The association between motivations for social media use, stress and academic attainment

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Abstract: Whilst there is concern about the role of social media use in adolescent and emerging adult development, there is a gathering consensus that *how* individuals spend their time on social media may be more important than *how much* time they spend on it, with potential benefits *and* risks of engagement. In addition, there is growing interest in a broader range of outcomes, including wellbeing, mental health and educational attainment. Building on this research, the present study offers a new, theory-driven investigation of complex cross-sectional associations between users' motivations for social media use and wellbeing, as well as users' motivations and academic outcomes. Specifically, self-perceived stress and Grade Point Average scores were regressed on self-reported social media motivations, using data collected from nearly 6000 Chinese undergraduate students. In line with our predictions and a transdiagnostic cognitive behavioral conceptualization of social media use, social enhancement / approach motivations ("to make new friends") and escapist motivations ("to kill time") were associated with lower and higher levels of self-reported stress, respectively. In addition, academic motivations for social media use (i.e. "for academic purposes") were associated with higher educational attainment. These effects persisted after controlling for a number of potential confounders, including key demographic and socioeconomic variables. Whilst the cross-sectional design precludes inferences about underlying directions of causality, these findings suggest that inter-individual differences in motivations for engagement may be crucial in understanding the role that social media plays in adolescent and emerging adult life and generate predictions for future longitudinal and cross-sectional studies.

Keywords: Social media use motives; adolescent and emerging adult development; formulation; mental health; educational attainment

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Introduction

Social media (SM) use reached a record level in the second quarter of 2020, when many countries were facing some form of lockdown due to the COVID-19 pandemic (Kemp, 2024). Usage rates remain high, particularly amongst late adolescents and emerging adults, who represent the heaviest users of the technology (Kemp, 2024). Given that this age represents a critical window of psychosocial development during which sensitivity to peer influence is elevated (Orben, Tomova, et al., 2020), and by the end of which almost 63% of lifetime psychological disorders emerge (Solmi et al., 2022),[1] it is perhaps unsurprising that there has been growing concern about the potential (harmful) effects of SM on the wellbeing and functioning of this population. Further, parallel increases in SM uptake and levels of depression, self-harm and suicidality in this age group (Twenge & Farley, 2020) has led some to posit a causal connection.

With respect to the evidence-base, narrative syntheses and meta-analyses of the data typically find associations between higher levels of SM use and an elevated risk of a range of negative mental health and wellbeing outcomes, including low self-esteem, depression, anxiety and self-harm and suicidal behaviors (e.g. Appel et al., 2020; Biernesser et al., 2020; Keles et al., 2020). However, documented effect sizes are typically very small, and longitudinal and experimental studies – whilst far less common – are inconsistent with respect to underlying directions of causality, or else suggest possible bidirectional effects (Orben, 2020). Further, a number of studies have highlighted associations between increased SM use and positive mental health/wellbeing (Erfani & Abedin, 2018).

[1] Solmi et. al. (2022) found that for 62.5% of individuals worldwide who experience mental health disorders, these disorders have an onset age before age 25.

In addition to representing a crucial period of psychosocial development, late adolescence/emerging adulthood also coincides with a number of key educational milestones and transition points (e.g., college and university), relative success/failure in which have been shown to be predictive of subsequent career, economic and health outcomes (Hahn & Truman, 2015; Vermeulen & Schmidt, 2008). Consequently, in parallel to research into SM/mental health links there has been growing interest in the potential impact of SM use on academic performance (Appel et al., 2020), although this has received considerably less attention to date (Tibber et al., 2022). Findings within the SM/academic attainment literature largely mirror those seen in the SM/mental health research, with evidence that SM use can be linked with both increased (e.g. OECD, 2023) and decreased (e.g. Rozgonjuk et al., 2019) educational attainment. Overall, literature reviews and meta-analyses of the field suggest no clear relationship between SM use and academic attainment (Appel et al., 2020), or else a small negative association, such that increased SM use is associated with poorer academic attainment (Marker et al., 2018).

In both fields there has also been a growing recognition that *how* individuals spend their time on SM may be more important than *how much* in determining the outcomes of engagement (Orben, Weinstein, et al., 2020). Thus, a growing body of research has begun to explore associations between SM users' motivations for SM engagement, as well as the specific behaviors that they engage in when online, and how these are related to outcomes. With respect to the SM/mental health link, positive effects of SM use have been linked to active interpersonal/relational motivations, such as connecting with others (Clark et al., 2018); in contrast, negative effects have been linked to avoidant motivations, such as using SM to pass time (Perugini & Solano, 2020), as well as passive social uses of SM, such as using SM to follow others (Clark et al., 2018). With respect to the SM/attainment link, positive effects of SM use have been linked to using SM for academic purposes, while

negative effects have been linked to multitasking and distractive uses of SM (e.g., Marker et al., 2018).

Despite this wealth of research, the field has been criticized for a lack of theoretical integration, which is deemed essential if a field is to progress (Orben, Weinstein, et al., 2020). One recent model which has attempted to integrate existing literature and theory, as well as insights from clinical practice with adolescent/emerging adult populations, is the *transdiagnostic cognitive behavioral conceptualization of SM use* (TCBC) (Tibber & Silver, 2022). Drawing heavily on a number of theories, including the *Uses and Gratifications Theory* (UGT) (Katz et al., 1973) and the *interpersonal connections behavior framework* (ICBF) (Clark et al., 2018) (more on these below), at its core, the conceptualization proposes that SM use is linked to a range of risks and benefits, which are defined by interactions between the user's online behavior and the affordances of the technology itself. Thus, according to the UGT, individuals are driven to use SM in anticipation of obtaining specific gratifications (*gratifications sought*), which in turn promote future use (Pertegal et al., 2019). According to the ICBF, SM is thought to be beneficial/harmful to the extent that it promotes/hinders satisfaction of gratifications that map on to core needs, particularly those relating to acceptance and belonging (Clark et al., 2018).

Pulling these theories (and a wealth of literature) together, the TCBC proposes that benefits of SM use are more likely to be accessed when engagement is intentional and purposeful, driven primarily by *enhancement* motivations, which *"function to enhance positive or neutral states"* (p.11) (Tibber & Silver, 2022), e.g., a desire to make new friends. This is because under these conditions the individual is more likely to experience satisfaction of core needs, particularly those relating to acceptance and belonging, as defined by the ICBF. In contrast, SM use is most likely to be harmful to the user when engagement is *automatic* and *habitual*, and driven primarily by *escapist* or *avoidant* motivations, which

"function to avoid negative affective states and compensate for perceived deficits" (p.11) (Tibber & Silver, 2022), e.g., to avoid offline conflict. This is because under these conditions the individual is less likely to experience satisfaction of core needs, particularly those relating to acceptance and belonging.

Using the TCBC as its basis, this study offers a new, theory-driven investigation of the complex associations between motivations for SM use and key outcomes in the areas of wellbeing and academic attainment, where existing research is inconclusive. Specifically, we test the following three hypotheses:

H1: Approach/enhancement motivations will be associated with better wellbeing

As noted above, the TCBC (Tibber & Silver, 2022) and ICBF (Clark et al., 2018) propose that SM use is most likely to be beneficial to wellbeing when engagement is driven by enhancement motivations. For example, if the individual engages with the online world to build new (or consolidate existing) friendships, a sense of connection and positive wellbeing are more likely to result. While research looking at motivations and wellbeing outcomes is limited (Tibber & Silver, 2022), many studies have highlighted the importance of social uses of SM for adolescents' wellbeing (Nesi et al., 2018). With reference to the TCBC, it is possible that using SM for social reasons may assist an individual in satisfying core needs associated with belonging.

H2: Avoidant/escapist motivations will be associated with poorer wellbeing and poorer academic attainment

According to the TCBC (Tibber & Silver, 2022) and ICBF (Clark et al., 2018), in contrast to enhancement motivations, *escapist/compensatory* motivations are more likely to be detrimental to wellbeing. For example, if the individual engages with the online world to

escape the challenges of face-to-face social interactions, feelings of disconnection are likely to be amplified. In support of this, existing research suggests that avoidant or escapist uses of SM may be associated with lower subjective wellbeing, greater loneliness and decreased social capital (Yang et al., 2021). Escapist use of SM has also been linked to higher levels of SM use and more addictive patterns of engagement (Kircaburun et al., 2020), both of which have in turn been linked to poorer wellbeing and mental health outcomes (Biernesser et al., 2020).

With respect to *attainment* outcomes, whilst the TCBC focuses primarily on satisfaction of *social* needs, the conceptualization proposes that satisfaction of needs more broadly, including "*satisfaction of more aspirational needs underpinned by the individual's particular set of values"* (p.25) (Tibber & Silver, 2022), e.g., education and learning, is also less likely when SM engagement is characterized by escapist motivations and avoidant behaviors. For example, if the individual engages with the online world to 'kill time' and avoid the challenges of the offline world (e.g., the challenges of studying itself), it is easy to see how attainment, educational or otherwise, might be negatively affected, potentially alongside social costs. In support of this proposal, a number of studies have shown an association between high endorsement of escapist coping strategies and poorer academic attainment (e.g. Gustems-Carnicer et al., 2019). Relatedly, distractive SM use and multitasking online have also been linked to poorer academic attainment (Marker et al., 2018; Rozgonjuk et al., 2019). For example, a 2022 survey undertaken as part of the OECD Programme for International Student Assessment (PISA) found that 25%-30% of students across OECD countries reported being distracted by either their own digital devices or those of fellow students during lessons (OECD, 2023). Further, interruptive smartphone notifications, which are often associated with SM use, may be particularly distractive and detrimental to academic outcomes (Rozgonjuk et al., 2019). Some research suggests that this

association between distractive smartphone use and poorer academic outcomes may be partially mediated by a more surface approach to learning (e.g. Rozgonjuk et al., 2018). This could be understood in terms of the TCBC, as it seems plausible that a more surface approach to learning would be less likely to satisfy individuals' aspirational needs.

H3: Informational motivations will be associated with better academic attainment

Finally, we hypothesized that using SM for informational purposes would be associated with higher academic attainment. According to the TCBC (Tibber & Silver, 2022), satisfaction of core needs, including aspirational needs underpinned by values such as education and learning, is more likely when engagement is intentional and purposeful, i.e., the individual engages online for a defined purpose that is aligned with their values, rather than just to 'kill time' (for example). The aforementioned 2022 PISA study also found that spending up to one hour per day on digital devices for *learning* activities was associated with *higher* academic attainment than spending no time on digital devices (OECD, 2023). In relation to SM use specifically, a number of studies have found associations between higher academic achievement and the use of SM for academic purposes, though not all studies have found such an effect, with some reporting null findings (Appel et al., 2020; Marker et al., 2018).

In addition, associations were also explored between outcome variables (mental health and academic attainment) and additional motivations not defined in H1-H3. This allowed us to assess for the specificity of any associations found in (H1-H3), i.e., to determine whether predicted associations were unique to motivational items selected *a priori,* or else shared with other motivations. Further, it allowed us to control for the potential confounding effects of covariance between motivations, i.e. the possibility that endorsement of a particular motivation is reflective of a more general, i.e. non-specific, motivation to engage in SM use.

The study was undertaken in a sample of Chinese undergraduate students, because this age group (primarily 18-21 years) broadly coincides with the peak in SM use (Kemp, 2024) as well as a proposed window of heightened sensitivity to the effects of SM use (Orben et al., 2022). In addition, it has been proposed that university students may be particularly prone to developing problematic patterns of use because of their flexible schedules, greater free time and reduced external (i.e., parental and organizational) control (Turel & Qahri-Saremi, 2016).

Methods

Ethical approval was granted by the university at which this study took place (Project ID: 202103-01). This study was added onto a voluntary university-wide survey into student wellbeing that is sent out to the student population yearly. At the start of the survey participants were informed how their data would be used and told that participation was voluntary and anonymous; in addition, there were minimal risks involved. Consequently, in accordance with national legislation and institutional requirements/ethical review, consent was implied by participants' voluntary participation. Data were collected between May and June 2021 with all first- and second-year undergraduate students at a Chinese university invited to participate in an online survey via a URL link distributed via class SM "groups" (mainly WeChat and DingTalk). The questionnaire was programmed using SurveyPlus (https://www.surveyplus.cn). When students accessed the survey using smartphones, the survey platform automatically directed them to the mobile friendly version. Although students were able to be in college as normal during this time, it is nevertheless worth noting that the time of data collection was during the period of the COVID-19 pandemic; potential implications of this are explored in the discussion.

Measures

Demographics and background information

Data were collected on several demographic and background factors, including the participants' gender (coded as "male" or "female") and year/department of study. The highest level of education achieved by the participant's mother and father were gathered using the following possible response options: (1) primary school and below; (2) junior middle school; (3) vocational high school; (4) ordinary high school; (5) technical secondary school/technical school; (6) associate college; (7) undergraduate college; and (8) graduate and above, which were collapsed into: (1) below high school; (2) high school or equivalent; and (3) college or above. To indicate the participant's annual family income, they selected from the following seven response options [all in Chinese Yuan (CNY)]: (1) <10k; (2) 10k-≤30k; (3) ≤50k; (4) 50k-≤100k; (5)100k-≤200k; (6) >200k; (7) unknown, which were collapsed into: (1) <50k; (2) 50k-≤100k; (3) 100k-≤200k; and (4) >200k.

Age was not included in the survey questionnaire because in the Chinese universities there is very little variation in the age of undergraduate students of the same cohort. Specifically for the university in this study, the administration data suggest that the *vast* majority of the respondents in our survey (>90%) would have been between 18 and 21 years of age at the time of data collection.

Social media platforms

For the purposes of this study, we used a comprehensive definition of 'social media', similar to that used by Nesi et al. (2018); this encompasses any "media used for social interaction, or any digital applications or tools that allow users to share content and communicate with others" (p.270) (Nesi et al., 2018). The specific applications included in this study (Weibo, WeChat, Bilibili, QQ, Douban, Zhihu, Toutiao and Douyin), however, were selected on the

basis that they showed the highest penetration of the Chinese Market and/or were deemed most popular among young adults in China (Tibber et al., 2022). In terms of platform affordances, Weibo, Bilibili, and Douyin are functionally similar to X (formerly Twitter), YouTube, and TikTok, respectively. WeChat and QQ are all-in-one applications with multiple functionalities such as instant messaging, video calling, group chats, online meetings, and posting and sharing content. Zhihu is a question-and-answer application similar to Quora; Toutiao is primarily an application for reading news, but users can also share their own work; Douban mainly allows users to view and share content about books, films and music, similar to IMDb, but also has some group forum functions.

Social media use

Level of SM use was determined by asking participants to report the average amount of time they spent on eight different SM applications per day, according to the actual duration data recorded on their mobile phones. Participants were asked to report their average daily use in hours rounded up to the nearest hour in an open textbox, which also allowed for numbers with decimals to indicate minutes and textual responses (e.g., 1-2 hours). Data were excluded where participants indicated they spent >12hrs on any single platform on the basis that this was likely an unreliable report, as per Tibber et al. (2022). Times spent on each SM platform were then summed for each participant to give an index of total daily SM use.

Educational attainment

Educational attainment was operationalized as the participant's most recent Grade Point Average (GPA). Participants were asked to provide their GPA by selecting from one of the following options: (1) ≤2.99, (2) 3-3.49; (3) 3.5-3.99; (4) 4-4.49, (5) 4.5 or above. However, these values were re-coded at the analysis stage into the following three categories: (1) <3.5;

(2) 3.5-3.99; and (3) 4 or above, with category boundaries selected post hoc to guarantee a minimum of 15% of participants in each category.

Self-perceived stress

Self-perceived stress was used as a proxy for mental health and wellbeing, as it has been posited as a general risk factor in the development of a number of mental and physical health outcomes (Hampton et al., 2016), and as such, has been deemed suitable for use in a general non-clinical sample (Tibber et al., 2022). This was measured using the ten-item version of the Perceived Stress Scale (Cohen & Williamson, 1988), which has low-medium reliability (α = .78) and medium validity (r = .32 - .39) (Cohen & Williamson, 1988) and has been translated into Chinese and validated in the target population (Tibber et al., 2022). For each item, participants were asked to endorse a statement, such as "feel nervous and anxious" according to how often they had felt that way in the past month on a five-point Likert scale from (1) "never" to (5) "always".

Motivations for social media use

Motivations for SM engagement were assessed using a Chinese translation of the Scale of Motives for Using Social Networking Sites for adolescents and youths (Pertegal et al., 2019). The original scale, which was found to be valid and reliable with good internal consistency (α = .77 - .90) (Pertegal et al., 2019), has 27 motivations/items. However, following cognitive interviews (a technique commonly used by survey researchers to gain in-depth information on how respondents understand and answer survey questions) with four students from the target university, 17 items (e.g., "to look for a date", "to meet new people" and "to fill my free time") were excluded from the translated version because they were not deemed relevant for the target population or their wordings largely overlapped with those of other items.

Retained items included: (1) “to find a romantic partner”; (2) “to make new friends”; (3) “for academic purposes”; (4) “to keep in touch with others”; (5) “to follow the lives of people I care about”; (6) “to kill time”; (7) “to get feedback from others”; (8) “to express my own views and feelings”; (9) “to keep up with what happens in the world”; and (10) “to find information”. Participants were asked to endorse all ten motivations on a five-point Likert scale with response options running from (i) “totally true” to (v) “totally untrue”; these data were reverse-coded prior to analysis, so that higher scores indicated higher levels of a given motivation. For hypotheses (H1-3), motivations (2) and (4) were classified as enhancement motivations, (6) was classified as an escapist motivation, and (3) and (10) were classified as informational. Thus, five items were used for hypothesis testing, and five items were used for exploratory analyses.

Sample

Data were available for 5676 participants (3148 from year 1 and 2528 from year 2), representing response rates of 54.2% and 44.3%, respectively. Data were excluded for the following reasons: missing data with respect to SM use (n=134), motivations for use (n=48), self-perceived stress (n=71), family income (n=1190) and for reporting >12hrs use of a single platform (n=17). Consequently, complete case analyses were undertaken on reduced samples of 4306 (75.9% of original) and 4253 (74.9% of original) for educational attainment and stress respectively.

Table 1 shows the demographic breakdown of all three samples. The majority of the original sample was male (56.1%). Approximately 67% and 72% of respondents said that their mother and father had attained at least high school level education, respectively. The modal category with respect to mother’s and father’s educational levels was ‘high school level’ (41.6% and 38.6% respectively). Approximately 50% of respondents had an annual

family income greater than 100k CNY; the modal annual family income category was >200k CNY (26.0%). The family income of most respondents in this study was higher than the national average.[2] The mean daily time spent on SM for the original sample was 4.63 hours (*SD* = 2.87). This is above the average daily time spent on SM among 16-24-year-olds across the 53 countries with highest rates of Internet use (2.98 hours and 2.53 hours for women and men respectively), and more than twice the average daily time spent on SM by 16-64-year-olds in China (1.93 hours) (Kemp, 2024). Univariate regression analyses regressing outcome variables on sociodemographic predictors are shown in Supplementary Material A.

[2] The national average per capita annual disposable income of households in China in 2021 was 35,128 CNY (Fu & Ye, 2023).

Table 1. Sample demographics. Data are presented for the overall sample (n= 5676), as well as the reduced samples used in regression of self-perceived stress scores ('Stress sample') and GPA ('Attainment sample') (n=4253 and n=4306), respectively. CNY=Chinese Yuan. Department X is a college within the university that only students who particularly excel academically and pass additional examinations can enter.

Variable	Level	Original sample *N(%)*	Stress sample *N(%)*	Attainment sample *N(%)*
Sex	Male	3183 (56.1)	2369 (55.7)	2399 (55.7)
	Female	2493 (43.9)	1884 (44.3)	1907 (44.3)
Mother's highest education level	Below high school	1862 (32.8)	1400 (32.9)	1413 (32.8)
	High school	2360 (41.6)	1771 (41.6)	1792 (41.6)
	College or above	1454 (25.6)	1083 (25.4)	1101 (25.6)
Father's highest education level	Below high school	1584 (27.9)	1192 (28.0)	1203 (27.9)
	High school or equivalent	2189 (38.6)	1648 (38.8)	1671 (38.8)
	College or above	1903 (33.5)	1413 (33.2)	1432 (33.3)
Annual family income (CNY)	≤50k	796 (14.0)	751 (17.7)	764 (17.7)
	50k-≤100k	832 (14.7)	791 (18,6)	797 (18.5)
	100k-≤200k	1381 (24.3)	1320 (31.0)	1337 (31.1)
	>200k	1477 (26.0)	1391 (32.7)	1408 (32.7)
	Not provided	1190 (21.0)	0 (0.0)	0 (0.0)
Cohort	First year	3148 (55.5)	2367 (55.7)	2398 (55.7)
	Second year	2528 (44.5)	1886 (44.4)	1908 (44.3)
Department of study	Humanities and Arts	622 (11.0)	464 (10.9)	472 (11.0)
	Social Sciences	870 (15.3)	676 (15.9)	686 (15.9)
	Sciences	530 (9.3)	398 (9.4)	400 (9.3)
	Engineering	1822 (32.1)	1362 (32.0)	1381 (32.1)
	Information	550 (9.7)	408 (9.6)	413 (9.6)
	Agricultural Life and Environment	439 (7.7)	313 (7.4)	314 (7.3)
	Medicine	630 (11.1)	480 (11.3)	484 (11.2)
	X	213 (3.8)	152 (3.4)	156 (3.6)

Analyses

Outcome variables (self-perceived stress and GPA) were regressed (separately) on predictor variables in linear and multinomial logistic regression analyses, respectively. Although GPA was recorded as an ordered variable, Brant's test of parallel regression found this assumption to be violated, and thus multinomial logistic regression was run instead of ordinal (Liang et al., 2020). Basic univariate models were run first (Group 1 Models) to test for zero-order associations between outcome variables (stress and educational attainment) and motivations for SM engagement. As we had multiple predictors (and hence multiple possible models that could be run and compared for fit), forward stepwise regression analyses were used to build multivariate models and determine which motivations should be retained on a statistical basis (Group 2 Models). However, because of the known limitations of forward stepwise regression analyses (e.g. Henderson & Denison, 1989), we interpret all findings carefully, and in view of the findings from basic univariate analyses. Finally, Group 2 Models were re-run whilst controlling for potential covariates (Group 3 Models), which were themselves selected in separate forward stepwise regression analyses. This allowed us to assess whether any identified associations between motivations and outcome variables retained in the multivariate models survived after controlling for the most significant covariates.

The following covariates were initially included: gender, family income, and total daily time spent on SM, since previous research suggests these factors may be differentially associated with SM use, wellbeing and academic outcomes (Appel et al., 2020; Biernesser et al., 2020; Liu et al., 2020; Twenge & Farley, 2020). In addition, the year of study (1st or 2nd) and department of study (e.g., "Department of Social Sciences" or "Department of Engineering") were also included as covariates to control for possible group and cohort effects.

Where forward stepwise regressions were run, predictors that were not significantly associated with the outcome variable ($p > .05$) were excluded; remaining variables were then

added to the model in an order based on the strength of their association with the outcome variable, as indicated by Akaike's Information Criterion (AIC) value. At each step, a likelihood ratio test (LRT) was applied to assess if the added variable significantly increased the variance explained and justified their retention ($p < .05$).

The following assumptions of linear regression were tested: linearity, low multicollinearity, and homoscedasticity. Normality of residuals was assumed since analyses are deemed robust to violations of this rule for large sample sizes (Schmidt & Finan, 2018). For multinomial logistic regression analyses assumptions of low multicollinearity and extreme outliers were tested. Where the homoscedasticity assumption was violated, analyses were re-run using robust standard errors. All analyses were undertaken in STATA (17, StataCorp LLC, College Station, TX).

Results

In Table 2, summary data are shown for key predictor and outcome variables for the original sample, before regression analyses were run on subsamples for stress and attainment outcomes. The mean total stress score was 27.13 ($SD = 6.37$). The modal GPA category was 2 ("4.00 - 4.49") and the most heavily endorsed motivation was "to keep in touch with others" (median = 4, IQR = 4-5 where 1 = "totally untrue" and 5 = "totally true"). The 10-item Chinese translation of the Scale of Motives for Using Social Networking Sites (Pertegal et al., 2019) was found to have adequate internal consistency ($\alpha = 0.76$).

Table 2. Predictor variables. Data are presented for each of the motivation variables. For predictor variables, 1 = "totally untrue" and 5 = "totally true". Median and interquartile range (IQR) are given for the full sample (n=5676), as well as the samples used for self-perceived stress scores ('Stress sample') and GPA ('Attainment sample') regression analyses (n=4253 and n=4306 respectively). Motivation types are indicated (in brackets) as Enhancement (En), Escapist (Es) or Informational (In).

	Original sample		Stress sample		Attainment sample	
Motivation	Median	IQR	Median	IQR	Median	IQR
Hypothesis testing						
To make new friends (En)	3	2-4	3	2-4	3	2-4
For academic purposes (In)	4	3-4	4	3-4	4	3-4
To keep in touch with others (En)	4	4-5	4	4-5	4	4-5
To kill time (Es)	4	3-4	4	3-4	4	3-4
To find information (In)	4	4-4	4	4-5	4	4-4
Exploratory analyses						
To find a romantic partner	1	1-2	1	1-2	1	1-2
To follow the lives of people I care about	4	3-4	4	3-4	4	3-4
To get feedback from others	3	2-4	3	2-4	3	2-4
To express my own views and feelings	3	3-4	4	3-4	4	3-4
To keep up with what happens in the world	4	3-4	4	3-4	4	3-4

Associations between motivations and self-perceived stress

Seven motivations were significantly associated with variance in stress scores in univariate analyses ($p < .05$) (Group 1 Models) (see Supplementary Material B). Specifically, "to make new friends" ($F(4, 5394) = 7.78$, $p < .001$), "for academic purposes" ($F(4, 5394) = 6.73$, $p < .001$), "to keep up with what happens in the world" ($F(4, 5394) = 3.14$, $p = .01$) and "to find information" ($F(4, 5394) = 4.26$, $p = .002$) were negatively associated with stress, such that increased levels of these motivations were associated with lower stress scores. In contrast, "to keep in touch with others" ($F(4, 5394) = 5.08$, $p < .001$), "to kill time" ($F(4, 5394) = 25.37$, $p < .001$), and "to get feedback from others" ($F(4, 5394) = 6.87$, $p < .001$) were positively associated with stress, such that increased levels of these motivations were associated with higher stress scores.

When included together in a basic multivariate model (Group 2 Models) (Table 3), all seven predictors were retained, and remained significant with the same sign of association. This model was statistically significant ($F(28, 5370) = 8.82$, $p < .001$) and explained 4.97% of variance in stress scores ($r^2 = 0.0497$). Finally, these seven predictors were included in an advanced multivariate model with sex, family income, average daily time spent on SM and cohort included as covariates (Group 3 Models) (See Supplementary Material C). This final multivariate model was statistically significant ($F(34, 4218) = 8.16$, $p < .001$) and predicted 6.69% of variance in stress scores ($r^2 = 0.0669$).

In this final multivariate model, five of the seven individual predictors retained in the basic multivariate model predicted unique variance in stress, with "to keep in touch with others" and "to find information" no longer emerging as significant. The signs of the associations for the remaining five motivations were retained, with "to make new friends" (b = -2.71, CIs = -3.87 – -1.56 , $p < .001$ at the highest motivation level), "for academic purposes" (b = -2.80, CIs = -4.87 – -0.73, $p = .01$ at the highest motivation level) and "to

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keep up with what happens in the world" (b = -1.63, CIs = -3.23 – -0.03, $p < .05$ at the highest motivation level) showing negative associations with stress (i.e. higher levels of motivation were associated with lower stress), and "to kill time" (b = 3.64, CIs = 2.03-5.25, $p < .001$ at the highest motivation level) and "to get feedback from others" (b = 1.28 CIs = 0.12-2.44, $p = .03$ at the highest motivation level) showing positive associations with stress (i.e. higher levels of motivation were associated with higher stress).

Table 3. Linear Regression of Stress on Motivation and Sociodemographic Predictors. Values in bold indicate significant predictors. 'Level' indicates the strength of motivation reported, where 1 = "totally untrue" and 5 = "totally true". The reference group for motivations (in brackets) was 1: "totally untrue". Motivation types are indicated (in brackets) as Enhancement (En), Escapist (Es) or Informational (In). The following motivations did not emerge as significant in any of the analyses beyond univariate analyses and hence are not presented in the table: "to find a romantic partner", "to follow the lives of people I care about", "to express my own views and feelings".

		Basic multivariate model		Advanced multivariate model with covariates	
Motivation	Level	β (95% CIs)	*p*	β (95% CIs)	*p*
Hypothesis testing					
To make new friends (En)	2	-0.34 (-0.92, 0.23)	.25	-0.43 (-1.09, 0.23)	.20
	3	**-0.89 (-1.43, -0.36)**	**.001**	**-0.86 (-1.48, -0.25)**	**.006**
	4	**-1.10 (-1.66, -0.54)**	**<.001**	**-1.02 (-1.66, -0.37)**	**.002**
	5	**-2.58 (-3.60, -1.56)**	**<.001**	**-2.71 (-3.87, -1.56)**	**<.001**
For academic purposes (In)	2	-1.57 (-3.44, 0.31)	.10	-2.16 (-4.32, -0.00)	.05
	3	**-1.79 (-3.51, -0.07)**	**.04**	-2.02 (-4.03, -0.00)	.05
	4	**-1.72 (-3.43, -0.01)**	**.05**	**-2.13 (-4.13, -0.12)**	**.04**
	5	**-2.39 (-4.16, -0.62)**	**.01**	**-2.80 (-4.87, -0.73)**	**.01**
To keep in touch with others (En)	2	2.20 (-0.11, 4.51)	.06	1.67 (-0.93, 4.28)	.21
	3	**3.06 (1.12, 4.99)**	**.002**	1.95 (-0.23, 4.14)	.08
	4	1.80 (-0.09, 3.68)	.06	0.81 (-1.32, 2.94)	.46
	5	1.82 (-0.09, 3.73)	.06	0.91 (-1.25, 3.07)	.41
To kill time (Es)	2	0.78 (-0.72, 2.28)	.31	1.09 (-0.58, 2.76)	.20
	3	**1.57 (0.14, 2.99)**	**0.03**	1.46 (-0.11, 3.03)	.07
	4	**2.65 (1.24, 4.06)**	**<.001**	**2.73 (1.18, 4.27)**	**.001**
	5	**3.90 (2.44, 5.36)**	**<.001**	**3.64 (2.03, 5.25)**	**<.001**
To find information (In)	2	-1.44 (-3.32, 0.45)	.14	-0.94 (-3.05, 1.17)	.38
	3	-0.99 (-2.70, 0.72)	.26	-0.93 (-2.86, 0.99)	.34

		Basic multivariate model		Advanced multivariate model with covariates	
Motivation	Level	β (95% CIs)	*p*	β (95% CIs)	*p*
	4	**-1.71 (-3.40, -0.02)**	**.05**	-1.69 (-3.56, 0.21)	.08
	5	-1.67 (-3.40, 0.06)	.06	-1.51 (-3.44, 0.43)	.13
Exploratory analyses					
To get feedback from others	2	-0.23 (-0.92, 0.47)	.52	-0.35 (-1.14, 0.44)	.38
	3	0.32 (-0.35, 0.99)	.35	0.07 (-0.69, 0.83)	.87
	4	**1.04 (0.36, 1.73)**	**.003**	0.64 (-0.13, 1.42)	.10
	5	**1.50 (0.43, 2.56)**	**.006**	**1.28 (0.12, 2.44)**	**.03**
To keep up with what happens in the world	2	-0.52 (-1.93, 0.89)	.47	-0.21 (-1.86, 1.44)	.80
	3	-1.20 (-2.49, 0.08)	.07	-1.04 (-2.55, 0.48)	.18
	4	**-1.35 (-2.64, -0.06)**	**.04**	-1.45 (-2.95, 0.06)	.06
	5	**-1.64 (-3.02, -0.26)**	**.02**	**-1.63 (-3.23, -0.03)**	**.05**

Associations between motivations and academic attainment

Seven motivations were significantly positively associated with GPA in univariate models (Group 1 Models) (see Supplementary Material B), such that higher levels of these motivations were associated with higher GPA. In descending order of effect size, these were: "for academic purposes" ($LR\chi^2$ (8) = 132.15, $p < .001$), "to follow the lives of people I care about" ($LR\chi^2(8) = 74.59$, $p < .001$), "to express my own views and feelings" ($LR\chi^2(8) = 59.85$, $p < .001$), "to keep in touch with others" ($LR\chi^2(8) = 57.77$, $p < .001$), "to get feedback from others" ($LR\chi^2(8) = 50.43$, $p < .001$), "to find information" ($LR\chi^2(8) = 29.20$, $p < .001$) and "to keep up with what happens in the world" ($LR\chi^2(8) = 16.27$, $p = .04$). Similarly to stress, the association between each of these motivations typically increased in strength across each step size, indicating roughly linear responses.

When included together in a basic multivariate model (Group 2 Models) (Table 4), only three predictors were retained: "for academic purposes", "to follow the lives of people I care about" and "to express my own views and feelings". These predictors remained significantly associated with GPA with the same sign of association as in the univariate models, such that increased motivation was associated with higher GPA category. This multivariate model was significant ($LR\chi^2(24) = 199.26$, $p < .001$) and explained 1.71% of the variance in GPA category (pseudo-$r^2 = 0.0171$). Finally, these three predictors were included in an advanced multivariate model with sex, family income, and father's education level included as covariates (Group 3 Models) (See Supplementary Material C). In this model, all three predictors predicted unique variance in GPA: "for academic purposes" (*RRR* = 2.58, CIs = 1.48 – 4.50, $p = .001$), "to express my own views and feelings" (*RRR* = 1.73, CIs = 1.13 – 2.65, $p < .05$), and "to follow the lives of people I care about" (*RRR* = 1.79, CIs = 1.21

– 2.66, $p = .004$).[3] The model was statistically significant ($LR\chi^2(36) = 391.00$, $p < .001$) and explained 4.26% of variance in GPA category (pseudo-$r^2 = 0.0426$).

[3] Relative risk ratios stated are for the likelihood of belonging to the highest GPA category as compared with the lowest GPA category. Statistics are given for the level of motivation where the association was strongest; for "for academic purposes" and "to express my own views and feelings" this was at the highest level of motivation, for "to follow the lives of people I care about" this was at the second-highest level of motivation.

Table 4. Multinomial Logistic Regression of Grade Point Average on Motivation, Demographic and Socioeconomic Predictors. Values in bold indicate significant predictors. 'Level' indicates the strength of motivation reported, where 1 = "totally untrue" and 5 = "totally true". The reference group for motivations (in brackets) was 1: "totally untrue". Motivation types are indicated (in brackets) as Enhancement (En), Escapist (Es) or Informational (In). The following motivations did not emerge to be significant in any analyses beyond univariate analyses and thus are not presented in the table: "to make new friends", "to keep in touch with others", "to kill time", "to find information", "to find a romantic partner", "to get feedback from others", "to keep up with what happens in the world".

		Basic multivariate				**Advanced multivariate**			
Motivation	Level	Intermediate to low GPA		High to low GPA		Intermediate to low GPA		High to low GPA	
		RRR (95% CIs)	*p*	RRR (95% CIs)	*p*	RRR (95% CIs)	*p*	RRR (95% CIs)	*p*
Hypothesis testing									
For academic purposes (In)	2	1.49 (0.83, 2.67)	.18	1.21 (0.69, 2.10)	.50	1.35 (0.70, 2.61)	.38	1.27 (0.66, 2.45)	.47
	3	1.43 (0.88, 2.32)	.15	0.99 (0.63, 1.56)	.96	1.24 (0.71, 2.17)	.45	0.93 (0.54, 1.62)	.81
	4	**1.65 (1.03, 2.66)**	**.04**	1.46 (0.94, 2.28)	.10	1.40 (0.81, 2.42)	.22	1.37 (0.80, 2.34)	.26
	5	**2.59 (1.58, 4.25)**	**<.001**	**2.88 (1.81, 4.58)**	**<.001**	**2.06 (1.17, 3.64)**	**.01**	**2.58 (1.48, 4.50)**	**.001**
Exploratory analyses									
To follow the lives of people I care about	2	1.35 (0.93, 1.98)	.12	1.31 (0.89, 1.91)	.17	1.41 (0.91, 2.17)	.12	1.25 (0.80, 1.96)	.32
	3	1.10 (0.78, 1.54)	.59	1.38 (0.99, 1.94)	.06	1.05 (0.71, 1.55)	.80	1.38 (0.93, 2.04)	.11
	4	1.23 (0.87, 1.73)	.24	**1.88 (1.34, 2.64)**	**<.001**	1.18 (0.80, 1.74)	.40	**1.79 (1.21, 2.66)**	**.004**

		Basic multivariate				Advanced multivariate			
Motivation	Level	Intermediate to low GPA		High to low GPA		Intermediate to low GPA		High to low GPA	
		RRR (95% CIs)	*p*	RRR (95% CIs)	*p*	RRR (95% CIs)	*p*	RRR (95% CIs)	*p*
	5	0.95 (0.64, 1.42)	.81	**1.53 (1.04, 2.26)**	**.03**	.95 (0.60, 1.49)	.81	1.47 (0.94, 2.30)	.09
To express my own views and feelings	2	0.88 (0.63, 1.24)	.47	0.99 (0.71, 1.37)	.95	0.78 (0.53, 1.15)	.20	0.96 (0.65, 1.41)	.83
	3	1.12 (0.83, 1.51)	.47	1.07 (0.80, 1.43)	.66	1.05 (0.74, 1.48)	.79	1.02 (0.73, 1.44)	.90
	4	1.09 (0.81, 1.47)	.56	1.05 (0.79, 1.41)	.72	0.96 (0.68, 1.35)	.81	0.92 (0.65, 1.29)	.62
	5	**1.48 (1.01, 2.19)**	**.05**	**1.79 (1.24, 2.59)**	**.002**	1.31 (0.84, 2.04)	.23	**1.73 (1.13, 2.65)**	**.01**

Discussion

With respect to our three stated hypotheses, one was fully supported (H3), and two were partially supported (H1 and H2). H1 *(Approach/Enhancement motivations will be associated with lower levels of stress*) was partially supported; thus, whilst the social motivation "to make new friends" was significantly associated with lower levels of stress and remained so after correcting for other motivations and covariates, the social motivation "to keep in touch with others" was not. With respect to H2 *(Avoidant/escapist motivations will be linked to poorer wellbeing and poorer academic attainment*), the escapist motivation "to kill time" was significantly associated with higher levels of stress, and again remained so after correcting for other motivations and covariates, but was not significantly associated with GPA. In support of H3 (*informational motivations will be associated with higher academic attainment*), the motivations "for academic purposes" and "to find information" were both associated with belonging to a higher GPA category; out of these two motivations, however, only the former remained significantly associated with GPA after controlling for other motivations and covariates.

With respect to the finding that the motivation "to make new friends" was significantly associated with lower levels of stress, this is consistent with a number of previous studies that have found that using SM for social purposes is linked to decreased stress, as well as increased perceived social support (Weinstein, 2018), in addition to a broader body of research into the protective effects of social connection and social capital (Ehsan et al., 2019). The findings are also consistent with the predictions of the TCBC and ICBF (Clark et al., 2018; Tibber & Silver, 2022), which emphasize the centrality of harnessing social connection (and relatedly, feelings of acceptance and belonging) if the mental health/wellbeing benefits of SM use are to be accrued. However, this assumes a specific direction of causality which could not be tested in our data. Thus, we could not

distinguish between the possibility that individuals who engage more with SM for the purposes of making new friends are more sociable and report being less stressed in part due to this pre-existing high sociability and good social support [see the *rich get richer* hypothesis, (Kraut et al., 2002)], and the possibility that the experience of making new friends itself leads to a decrease in levels of stress. Note however that these two potential directions of causality are not mutually exclusive.

As noted, in contrast to the association with the "to make new friends" motivation, levels of stress were *not* associated with endorsement of the "to keep in touch with others" motivation (after addition of covariates etc.). This was counter to our prediction, which, on the basis of existing research and theory outlined in the introduction, assumed that *all* social approach behaviors would be linked to positive wellbeing/mental health outcomes (e.g. Nesi et al., 2018). The findings instead suggest that the association between social motivations for SM use and stress likely depend on the nature of the social motivation; specifically, *relationship formation* motivations may be associated with better wellbeing, whilst *relationship maintenance* motivations may not be. One *post hoc* explanation is that individuals who have better wellbeing (i.e. report being less stressed) may be more likely to reach out to make new relationships, perhaps because of associated levels of confidence. Given that the participants in the present study were in their first and second years of university (a time when making new friends is particularly important), it is also possible that being able to use SM to support new relationship formation offline, and/or to support the individuation process that typically characterizes this period of development (Erikson, 1968), was *particularly* beneficial to their wellbeing. Finally, the phrase "to keep in touch with others" is quite vague and could have been interpreted to include more habitual uses of SM which are less aligned with core needs – for example, chatting with others on social media out of boredom/as a way of passing the time. This is purely speculative however, and it

should be noted that there is considerable inconsistency in the literature, with some studies finding a reversed pattern of associations to the one we find: i.e., associations between relationship *formation* motives and *poorer* wellbeing, and relationship *maintenance* motives and *better* wellbeing (e.g. Perugini & Solano, 2020). Future research employing longitudinal and/or experimental studies are therefore needed to assess directions of causality as well as potential mediating/moderating factors.

With respect to the finding that endorsement of the motivation "to kill time" was significantly associated with higher levels of stress, this is consistent with existing research into the detrimental psychological effects of avoidance behaviors (e.g. Cheng et al., 2020). The findings are also consistent with predictions to emerge from the TCBC, which posits that escapist/compensatory motivations are more likely to be associated with avoidant online behaviors, and hence, dissatisfaction of core needs, particularly those relating to acceptance and belonging (Tibber & Silver, 2022). While scarce, longitudinal research into such associations suggests that avoidant coping styles and the use of SM as compensation for offline difficulties may be predictive of higher levels of depression and loneliness at a later time point (e.g. Cheng et al., 2020). Once again, however, the reversed direction of causality is also possible, such that escapist motivations may be more common in individuals who are already experiencing poor wellbeing, and who thus turn to SM as a way of escaping from such difficulties. In line with the TCBC, we may speculate that use of SM in these cases does not help satisfy core needs of belonging, thus not ameliorating (or even potentially worsening) wellbeing. These two possible directions of causality are not mutually exclusive, and future research should explore the possibility that any relationship between escapist uses of SM and poor wellbeing may be bidirectional.

In terms of the relationship between using SM "to kill time" and academic attainment, our hypothesis was not supported: no significant association was found between this motivation and GPA scores in either univariate or multivariate models. As noted, on the basis of the TCBC (Tibber & Silver, 2022) we predicted that escapist motivations would be associated with poorer outcomes, beyond just *social* outcomes. The reason why such an effect was not seen is unclear, although as proposed by the model, the potential benefits and risks of SM use may be particularly pertinent in this age group with respect to the *social* domain. Thus, research has highlighted the central role of social processes in young people's lives and mental health (Orben, Tomova, et al., 2020), and indicated that young people's engagement with SM is driven predominantly by *social* motivations (Kircaburun et al., 2020).

Finally, the finding that using SM "to find information" or "for academic purposes" was associated with higher GPA was consistent with previous research, which has shown similar results in adolescent and undergraduate student samples (Marker et al., 2018). For the motivation "for academic purposes" only, this effect was retained in the final full multivariate model. Given that there was a moderate to strong positive correlation between the motivations "for academic purposes" and "to find information", it is likely that the association between the motivation "to find information" and GPA simply failed to reach significance in the full multivariate model due to shared variance with the motivation "for academic purposes". Seen through the lens of the TCBC, it makes sense that the use of SM for "academic purposes" (and "to find information" for that matter) would be predictive of higher educational attainment, since this represents purposeful/intentional engagement with the technology, with a clearly defined motivation, that is likely to result in an approach behavior (i.e. engagement with the learning process) and hence satisfaction of core needs, in

this case, those underpinned by values relating to learning and education (Tibber & Silver, 2022).

With regards to our exploratory analyses, four motivations were found to be significantly associated with stress or educational attainment in the final models when controlling for other motivations and covariates. “To get feedback from others” was positively associated with stress, such that increased levels of this motivation were associated with increased stress. It seems likely that this is linked to the wealth of literature that has found that using SM to compare oneself to others is associated with poorer wellbeing (Appel et al., 2020), possibly mediated by poor self-esteem (Tibber et al., 2020). Conversely, increased levels of the motivation “to keep up with what happens in the world” was associated with lower stress. In line with the TCBC, we could speculate that this use of SM may help to fulfil a need for a sense of connection with the wider world; however, further research would be required to test this. The motivations “to follow the lives of people I care about” and “to express my own views and feelings” were positively associated with GPA, such that higher levels of these motivations were associated with a greater chance of belonging to the highest GPA category compared to the lowest. The finding that those who were more strongly motivated to use SM to express their own views and feelings were more likely to have higher GPA scores may relate to wider research that suggests higher confidence may be correlated with higher academic attainment (e.g. Saeed et al., 2020).

Limitations and recommendations

With respect to the limitations to the study, there were several. First, as noted, the cross-sectional design precluded inferences about underlying directions of causality. Longitudinal and/or experimental studies would enable future researchers to gain a better understanding of the extent to which underlying motivations for SM use influence wellbeing

and academic outcomes, versus motivations being themselves influenced by state and trait wellbeing, academic and personality variables. Second, the data collected relied on self-report questionnaires. Research has found that self-report measures of technology use may be inaccurate when compared to objective measures (Parry et al., 2021). While this study aimed to improve accuracy by asking students to self-report based on data recorded on their phones, the potential for bias remains. Future studies could use methods such as passive data collection of app usage from users' phones to obtain a more objective measure. Third, in terms of the UGT, the present study only explored gratifications *sought* – i.e. motives for using SM – and did not assess gratifications *obtained*. Research has demonstrated that self-reported satisfaction with social network site use is high when gratifications *obtained* is greater than gratifications *sought*, i.e., when SM use effectively satisfies the individual's needs (Bae, 2018). In this study, we could not determine whether this was indeed the case, and whether SM users typically obtained what they were looking for in the online world. Future research should therefore investigate the extent to which participants' subjective judgements of how sufficiently their self-reported motivations and reasons for SM use are fulfilled by the act of using SM moderates the relationship between SM use and wellbeing and academic outcomes.

Fourth, studies have shown different SM is not a homogenous construct, but that different SM applications have different features and affordances, with implications for their "addictive" potential and associations with psychological and mental health/wellbeing variables (Rozgonjuk et al., 2021; Tibber et al., 2022). Future studies should therefore explore whether specific platform features and affordances mediate the associations found in this study. Fifth, the sample in this study had a higher average household income than the national average and above average daily SM usage relative to adolescents/emerging adults across the largest global economies. Moreover, it is possible that the COVID-19 pandemic

which was ongoing at the time of data collection may have impacted students' use of SM as well as their wellbeing and academic outcomes. While our findings are broadly supported by wider literature, and data were collected during a period without any national or regional lockdowns, further research is needed to better understand the generalizability of these findings across other populations and outside of the COVID-19 era.

Conclusions

This study draws upon, and tests predictions to emerge from, the TCBC, in an attempt to increase understanding of SM/mental health and SM/academic outcome links in an emerging adult student population sample. The findings reported support a growing body of evidence that highlights the importance of understanding inter-individual differences in the complex pattern of associations seen between SM use and a range of outcomes. The findings were broadly consistent with predictions emerging from the TCBC, as well as the ICBF, in demonstrating links between various enhancement/approach motivations and positive wellbeing and academic outcomes; in the domain of stress specifically, which was used as a proxy for wellbeing and mental health, links were also demonstrated between escapist motivations and negative outcomes (i.e. increased stress). Whilst the cross-sectional nature of the data limited interpretation, if the underlying direction of causality presumed by the TCBC were to be demonstrated (running from SM use to outcomes), the findings would indicate a potential benefit of developing resources and interventions to support emerging adults to engage with SM in a more intentional and purposeful way that is line with their values and needs, e.g., to cultivate social connection and support their learning. This study therefore adds to a call for a more nuanced approach to understanding the possible impacts of SM use that considers inter-individual differences and individual-technology interactions. Future experimental and longitudinal studies are needed, however, to assess causality and its

underlying direction/s. It is hoped that such research will eventually contribute to the development and testing of individualized supports and interventions aimed at supporting people to use SM in ways that ameliorate the harms and harness the benefits of engagement.

Data Availability Statement

Data generated or analyzed during this study are available publicly online at xxx

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