABSTRACT

College students' misuse of mobile devices during class for off-task purposes is a global issue that harms learning. While prior studies examined device misuse frequency within individual countries, no known studies have directly compared transnational differences in this behavior, leaving little known about whether crosscultural differences influence this behavior. This study investigates whether the country where students attend college (United States, South Korea, or Turkey) moderates the relationships among self-regulation of learning (SRL) tendencies, motivational factors (basic psychological needs satisfaction and utility value perceptions), and device misuse. Hierarchical moderated regression analyses revealed consistent patterns across cultures: SRL tendencies had little impact on device misuse, whereas basic needs satisfaction and utility value perceptions served as protective factors. Findings suggest that digital distraction in college classrooms transcends cultural influences that commonly lead to differences in student behavior, emphasizing the need for globally relevant strategies to reduce distractions and enhance student motivation. These results also challenge traditional assumptions that self-regulated learners are less susceptible to digital distraction. Even the more self-regulated participants in the present study regularly misused their devices during class. Such findings indicate that the performance phase of SRL that unfolds during class is riddled with disruptions and device misuse, even for the more self-regulated college students. Findings highlight the importance of fostering motivationally supportive learning environments to curb digital distraction and nourish student engagement.

1. Introduction

Student misuse of mobile devices (e.g., smartphones, laptops) during class is an ongoing, global issue in postsecondary classrooms (Flanigan & Kim, 2022; Geçer, Yıldırım, Bağcı, & Atar, 2024; Jamet, Gonthier, Cojean, Colliot, & Erhel, 2020; Parry & le Roux, 2018; Wammes et al., 2019). College students across cultures chronically use their devices for off-task purposes (e.g., texting, scrolling social media, browsing the Internet, gaming, shopping) in the classroom (e.g., Jamet et al., 2020; McCoy, 2020). This phenomenon is commonly called digital distraction (Flanigan & Titsworth, 2020; McCoy, 2020). Perhaps unsurprisingly, misusing mobile devices interferes with attention (Colliot, 2022; Peng & Tullis, 2022), reduces engagement (Kuznekoff & Titsworth, 2013;

Ravizza, Uitvlugt, & Fenn, 2017), and hinders learning in classroom settings (Kates, Wu, & Coryn, 2018; Kuznekoff, Munz, & Titsworth, 2015; Ravizza, Hambrick, & Fenn, 2014). Many college students are aware of these downsides and still consciously decide to misuse their devices during class (Flanigan & Babchuk, 2015; Froese et al., 2012; Gingerich & Lineweaver, 2014).

Previous studies have predominantly focused on singular populations, often overlooking how cultural contexts might influence device misuse in college classrooms. To date, little to no known research has taken a cross-cultural approach when investigating the factors associated with device misuse in the classroom. This lack of transnational research into a transnational issue has left a hole in the global research community's understanding of whether some cultures might be more or

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less susceptible to the digital distraction phenomenon than others. The purpose of the present research was to investigate whether cross-cultural differences exist in how motivational influences (i.e., basic psychological needs satisfaction and perceived utility value of coursework) and college students' self-regulation of learning tendencies predict the frequency of their device misuse during class.

2. Literature review

2.1. Digital distraction in college classrooms

Learning refers to both a process and a product (Alexander, Schallert, & Reynolds, 2009). Digital distraction hinders both (Flanigan & Kim, 2022). As a process, learning refers to the thoughts, behaviors, and experiences that people have while learning new knowledge or skills (Alexander et al., 2009). Digital distraction interferes with the learning process by pulling student behaviors and attention off-task (Colliot, 2022). Most of the device misuse in college classrooms happens on smartphones and laptops (McCoy, 2020). The typical college student spends about 30 % of an average class period misusing their smartphones (Flanigan, Hosek, Frisby, Babchuk, & Ray, 2023; McCoy, 2020). Off-task phone use occurs once every five minutes for many undergraduates (Kim et al., 2019), leading them to send and receive more than a dozen text messages each class period (Dietz & Henrich, 2014; Pettijohn, Frazier, Rieser, Vaughn, & Hupp-Wildsde, 2015). Laptop users do not fare any better. Most laptop users spend around half of their class time using their computers for non-class purposes (Ragan, Jennings, Massey, & Doolittle, 2014; Ravizza et al., 2017). Although many students believe that using laptops in class makes it easier to take notes and learn (Houle, Reed, Vaughan, & Clayton, 2013; Morehead, Dunlosky, Rawson, Blasiman, & Hollis, 2019; Witherby & Tauber, 2019), they often choose to use these devices for distracted, off-task purposes. Thus, if devices are allowed in the classroom, then it is likely that many students will use those devices for off-task purposes during class, even if students had intended to use their devices for on-task purposes (e.g., typing their notes, looking up course-relevant information).

Digital distraction also interferes with the products of learning—the knowledge and abilities gained by engaging in the learning process (Alexander et al., 2009). A growing combination of experimental (e.g., Demirbilek & Talan, 2018; Flanigan & Titsworth, 2020) and correlational (e.g., Kates et al., 2018; Ravizza et al., 2017) research has shown that misusing digital devices during class lectures hinders learning. Reductions in lecture learning begin to emerge even after a modest amount of device misuse (Fauquet-Alekhine, 2015). Moreover, the frequency of students' device misuse during class has been linked to reductions in their course grades (Kates et al., 2018) and cumulative grade point average (Wu, Mei, & Ugrin, 2018). These downsides highlight the nefarious influence of digital distraction in higher education and the persistent need for research aimed at better understanding student digital distraction.

2.2. Self-regulation of learning and digital distraction

The learning process is often understood and studied within the framework of self-regulation of learning (SRL). SRL refers to the extent to which learners take behavioral, cognitive, and metacognitive control and ownership over their learning process (Zimmerman, 1986). Students are being self-regulated when they intentionally plan and implement task-specific learning strategies, reflect on whether their chosen strategies were helpful for achieving their learning and task-oriented goals, and adjust their strategy use when necessary (Azevedo, Moos, Greene, Winters, & Cromley, 2008; Hofer, Yu, & Pintrich, 1998). The social-cognitive theory of SRL contends that SRL is situationally dependent (Schunk, 2001; Zimmerman, 2000) and influenced by a variety of motivational and environmental factors (Schunk & Zimmerman,

2023; Zimmerman, 2002). Thus, learners are not expected to be equally self-regulated across all learning contexts. Rather, a learner may self-regulate their behavior more conscientiously in one course or subject area than another. For instance, an undergraduate who is uninterested in the arts and who aspires to be a financial planner might engage in little SRL in their art history course but implement more SRL strategies in their economics courses.

Perhaps one of the most prominent SRL frameworks is Zimmerman's (2000) cyclical model. According to this model, SRL includes three phases: forethought, performance, and self-reflection. The forethought phase occurs before the academic task begins. In the context of classroom learning, forethought happens before the start of class. During this phase, students set goals, identify motivational sources, activate their task motivation, and plan their approach to classroom learning. For instance, a student might remind themselves why they are motivated to learn the course content and decide on their goals for the class period, where to sit, whether to take notes, if they want to bring a laptop to class, or where they will place their phone during class.

The performance phase occurs while learners are actively engaged in the academic task. In the context of classroom learning, the performance phase occurs during class. It is during this phase that students initiate task-appropriate strategies and monitor the effectiveness of these strategies to support their learning (Zumbrunn, Tadlock, & Roberts, 2011). For instance, students may pay attention, take notes, monitor their ongoing understanding of lecture content, and ask questions.

The self-reflection phase occurs after class ends and is when students evaluate the overall effectiveness of their learning strategies and their comprehension of lecture content. They use this information to decide whether to approach future class periods similarly or differently. Student engagement in SRL processes in the classroom has been consistently and positively linked with academic achievement (Ergen & Kanadli, 2017; Zimmerman, 1990, 2000, 2013).

Succumbing to the temptation to use devices for off-task purposes during any of these three phases represents a failure of a student's behavioral self-regulation and indicates that the SRL process has gone awry (le Roux & Parry, 2021). In classrooms where devices are allowed, it is likely that the performance phase of students' SRL process will be derailed by off-task device use.

2.2.1. SRL tendencies do not end device misuse

The connection between SRL and college student misuse of devices is complicated. Some research has demonstrated that, as college students' general SRL tendencies increase, their device misuse decreases (e.g., Barron & Kaye, 2020; Deng, 2020; Wei, Wang, & Klausner, 2012). Yet, this does not imply that engagement in SRL processes wholly prevents students from misusing their devices—only that applying SRL strategies helps students misuse their devices less often than their classmates who are not self-regulating their learning (Ruppel, Barideaux Jr, & Travis, 2023). Other research has indicated that SRL tendencies do not appear to stop college students from misusing their devices during class. Indeed, findings suggest that even the undergraduates most inclined to self-regulate their learning process misuse their devices during class (e.g., Deng, Zhou, & Broadbent, 2024; Flanigan, 2018; Ruppel et al., 2023). This contradictory research is at odds with traditional characterizations of SRL. Students engaged in SRL processes have long been described as “good strategy users” who control their behaviors and monitor their thoughts and emotions to guide their learning (Pressley, Borkowski, & Schneider, 1989). Students engaged in such processes would not be expected to misuse their devices during class. Yet, the existing literature has not consistently established that SRL tendencies prevent device misuse during class. This lack of a consistent, established relationship suggests that perhaps even the students most inclined to self-regulate their learning process within a particular context are unable to overcome the temptation to misuse their devices during class. Thus, one goal of the present research was to examine the strength of the relationship between college students' SRL tendencies and device misuse during

class.

2.3. Motivational influences and digital distraction

Adequate motivation is necessary for students to engage in the kinds of deliberate, self-guided processes involved in SRL (Zimmerman, 2000). As discussed by Elliott (2023), motivation provides the energization and direction for behavior towards a particular goal (e.g., mastery of content or an understanding of how to apply new information). Motivation gives students the energy and desire to initiate and sustain the effort needed to stay on task and learn (Brophy, 2010; Elliott, 2023). Motivation also provides students with a sense of direction. For instance, students report feeling more motivated when they see clear connections between current learning tasks and their future goals (Peteranetz, Flanigan, Shell, & Soh, 2018; Simons, Vansteenkiste, Lens, & Lacante, 2004) and when they feel a sense of interest in the subject matter (Renninger & Hidi, 2015). Motivated students use more SRL strategies (Cetin, 2015; Mega, Ronconi, & De Beni, 2014) and tend to experience higher academic achievement (Richardson, Abraham, & Bond, 2012) than their less motivated peers.

Given the links among motivation, SRL strategy use, and task engagement, it would be assumed that device misuse decreases as motivation increases. The research in this area suggests this is the case. For instance, McGloin, McGillicuddy, and Christensen (2017) found that the mastery approach goal orientation was negatively associated with off-task mobile phone use, while the mastery avoidance goal orientation was positively associated with mobile phone misuse during class. Similarly, Stephens and Pantoja (2016) showed that intrinsically motivated students were less likely to misuse their mobile devices during class than their amotivated classmates. Furthermore, outside of the classroom, Xu (2015) found that increasing perceptions of the utility value (e.g., perceived relevance for one's future goals and aspirations) of homework assignments led to decreasing frequencies of device misuse among high school students while working on those assignments. Investigating this relationship could help educational researchers and practitioners understand whether improving college students' utility value perceptions is a viable pathway for curbing classroom digital distraction. One goal of the present research was to address this gap in the existing literature by investigating whether the strength of students' utility value perceptions of their coursework relates to the frequency of their device misuse during class.

More recently, Flanigan, Brady, Dai, and Ray (2023) used Self-Determination Theory (Ryan & Deci, 2000, 2020) as the theoretical framework for their recommendations to curb student digital distraction in college classrooms. These authors proposed that digital distraction can arise when students' basic psychological needs for autonomy, competence, or relatedness are unsatisfied in college classrooms. These authors also explained how instructors' course technology policies and enforcement strategies may unintentionally threaten students' basic psychological needs in the classroom and hinder student motivation and engagement. This work was grounded in a robust literature base which has demonstrated that satisfaction of undergraduate students' basic psychological needs enhances motivation, engagement, and achievement (e.g., Jang, Kim, & Reeve, 2016; Niemiec & Ryan, 2009; Reeve, 2012; Ryan & Deci, 2000). Yet, despite the sound theoretical basis to assume a connection between basic psychological needs satisfaction and students' digital distraction tendencies in undergraduate classrooms, to date, no known studies have directly investigated this relationship. One goal of the present research was to address this literature gap.

2.4. The need for transnational research

Most studies on digital distraction in college classrooms have focused on the tendencies of students in individual countries. For instance, studies have documented the pervasiveness of digital distraction in college classrooms in the United States (Flanigan, Hosek, et al., 2023),

South Africa (le Roux & Parry, 2018), China (Wu et al., 2018), France (Jamet et al., 2020), South Korea (Kim et al., 2019), and other individual countries. No known studies have directly compared the classroom digital distraction frequencies of college students across countries. Yet, societal and cultural norms often influence student behaviors and attitudes (Hofstede, 1986). For instance, students are likelier to show deference to their instructors and adhere to classroom policies in countries where deference to authority is emphasized (i.e., high power-distance societies), than students in low power-distance societies (Hofstede, 1986). Conversely, individualistic societies that place more value on personal autonomy tend to produce students who expect more independence in the classroom and fewer restrictions on their behavior than collectivist societies with less emphasis on personal autonomy (Hofstede, 1986).

Societal norms and cultural dimensions like power distance and individualism versus collectivism shape classroom environments (Hofstede, 1986). Although much work on the differences and influences of these societal and cultural across cultures originally focused on workplace settings (e.g., Hofstede, 1980, 1983), later work showed the utility of examining these differences and influences in educational contexts (e.g., Hofstede, 1986). Differences in societal expectations should thus create distinct educational contexts that affect student behaviors, including the misuse of mobile devices during class. While the products (e.g., grades, enhanced subject-area knowledge and skills) of learning are not assumed to differ across cultures, it is plausible that the process of classroom learning looks different across cultures. For instance, one culture might value rote, instructor-focused instruction over active, student-centered instruction. Yet, as Shell et al. (2010) discuss, the underlying cognitive processes necessary for learning (e.g., attention, repetition, prior knowledge activation) are universal, and so would not be assumed to differ across cultures. Thus, the presence of digital distraction in college classrooms would be assumed to have a universal, negative effect on learning. If the present study were to uncover societal differences in the amount of digital distraction occurring in college classrooms, then it would be worthwhile for future research to identify the factors contributing to those differences and whether they can be leveraged across cultures to curb device misuse.

The present research involved college student participants from three countries: the United States, Turkey, and South Korea. The United States is classified as a low power-distance, individualistic country (Hofstede, 1980, 1986; Matsumoto & Juang, 2017; Triandis, 1995), while Turkey and South Korea are classified as high power-distance, collectivist countries (Choi, Kim, & Kim, 2013; Hofstede, 1980, 1986; Kağıtçıbaşı, 2007). Comparing the interplay among digital distraction, SRL tendencies, and motivational influences across these three countries allows the present research to investigate whether the relationships among these variables differ between countries with relatively similar (i.e., Turkey vs. South Korea) and dissimilar (i.e., the United States vs. Turkey and South Korea) norms.

Discovering transnational differences in the relations among these variables would indicate the need for future research that identifies the cultural factors driving those differences and whether those factors can be leveraged to inform motivational or SRL interventions that curb digital distraction across cultures. Finding that such effects do not exist would provide evidence that the strength of the relationship between motivational influences and/or college students' SRL tendencies and their device misuse during class is consistent across cultures. This lack of cultural moderation would be a form of evidence that college students' digital distraction tendencies are similar across countries, regardless of the cultural context of students' classroom experiences or their motivational or SRL dispositions.

3. The present study

The present transnational research investigated whether SRL tendencies and motivational influences (i.e., basic psychological needs

satisfaction and perceived utility of coursework) predicted undergraduates' digital distraction behaviors in the face-to-face courses required for their academic majors. The main research question guiding the present study was: Do cross-cultural differences exist in how SRL tendencies and motivational influences predict digital distraction frequencies (as measured by the percentage of class time spent misusing devices) in college classrooms? We evaluated the following hypotheses related to whether the country where participants attend college moderated the relationships among SRL tendencies, motivational influences, and digital distraction frequencies during class.

3.1. SRL tendencies and digital distraction

H₁ = The country where participants attend college moderates the effects of SRL tendencies on the amount of time spent misusing digital devices during typical class periods in major required courses.

3.2. Basic psychological needs satisfaction and digital distraction

H₂ = The country where participants attend college moderates the effect of basic psychological needs satisfaction on the amount of time spent misusing digital devices during typical class periods in major required courses.

3.3. Perceptions of utility value and digital distraction

H₃ = The country where participants attend college moderates the effect of utility value perceptions on the amount of time spent misusing digital devices during typical class periods in major required courses.

4. Methods

4.1. Participants

Participants for this research were a convenience sample of 231 undergraduates from the United States ($n = 74$), Turkey ($n = 61$), and South Korea ($n = 96$). The average participant age was 21.9 years ($SD = 4.71$), and the majority (60 %) identified as female. Most participants self-identified their race or ethnicity as Korean ($n = 65$), Turkish ($n = 54$), Asian (other than Korean) ($n = 37$), White ($n = 22$), Hispanic/Latino ($n = 20$), or Black/African American ($n = 14$). Participants represented underclassmen ($n = 139$) and upperclassmen ($n = 91$). All participants had declared their academic majors. The most common majors among the participants were education ($n = 165$), theology ($n = 23$), psychology ($n = 8$), and religious studies ($n = 6$). See Table 1 for an overview of participant demographics across the three countries.

4.2. Materials

4.2.1. Online survey

Study data were gathered using an online, self-paced, self-report survey on mobile device misuse during class, SRL tendencies, and motivational influences in face-to-face required major courses. The online survey was administered using Qualtrics. Surveys were translated into Turkish for participants in Turkey and Korean for participants in South Korea using the Qualtrics translation tool. Translations were then reviewed for accuracy by native speaking members of the research team. The sections and scales contained within the online survey are described in turn. All survey items were framed within the context of, "In the face-to-face classes I am taking this semester required for my major..."

4.2.1.1. Mobile device misuse during class. One open-ended, written-response item that assessed the percentage of time (0–100 %) participants spend misusing their devices during a typical one-hour class period in their major-required courses.

Table 1

Participant demographics across countries.

	United States	Turkey	South Korea
Mean Age	23.12 ($SD = 6.42$)	23.45 ($SD = 4.36$)	20.23 ($SD = 2.05$)
Gender			
Male	21	21	48
Female	53	38	48
Grade Level			
First Year	4	0	62
Second Year	30	12	31
Third Year	17	6	2
Fourth Year	23	42	1
Major			
Education	48	23	94
Theology	0	23	0
Religious Studies	0	6	0
Psychology	8	0	0
Other	13	2	0
Race/Ethnicity			
Korean	0	0	65
Turkish	0	54	0
Asian (Other than Korean)	6	0	31
White/Caucasian	22	0	0
Hispanic or Latino	20	0	0
Black or African American	14	0	0
Kurdish	0	2	0
Laz	0	2	0
Native Hawaiian or Pacific Islander	1	0	0
Indigenous American	1	0	0
Mixed Heritage	10	1	0

Aside from the Mean Age row, cell values represent the total number of participants from each country who selected each response option.

participants spend misusing their devices during a typical one-hour class period in their major-required courses.

4.2.1.2. SRL tendencies. Participants' SRL tendencies in the courses required for their major were measured using a five-item version of the Self-Regulation of Learning (SRL) subscale of the Student Perceptions of Classroom Knowledge Building (SPOCK) scale (Shell et al., 2005). This subscale assesses students' general SRL orientation towards their courses. The subscale has previously demonstrated acceptable levels of reliability (i.e., coefficient alpha estimates around 0.80) (e.g., Nelson, Shell, Husman, Fishman, & Soh, 2015; Shell & Husman, 2008). All items contained a 5-point Likert-type scale ranging from 1 (almost never) to 5 (almost always). Scores were calculated as the mean score across all five items. Higher scores indicated a greater tendency to engage in SRL behaviors when completing course-related tasks. Sample items include, "I set goals for myself which I try to accomplish" and "I make plans for how I will study." The coefficient alpha estimate for the SRL subscale in the present study was 0.80.

4.2.1.3. Basic psychological needs satisfaction. Participants' basic psychological needs satisfaction was assessed using the three-factor Basic Needs Satisfaction at College Scale (Jenkins-Guarnieri, Vaughan, & Wright, 2015). This 13-item instrument consisted of three subscales that assessed participants' autonomy (4 items), competence (5 items), and relatedness (4 items) satisfaction. These subscales have previously demonstrated acceptable reliability estimates (Jenkins-Guarnieri et al., 2015). Separate scores were calculated for autonomy, competence, and relatedness satisfaction using the mean scores across each subscale's items. A sample item assessing autonomy satisfaction was, "I am free to express my ideas and opinions at school." A sample item assessing

competence satisfaction was, “Most days, I feel a sense of accomplishment from attending class and studying.” A sample item assessing relatedness satisfaction was, “I really like the people I go to school with.” Each item used a Likert-type scale ranging from 1 (Not at all true) to 7 (Very true). The coefficient alpha estimates for the autonomy, competence, and relatedness subscales in the present study were 0.72, 0.74, and 0.72, respectively.

4.2.1.4. Perceived utility value of coursework. Participants’ perceived utility value of the coursework in the courses required for their academic major was assessed using the 6-item Academic Relevance Scale (ARS) (Hulleman, Godes, Hendricks, & Harackiewicz, 2010). All six items used a Likert-type scale ranging from 1 (Strongly Agree) to 7 (Strongly Disagree). The scale has previously demonstrated acceptable reliability estimates (e.g., Hulleman et al., 2010; Hulleman, Durik, Schweigert, & Harackiewicz, 2008). Scores were calculated as the mean score across all scale items. Sample items from this scale include, “The course material is relevant to my future career plans” and “I see how what we are studying is important to my future.” The coefficient alpha estimate for the ARS in the present study was 0.87.

4.2.1.5. Participant demographics. Participants completed a demographics survey consisting of two selected-response (i.e., age and grade level) and four written-response (i.e., gender, race/ethnicity, major, and the country where attending college) items.

4.3. Procedures

4.3.1. Data collection

Data collection began after approval was obtained from the Institutional Review Boards from the university of the principal investigator and the institutions in the United States and South Korea where data were gathered. The institution in Turkey did not have institutional review boards, so a signed letter of cooperation was obtained from a university administrator before data collection began. The letters of cooperation summarized the purpose and procedures of the present research. Participant recruitment took place only in these three institutions. All three institutions can be characterized as large, urban, research-oriented institutions.

Data collection occurred during April and May of 2024. Participants were emailed a link to the online survey. The first page of the survey was the informed consent sheet. The second page contained the data collection instrument. The anonymous survey instrument contained 39 items and took participants approximately 12 min to complete. The survey was completed during participants’ free time outside of class using their own personal devices. Participants from the institution in the United States were recruited using the SONA research recruitment platform and received one hour of research participation credit to satisfy a course requirement for participating in the research. Participants from Turkey and South Korea received our recruitment materials via email through their college-wide student listservs and received no research participation incentives.

4.3.2. Data analysis

Quantitative data were analyzed using IBM SPSS Statistics (Version 27). Scores for the SRL subscale, Basic Needs Satisfaction at College, and ARS scales were calculated as the mean score across all scale and subscale items. Data were analyzed using univariate descriptive statistics, one-way Analysis of Variance (ANOVA) and hierarchical moderated multiple regression. ANOVAs were conducted to compare differences between countries on digital distraction tendencies. Hierarchical moderated multiple regressions were conducted to determine whether the country where participants attend college moderates the effects of SRL tendencies or motivational influences on device misuse during class. Statistical assumptions related to linearity and homoscedasticity,

independence and normality of errors, multicollinearity, and the variance inflation factor (i.e., no values larger than 10) were satisfied for our analyses.

5. Findings

Findings are presented across two separate sections. First, cross-cultural findings related to device misuse during typical class periods in required major courses are presented. Second, transnational findings related to whether the country where participants attend college moderates the effects of SRL tendencies or motivational influences on device misuse during class are presented.

5.1. Mobile device misuse during typical class periods

Most participants misuse the mobile devices they bring to class. Participants self-reported the average percentage of time spent misusing their mobile devices during typical class periods of face-to-face courses required for their major. On average, participants spend about 32 % of the duration of typical class periods digitally distracted. The percentage of time spent misusing devices during class was similar for participants across these three countries, with undergraduates from the United States ($M = 29\%$; $SD = 24.4$), Turkey ($M = 36\%$; $SD = 22.7$), and South Korea ($M = 32\%$; $SD = 26.6$) spending about one-third of the time in their typical class periods misusing devices. A one-way ANOVA revealed no statistically detectable difference across these three countries in the percentage of time spent misusing mobile devices during typical class periods, $F(2, 224) = 1.281, p = 0.280, \eta^2_p = 0.011$.

Table 2 displays the typical percentage of time spent misusing digital devices during class across these three countries. Regarding transnational differences, about one-fifth of the participants from both Turkey and South Korea (19 % and 18 %, respectively) misuse their devices for more than half the duration of their typical class periods, while only about one-tenth (12 %) of the participants from the United States misuse their devices that often. Furthermore, about 45 % of the participants from Turkey misuse their devices for more than 41 % of a typical class period, while only 24 % of the participants from the United States and 27 % of the participants from South Korea misuse their devices that often.

5.2. Predicting digital distraction tendencies across countries

Transnational findings related to whether the country where participants attend college moderates the effects of SRL tendencies or motivational influences (i.e., basic psychological needs satisfaction and perceived utility value of coursework) on the amount of time spent misusing devices during class are presented in turn. Table 3 shows the

Table 2
Typical percentage of time spent misusing devices during class across countries.

	United States	Turkey	South Korea	Total Sample	Cumulative Percentage
0 %	4 %	2 %	3 %	3 %	3 %
1–10 %	32 %	21 %	29 %	28 %	31 %
11–20 %	16 %	12 %	19 %	16 %	47 %
21–30 %	9 %	12 %	15 %	12 %	59 %
31–40 %	7 %	11 %	6 %	10 %	69 %
41–50 %	12 %	25 %	9 %	14 %	83 %
51–60 %	0 %	9 %	3 %	4 %	87 %
61–70 %	3 %	4 %	6 %	4 %	91 %
71–80 %	7 %	4 %	4 %	5 %	96 %
81–90 %	1 %	2 %	2 %	2 %	98 %
91–100 %	1 %	0 %	3 %	2 %	100 %

Cell values in the United States, Turkey, and South Korea columns represent the percentage of participants from each country whose reported percentage of time spent misusing devices during class placed them within each range.

Table 3

Descriptive statistics and correlations for study variables.

Variable	<i>n</i>	<i>M</i>	<i>SD</i>	1	2	3	4	5	6
1. PTMU	227	31.82	24.93	–					
2. SRL Total	227	18.74	3.28	–0.091	–				
3. Utility Value	227	22.70	4.19	–0.222**	0.356**	–			
4. Competence	225	24.06	4.57	–0.200**	0.492**	0.520**	–		
5. Autonomy	225	19.29	4.68	–0.158*	0.306**	0.554**	0.607**	–	
6. Relatedness	226	20.13	5.00	–0.042	0.185**	0.241**	0.460**	0.431**	–

PTMU = Percentage of Time Spent Misusing Devices. ** indicates correlation significant at the 0.01 level (two-tailed). * indicates correlation significant at the 0.05 level (two-tailed).

descriptive statistics and correlations among the variables used in these analyses across the entire sample, while Table 4 shows the descriptive statistics for these variables across the three countries.

Findings in the following subsections are based on two-step hierarchical moderated regression models. In Step 1 of each model, either SRL tendencies or motivational influences (i.e., basic needs satisfaction and utility perceptions) were entered as predictors along with dummy-coded country variables (South Korea and United States, with Turkey as the reference group). In Step 2, interaction terms (i.e., each dummy-coded country variable by the SRL or motivational variable of interest) were added into the model to determine if the country where participants attended college had a moderation effect. High correlations among autonomy, competence, and relatedness satisfaction led to separate models being run for each of these basic psychological needs to avoid multicollinearity issues in analyses. Table 5 provides an overview of the main effect and moderation findings for Steps 1 and 2 in each analysis.

5.2.1. SRL and digital distraction tendencies

The Step 1 model, including the main effect of SRL tendencies (i.e., total SRL subscale score) and the dummy-coded country variables, did not account for a significant proportion of variance in the amount of time spent misusing devices during class, $F(3, 222) = 1.55, p = 0.202, R^2 = 0.02$. Furthermore, the results indicated that SRL tendencies did not significantly predict the amount of time spent using devices for off-task purposes during class ($B = -0.73, SE = 0.50, p = 0.149$). Additionally, the country dummy variables showed no differences between participants from South Korea ($B = -4.38, p = 0.295$) or the United States ($B = -6.54, p = 0.138$) from participants from Turkey on the amount of time spent misusing devices during class.

In the Step 2 model, adding the interaction terms into the model did not contribute a significant proportion of variance in the amount of time spent misusing devices during class that was accounted for, $F_{\text{change}}(2, 220) = 0.64, p_{\text{change}} = 0.317, R^2_{\text{change}} = 0.01$. The interaction terms for both South Korea ($B = 0.24, SE = 0.38, p = 0.526$) and the United States ($B = -0.32, SE = 0.44, p = 0.469$) were not statistically different from that of Turkey. Additional dummy coding was performed to compare participants from South Korea and the United States directly, setting the United States as the reference group. There was not a statistically detectable difference in the interaction terms for participants

Table 4

Self-regulation of learning and motivational variable descriptive statistics across country where participants attend college.

	United States		Turkey		South Korea	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Self-Regulation of Learning	19.14	3.57	18.62	3.27	18.52	3.04
Perceived Utility Value of Coursework	24.54	4.50	20.91	3.46	22.39	3.85
Basic Psychological Needs Satisfaction						
Competence	24.61	4.72	23.56	4.47	23.97	4.55
Autonomy	21.28	4.45	18.47	5.14	18.23	4.13
Relatedness	18.03	5.14	19.89	4.69	21.92	4.52

from South Korea ($B = 0.31, SE = 0.37, p = 0.410$) and the United States.

Taken altogether, the findings from both steps in our analysis indicate that SRL tendencies do not predict the amount of time spent misusing devices during class, and that this lack of a relationship between SRL tendencies and digital distraction tendencies is similar across cultures.

5.2.2. Basic psychological needs satisfaction and digital distraction tendencies

5.2.2.1. Autonomy satisfaction. The Step 1 model including autonomy satisfaction and the dummy-coded country variables (South Korea and United States, with Turkey as the reference group) did not account for a significant proportion of variance in the amount of time spent misusing devices during class, $F(3, 221) = 2.36, p = 0.073, R^2 = 0.03$. Yet, autonomy satisfaction did significantly predict off-task device use ($B = -0.79, SE = 0.38, p = 0.037$). Again, the country dummy variables showed no differences between participants from South Korea ($B = -4.49, p = 0.286$) or the United States ($B = -4.67, p = 0.309$) from participants from Turkey on the amount of time spent misusing devices during class.

In the Step 2 model, adding the interaction terms into the model did not contribute a significant proportion of variance in the amount of time spent misusing devices during class that was accounted for, $F_{\text{change}}(2, 219) = 0.58, p_{\text{change}} = 0.559, R^2_{\text{change}} = 0.005$. The interaction terms for both South Korea ($B = 0.54, SE = 0.93, p = 0.560$) and the United States ($B = 1.03, SE = 0.95, p = 0.281$) were not statistically different from that of Turkey. Additional dummy coding was performed to compare participants from South Korea and the United States directly, setting the United States as the reference group. There was not a statistically detectable difference in the interaction terms for participants from South Korea ($B = -0.49, SE = 0.95, p = 0.281$) and the United States.

Taken altogether, the findings from both steps in our analysis indicate that autonomy satisfaction accounts for a small amount of the amount of time spent misusing devices during class, and that this relationship between autonomy satisfaction and digital distraction tendencies is similar across cultures.

5.2.2.2. Competence satisfaction. The Step 1 model including competence satisfaction and the dummy-coded country variables (South Korea and United States, with Turkey as the reference group) accounted for a significant proportion of variance in the amount of time spent misusing devices during class, $F(3, 221) = 3.65, p = 0.013, R^2 = 0.05$. While competence satisfaction significantly predicted off-task device use ($B = -1.04, SE = 0.36, p = 0.004$), the country dummy variables again showed no differences between participants from South Korea ($B = -3.75, p = 0.369$) or the United States ($B = -5.68, p = 0.198$) from participants from Turkey on the amount of time spent misusing devices during class.

In the Step 2 model, adding the interaction terms into the model did not contribute a significant proportion of variance in the amount of time spent misusing devices during class that was accounted for, $F_{\text{change}}(2, 219) = 0.95, p_{\text{change}} = 0.387, R^2_{\text{change}} = 0.01$. The interaction terms for

Table 5

Main and moderation effects of SRL and motivational variables on digital distraction tendencies.

	SRL	Autonomy Satisfaction	Competence Satisfaction	Relatedness Satisfaction	Perceived Utility Value
Step 1					
Main Effect of SRL/Motivational Variable	No	Yes	Yes	Yes	Yes
Main Effect of Country	No	No	No	No	No
Step 2					
Moderation Effect of Country	No	No	No	No	No

both South Korea ($B = 1.27$, $SE = 0.93$, $p = 0.171$) and the United States ($B = 0.71$, $SE = 0.96$, $p = 0.459$) were not statistically different from that of Turkey. Additional dummy coding was performed to compare participants from South Korea and the United States directly, setting the United States as the reference group. There was not a statistically detectable difference in the interaction terms for participants from South Korea ($B = 0.56$, $SE = 0.83$, $p = 0.498$) and the United States.

Taken altogether, the findings from both steps in our analysis indicate that competence satisfaction accounts for a small amount of the amount of time spent misusing devices during class, and that this relationship between autonomy satisfaction and digital distraction tendencies is similar across cultures.

5.2.2.3. Relatedness satisfaction. The Step 1 model including relatedness satisfaction and the dummy-coded country variables (South Korea and United States, with Turkey as the reference group) did not account for a significant proportion of variance in the amount of time spent misusing devices during class, $F(3,222) = 1.10$, $p = 0.348$, $R^2 = 0.02$. Furthermore, the results indicated that relatedness satisfaction did not significantly predict off-task device use ($B = -0.30$, $SE = 0.35$, $p = 0.400$). Again, the country dummy variables showed no differences between participants from South Korea ($B = -3.85$, $p = 0.369$) or the United States ($B = -7.60$, $p = 0.090$) from participants from Turkey on the amount of time spent misusing devices during class.

In the Step 2 model, adding the interaction terms into the model did not contribute a significant proportion of variance in the amount of time spent misusing devices during class that was accounted for, $F_{\text{change}}(2, 220) = 2.24$, $p_{\text{change}} = 0.109$, $R^2_{\text{change}} = 0.02$. However, compared to Turkey, there was a statistically detectable difference in the interaction term for participants from South Korea ($B = 1.83$, $SE = 0.92$, $p = 0.049$), but not for participants from the United States ($B = 1.68$, $SE = 0.92$, $p = 0.70$). Additional dummy coding was performed to compare participants from South Korea and the United States directly, setting the United States as the reference group. There was not a statistically detectable difference in the interaction terms for participants from South Korea ($B = 0.15$, $SE = 0.80$, $p = 0.857$) and the United States.

Taken altogether, the findings from both steps in our analysis indicate that relatedness satisfaction accounts for a small amount of time spent misusing devices during class, and that this relationship between relatedness satisfaction and digital distraction tendencies is similar across cultures.

5.2.3. Perceived utility value of coursework and digital distraction tendencies

The Step 1 model including the main effects of utility value perceptions and the dummy-coded country variables (South Korea and United States, with Turkey as the reference group) accounted for a significant proportion of variance in the amount of time spent misusing devices during class $F(3,223) = 3.98$, $p = 0.009$, $R^2 = 0.05$. Furthermore, the results indicated that utility value perceptions predicted off-task device use during class ($B = -1.25$, $SE = 0.41$, $p = 0.003$). Again, the country dummy variables showed no differences between participants from South Korea ($B = -0.35$, $p = 0.768$) or the United States ($B = -0.44$, $p = 0.703$) from participants from Turkey on the amount of time spent misusing devices during class.

In the Step 2 model, adding the interaction terms into the model did not contribute to the proportion of variance in the amount of time spent misusing devices during class accounted for, $F_{\text{change}}(2,221) = 0.07$, $p_{\text{change}} = 0.929$, $R^2_{\text{change}} = 0.001$. The interaction terms for participants from South Korea ($B = -0.35$, $SE = 1.17$, $p = 0.768$) and the United States ($B = -0.44$, $SE = 1.16$, $p = 0.703$) were not statistically different from that of Turkey. Additional dummy coding was performed to compare participants from South Korea and the United States directly, setting the United States as the reference group. There was not a statistically detectable difference in the interaction terms for participants from South Korea ($B = 0.10$, $SE = 0.91$, $p = 0.915$) and the United States.

Taken altogether, the findings from both steps in our analysis indicate that perceptions of the utility value of coursework account for a small amount of time spent misusing devices during class and that the strength of the relationship between perceptions of utility value and digital distraction tendencies is similar across cultures.

6. Discussion

The present research investigated whether cross-cultural differences existed in how SRL tendencies and motivational influences predicted digital distraction frequencies in college classrooms. Contrary to all three of our hypotheses, no cross-cultural differences were uncovered. Rather, findings showed similarities in the amount of time spent misusing mobile devices during class, and in the relationships motivational influences and SRL tendencies have and do not have with device misuse. By leading to the rejection of all three alternative hypotheses, our analyses provided evidence for universal effects—or lack thereof—of motivational influences and SRL tendencies on college students' digital distraction tendencies during class across cultures. In the following sections, we interpret our findings and offer implications for theory and practice.

6.1. Self-regulation of learning and digital distraction

Our findings suggest that college students' SRL tendencies are not predictive of their device misuse during class. This lack of a relationship between SRL and digital distraction frequencies was consistent across the three countries included in the present research. In addition, participants succumbed to digital distraction regardless of their SRL tendencies. Such findings suggest that even the most self-regulated students are unable to resist the temptation to misuse their devices during class. Ours is the first known study to uncover such a relationship and provide evidence for the universality of this relationship across cultures. The lack of cultural differences uncovered suggests that college students' digital distraction tendencies across the globe are similarly unaffected by their general SRL tendencies.

The present findings seem to call into question the traditional beliefs about the behaviors of self-regulated learners. With respect to Zimmerman's (2000) cyclical model of SRL, our findings suggest that the performance phase during class is not one long, unbroken phase of SRL. Rather, even for the most self-regulated learners, classroom experiences seem to be riddled with interruptions of off-task device use. The present study showed that most college students misuse their devices for about 30 % of a typical class period. This finding suggests that, at best, most

college students only commit about two-thirds of a typical class period to regulate their learning in a way that avoids digital distraction. Going forward, it seems that the higher education community’s understanding of SRL would be enhanced if theoretical frameworks accounted for frequent disruptions in the performance phase of classroom learning. The regularity of these disruptions may have important implications for a typical student’s capacity for sustained SRL and the effectiveness of the SRL processes they engage in.

Clearly, undergraduates are not self-regulating their learning process on a constant, ongoing basis throughout an entire class period. [Baumeister, Braslavsky, Muraven, and Tice \(1998\)](#) explained how “the self’s capacity for active volition is limited” (p. 1252) and that “acts of self-control, responsible decision making, and active choice seem to interfere with other such acts that soon follow” (pp. 1263–1264). SRL is a complex process that involves self/volitional control, decision making, and implementation of task-appropriate behaviors and thoughts to guide one’s learning process. Furthermore, the presence of readily available mobile technology can induce a state of motivational interference within college students that they must resist to remain on task ([Flanigan, Babchuk, & Kim, 2022](#)). All of these processes require attention, energy, and effort. Considering this, it is plausible that, for a typical undergraduate, the capacity to self-regulate their learning process is depleted within a typical class period as attention, energy, and effort are expended. When this depletion occurs, digital distraction may be the common outcome as volitional control wanes and students turn to off-task activities. Clearly, more research is needed to fully understand (a) the factors that contribute to or protect undergraduates from the depletion of their capacity for SRL and (b) whether this depletion contributes to device misuse.

6.2. Motivational influences and digital distraction

While our findings indicate that college students’ general SRL tendencies do not curb their digital distraction tendencies, findings do suggest that college instructors can reduce device misuse by creating motivationally supportive learning environments. Regardless of the country where they attended college, participants reported less off-task device use when their basic psychological needs for competence, autonomy, and relatedness were satisfied and when they saw utility value in their coursework. Although our analyses led to the acceptance of the null hypothesis regarding the moderating effect of country on the relationship between motivational influence and digital distraction tendencies, this does not mean that motivational influences were inconsequential. Rather, motivational influences were similarly consequential for curbing the device misuse of participants from all three countries included in the present study. Ours is the first known study to uncover such a relationship and provide evidence for the universality of this relationship across cultures.

The lack of cultural differences uncovered in the present study suggests that students’ digital distraction tendencies across the globe are similarly affected by motivational influences. Such findings suggest that college students’ state-dependent motivation to learn influences their tendencies to misuse devices during class and can act as a buffer against succumbing to digital distraction. Fortunately, instructors can create classroom environments that influence their students’ basic psychological needs satisfaction ([Schenkenfelder, Frickey, & Larson, 2020](#)) and utility value perceptions ([Hulleman et al., 2010](#)).

Satisfying students’ basic psychological needs is a well-established pathway for supporting student motivation, engagement, and learning ([Guay, 2022; Niemiec & Ryan, 2009; Reeve, 2012](#)). [Table 6](#) contains evidence-based strategies that can be used to support students’ need for competence, autonomy, and relatedness in college classrooms. Yet, in addition to actively supporting these basic psychological needs, college instructors must also be cognizant of not behaving in ways that undermine students’ basic psychological needs. [Flanigan, Hosek, et al. \(2023\)](#) explained how instructors’ technology policies and enforcement

Table 6
Instructor strategies to satisfy college students’ basic psychological needs.

Strategies	
Competence	Provide efficacy-supporting feedback to help students develop a sense of mastery and confidence in their abilities (Niemiec & Ryan, 2009)
	Scaffold student learning to help build knowledge and ability gradually by reducing frustration and fostering a sense of competence as they successfully complete now, increasingly difficult tasks (Hensley, Sayers, Brady, & Cutshall, 2021)
	Challenge students with appropriately difficult tasks to allow them to experience growth and reinforce their beliefs in their abilities (Bovill, Bulley, & Morss, 2011)
Autonomy	Rationalize course rules and policies for students so they understand their purpose, making them more likely to internalize the rules and policies as personally meaningful, rather than externally imposed (Aelterman, Vansteenkiste, & Haerens, 2019)
	Minimize coercion and giving students a sense of choice in the classroom to foster a sense of ownership over their learning process (Niemiec & Ryan, 2009)
	Encourage and respond to student questions to signal to students that their thoughts and questions matter (Ryan & Deci, 2020)
Relatedness	Cultivate a sense of rapport with students to help them feel a sense of belonging and connection in the classroom (Niemiec & Ryan, 2009)
	Reduce antagonistic instructor behaviors to create a more supportive and respectful learning environment that students feel comfortable in (Baker & Goodboy, 2018)
	Offer support and encouragement to struggling students to help reinforce the sense that the instructor is on their side, and they are not alone in their learning process (Hensley et al., 2021)

strategies intended to curb digital distraction could inadvertently undermine college students’ basic psychological needs satisfaction. For instance, [Flanigan, Hosek, and colleagues](#) explained how not letting students type notes on their laptops can threaten competence satisfaction if students believe typing notes makes it easier for them to learn, unilaterally implementing technology policies without providing rationalizations for those policies to students can harm autonomy satisfaction, and using confrontational strategies to enforce course technology policies (i.e., calling a student out in front of their classmates) can erode relatedness satisfaction.

Helping students see utility value in their coursework appears to be another viable pathway for curbing digital distraction during class. Although perceptions of utility value have already been linked to less device misuse while doing homework ([Xu, 2015](#)), ours is the first known study to establish this link inside college classrooms. The strength of students’ perceptions of the utility value of their coursework is positively associated with motivation and engagement ([Peteranetz et al., 2018; Shell, 2023](#)). Furthermore, present findings underscore the need to continue training students in metacognitive awareness so they can identify when and how coursework is relevant to them. This awareness could simultaneously help students stay on task and initiate SRL strategies for managing their device use, attention, effort, and learning during class.

7. Limitations and future research

The present study contributes to the higher education community’s understanding of the interplay among motivational influences, SRL, and digital distraction in college classrooms. Yet, there were a few limitations in the present study that could be addressed in future research. First, only three countries were included in the present study. One country from North America (i.e., the United States), another from East Asia (i.e., South Korea), and another that uniquely straddles both Europe and Asia geographically and culturally (i.e., Turkey). Expanding future investigations to include more countries and cultures would enhance the field’s understanding of the role of cultural influences on student digital

distraction tendencies.

Second, the present research focused on students' experiences in traditional classroom settings (e.g., classrooms with desks and chairs and fewer than 40 students in the room). Future research should examine additional classroom contexts. For example, how might the findings differ in large lecture hall environments?

Third, data were gathered based on students' orientation towards major required courses. It is plausible that the interplay among motivation, SRL, and digital distraction looks differently for classes that are not required for majors. For instance, students may hold different types of goals in these classes which could impact motivation, SRL, and digital distraction tendencies.

Fourth, the present research included four motivational influences (e.g., competence, autonomy, and relatedness needs satisfaction and perceived utility value). Yet, there remain a considerable number of other motivational factors (e.g., self-efficacy, expectancy for success, perceived cost, outcome attributions) that could affect students' digital distraction tendencies. Accounting for other motivational influences would allow future research to expand the field's understanding of the relationship between college student motivation and device misuse in the classroom.

Fifth, the present research assessed the relationship between participants' SRL orientation towards their major required courses and their digital distraction tendencies during class. No link was detected between these two variables regardless of the country in which participants attended college. Other research (e.g., Hartley, Bendixen, Olafson, Gianoutsos, & Shreve, 2020) has detected a relationship between college students' SRL and digital distraction tendencies while they study outside of the classroom. Future research should investigate whether this relationship outside of the classroom persists across cultures. Such research would continue to deepen the educational research community's understanding of the cross-cultural nature of the relations among SRL tendencies, motivational influences, and digital distraction.

Finally, the present study relied on a convenience sampling approach, which carries an inherent risk of selection bias and may limit the generalizability of findings. As such, conducting additional research in this area using randomized sampling procedures would improve methodological rigor.

8. Conclusion

Our results indicate that digital distraction is a common occurrence in college classrooms around the globe. Moreover, the relationships between motivational influences, SRL tendencies, and device misuse were consistent across the three countries included in the present research. These commonalities across countries suggest that, although cultural norms such as deference to authority or individualism might traditionally shape student behavior (Hofstede, 1980, 1986), the appeal and accessibility of mobile technology might be more influential on student behavior than traditional societal norms. Scholars have postulated that mobile phones and other electronic devices are not simply technological innovations or social fads (Ling, 2004). Rather, these devices have permeated nearly every facet of our personal and professional lives and often motivate and shape human behavior. As mobile devices have become omnipresent in college classrooms, they appear to influence student behaviors similarly across cultures. As noted by Viberg and Grönlund (2013), perhaps technology itself is the defining shaper of student behavior in contemporary classrooms.

In contrast with theoretical expectations, even the more self-regulated participants in our study regularly succumb to digital distraction during class. Thus, the performance phase of Zimmerman's (2000) cyclical SRL model does not appear to be one unbroken phase of effective SRL. Instead, our findings indicate that a typical college student spends at least one-third of a typical class period off task. Rather than hope that college students will self-regulate their own device use during class, college instructors should create motivationally supportive

classroom contexts to protect the integrity of the classroom against digital distraction. Our findings suggest that designing classroom environments and instruction that satisfy students' basic psychological needs for competence, autonomy, and relatedness, and help students understand the utility value of their coursework are viable pathways to motivate student engagement and minimize digital distraction in college classrooms. Based on these findings, we encourage college instructors across cultures to protect the integrity of their classroom learning environments against digital distraction by consciously supporting student motivation.

CRedit authorship contribution statement

Abraham E. Flanigan: Writing – review & editing, Writing – original draft, Resources, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Anna C. Brady:** Writing – review & editing, Writing – original draft, Methodology, Investigation, Conceptualization. **Mete Akcaoglu:** Writing – review & editing, Writing – original draft, Methodology, Investigation, Conceptualization. **Yan Dai:** Writing – review & editing, Writing – original draft, Methodology, Investigation. **Sungjun Won:** Writing – review & editing, Writing – original draft, Investigation. **Bridget K. Daleiden:** Writing – review & editing, Writing – original draft, Investigation. **Kendall Hartley:** Writing – review & editing, Writing – original draft, Investigation.

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The authors do not have permission to share data.

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