
An exploratory investigation into social media use in Trinidad and Tobago: A comparison of Facebook and TikTok

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Abstract

This study draws on past studies on problematic social media use (PSMU) to assess trends and deduce predictive factors associated with problematic Facebook use (PFU) and problematic TikTok use (PTU) amongst university students in Trinidad and Tobago using Multivariate Multiple Linear Regression. The study fills the gaps in the extant literature associated with TikTok and limited research outside of North American and Europe. In addition, this is one of the first studies to empirically compare the prevalence and predictors of problematic use between two social media platforms. Furthermore, the study uses a comprehensive list of predictors based on an examination of the literature: five dimensions of gratification (motives of social media use), psychological variables (self-esteem and loneliness), Big Five personality traits, demographics (sex and age) and level of engagement (duration and frequency of use). The study found that PFU and PTU had a prevalence of 0.57% and 3.70% respectively. PFU and PTU use were both correlated to level of engagement, self-presentation, and age. The additional predictors of content gratification, process gratification, social gratification, technical gratification, extraversion, loneliness, and sex were identified for PTU. Additionally, the findings suggest that females have higher levels of engagement on social media and problematic use scores.

Keywords: Bergen Social Media Addiction Scale, TikTok Problematic Use Scale, Uses and Gratification Theory, Big Five personality traits, social media addiction, mental health

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Introduction

Social media platforms have become integrated into society and are considered important mediums for social relationships, business, and collective actions, and form their own community structures (Cheng et al., 2019). While benefits can be derived from the interaction of persons with social media platforms, the increasing level and possible dependence on their usage can be problematic (Savci et al., 2020). Problematic social media use (PSMU) is defined as an obsessive usage of the social media platforms resulting in neglect and undermining of various domains of one's life such as work, school, social interactions (non-Internet activities), and a loss of control over the usage of the platform (Ryan et al., 2014; Smith, 2022; van Rooij et al., 2017).

Studies suggest that in line with the cognitive-affective-behavioural modelling paradigm, problematic use arises from maladaptive cognitive processes that distort habit into addiction (Chen, 2019a; Sun & Zhang, 2021). The theory of rational addiction suggests that individuals develop habitual usage patterns to obtain a desired gratification or utility in relation to perceived consequences (Smith & Short, 2022). In this context, individuals may seek to continually increase usage of social media to maximize gratification and utility under the assumption that further use will not have a negative effect. However, problematic use can develop due to maladaptive cognitive responses where individuals continue to increase usage to the point where no further benefit can be derived (Wang et al., 2015). At this stage, usage becomes less based on rational reflection on the utility of use and more as a reflexive action due to a distorted habitual response. Studies have found that the utility and gratifications that correlate to increasing habitual use include ease-of-use, information acquisition, and distraction/entertainment (Chen, 2019; Kicarburun et al., 2018; Wang et al., 2015). Furthermore, increasing use may be part of a maladaptive coping mechanism to escape from stressors or negative perception of self (e.g., low self-esteem, loneliness) experienced in the physical world, that is, escapism.

This study focuses on problematic Facebook use (PFU) and problematic TikTok use (PTU) to understand their prevalence amongst university students. It adds to the understanding of the use of TikTok and the possible addiction-like behaviours of its users, which is a gap recently highlighted by researchers (Montag et al., 2021; Smith & Short, 2022). Furthermore, it utilizes a multivariate approach to compare predictors and their effects on problematic use of Facebook and TikTok, using one of the most comprehensive lists of predictors in the literature.

A review of the literature showed a definitive absence of studies, which specifically sought to empirically compare predictors or their effects between social media platforms. This comparative approach can elucidate the potential importance of the different approaches to technology use in the two social media platforms in relation to affordances that satisfy the user's needs leading to increased use and potential addiction. Therefore, it also contributes empirical data to the ongoing discussions on whether social media addiction should be measured collectively or individually as has predominantly been the case (Balcerowska et al., 2020; Smith & Short, 2022). Specifically, it considers the uniqueness of the functioning of

individuals and the predictors of addiction between specific social media platforms as suggested in recent literature, that is whether social media addiction is technology use focused (Balcerowska et al., 2020).

Review of the Literature

Facebook and TikTok Usage

There has been notable attention given by academics and clinicians to Facebook as the prototypical example of a social network service over the last ten years given its seemingly unrivalled popularity (Mohsin, 2021; Montag et al., 2021). As such, most of the literature on the problematic use of social media has focused on Facebook (Menon & Meghana, 2021; Primi et al., 2021; Smith, 2022). However, while its hold on users remains strong, the time spent on the service is being outmatched by the newcomer, TikTok (Montag et al., 2021; Smith & Short, 2022).

Researchers have highlighted the need to examine TikTok to understand the reasons for its rapid success, the high levels of engagement by users, potential for problematic use, links to cyberbullying and accidental deaths associated with the platform (Montag et al., 2021; Smith & Short, 2022; Stokel-Walker, 2020; Zhang, 2018). Initial empirical research has supported the existence of problematic use of TikTok and its relationship with higher frequencies, and duration of use, with the addiction-like behaviours of withdrawal and relapse being those most related with the use of TikTok (Smith & Short, 2022).

Problematic social media use

Technology-use focused approach

A limited number of studies have highlighted the link between motivation to use social media and a platform's technical characteristics with reference to the Technological Acceptance Model (TAM), Needs-Affordance-Features (NAF) Model of Technology Use and the theory of Uses and Gratification (Chen, 2019; Wang et al., 2015; Tarafdar et al., 2020; Montag et al., 2021). These discussions suggest that the level of attraction to a social media platform or the reason for its use will not be consistent if the implementation of the platforms differs. The application of this theory to PSMU hypotheses is that only when a person's needs are gratified (technology-based needs-affordance) by the media will he/she continue or increase his/her use (Montag et al., 2021). Furthermore, they highlight that psychological needs motivate the use of technology (Karahanna et al., 2018). Given the difference in the implementation of Facebook and TikTok, there may exist some differences in the adoption of the services and likelihood of addiction-like behaviours. Furthermore, the underlying psychological factors that attract users may not be consistent between platforms.

Determinants of technology use and the likelihood of social media addiction

Research has demonstrated that the use of social media platforms, technology use in general and gratification obtained or desired from technology vary as a function of user characteristics, such as age, sex, personality, motives and psychological characteristics (Korabou et al., 2020).

The following sections examine the available support for the significance of these relationships in the literature.

Socio-demographic

Empirical assessment on the role of demographics on PSMU has had mixed results (Cimadevilla & Jenaro, 2019; Peris et al., 2020). Some studies suggested a higher tendency of PSMU among males (Cheng et al., 2019b; Peris et al., 2020), while other studies showed females having a higher tendency to engage in PSMU (e.g., Bányai et al., 2017; Yen et al., 2009). Further obfuscating the role of sex in PSMU are a few studies that found no statistically significant relationship with sex (Tang et al., 2016). Most past empirical studies suggest that younger persons are more likely to experience PSMU (Henzel & Håkansson, 2021; Peris et al., 2020). This outcome is supported by research that exposit on youth susceptibility to problematic use being attributable to the incomplete development of regions in the brain responsible for self-regulation (Steinberg, 2008) and higher susceptibility to negative peer influence (Steinberg & Monahan, 2007).

Big Five personality traits

Big Five personality traits of openness to experience, conscientiousness, extraversion, agreeableness, and emotional stability (inverse of neuroticism) have an important role in explaining different tendencies/propensities in experiencing PSMU and adopting certain technologies, as they can define online interactions (Durak & Senol-Durak, 2014; Omar & Dequan, 2020; Peris et al., 2020). The most studied personality dimension in relation to PSMU has been extraversion, which has been found to be mostly positively correlated to an increased risk of PSMU (Cheng et al., 2019; Hussain & Pontes, 2018; Peris et al. 2020). Other studies found no link between extraversion and specific social media, for example, Facebook (Skues et al., 2012). Neuroticism has shown a positive association with PSMU, which has been attributed to a person's desire to establish social connections online that they are unable to establish in the physical world (Kircaburun et al., 2018; Marengo et al., 2020; Peris et al., 2020). In comparison, Omar and Dequan (2020) found that the Big Five personality traits, except for agreeableness, were correlated to TikTok usage.

Psychological variables

Self-esteem has been identified as being positively correlated with social media addiction (Peris et al., 2020). Liu et al. (2020) suggest that persons experience low self-esteem due to being unsatisfied with their bodies and, as a result, seek positive responses through social media where they can control how they are viewed. Thus, social media can build 'online' self-esteem by providing a feeling of belongingness and a path to peer acceptance (Zhao et al., 2008; Yu et al., 2010). Past research suggests that the underlying nature of this relationship is the mediating effect of self-presentation and extraversion on self-esteem and PSMU (Smith, 2022).

Loneliness has also been identified as being correlated to PSMU and correlates to low self-esteem, which is itself a predictor of problematic use (Baltaci, 2019; Baturay & Toker, 2016; Eraslan-Capan, 2015). Loneliness can be defined as an inconsistency in one's desired and

perceived levels of social connectedness (Baltaci, 2019; Youssef et al., 2020). The relationship between loneliness and PSMU arises out of a dependency on social networking platforms for interpersonal interaction (to reduce feelings of loneliness) as they generally lack offline interaction (Primack et al., 2017; Shuai et al., 2018).

Methods

Participants and procedure

The present study involved 353 Trinidad and Tobago university students at the undergraduate and postgraduate levels. There was a higher proportion of females (61.5%) and younger persons participating, $\bar{x} = 26.09$ ($SD = 7.59$). Data was captured using a voluntary self-administered online survey.

Variables and Instruments

Measurement of problematic Facebook and TikTok use

The study utilized the Bergen Facebook Addiction Scale (BFAS) (Cronbach alpha = .866) and Problematic TikTok Use Scale (PTUS) (Cronbach alpha = .907) to assess problematic Facebook and TikTok use respectively (Andreassen et al., 2012; Smith & Short, 2022). The BFAS and PTUS both consist of six items, each representing one of the six components of addiction as identified by Griffiths (2005):

- ***Salience***. Total preoccupation with a given activity. The activity becomes the single most important activity in the person's life and dominates his/her thinking. This leads to cognitive distortions, cravings for the activity and deterioration of socialised behaviour.
- ***Mood modification***. This refers to the subjective experiences that people report because of engaging in the activity and can be seen as a coping strategy.
- ***Tolerance***. This is the process whereby increasing amounts of the activity are required to achieve the former mood modifying effects.
- ***Withdrawal***. These are the unpleasant feeling states and/or physical effects (e.g., the shakes, moodiness, irritability, etc.) that occur when the person is unable to engage in the activity.
- ***Conflict***. This refers to the disagreements, divergences and struggles with persons, activities and even themselves due to concerns with excessive levels of engagement in the activity.
- ***Relapse***. This is the tendency for repeated reversions to earlier patterns of excessive engagement in the activity to recur, and for even the most extreme patterns typical of the height of excessive engagement in the activity to be quickly restored after periods of control.

The six dimensions of addiction were measured using six 5-point Likert-type items with a range of 1 to 5.

Demographics

Information regarding age and sex was collected as the last two questions in the questionnaire. Sex was represented as a dichotomous variable, while age was given as ordinal (18-24, 25-34, 35-44, 45-54, 55-64, 65-74 and 75 or older).

Assessment of Use and Gratification (motives of use)

The study combined works on the relationship between gratification and Internet use by Stafford et al. (2004), Liu et al. (2010) and Omar and Subramanian (2013) to examine five dimensions of gratification. These dimensions are content (direct or substantive intrinsic value of the media to the user); social (media allows interactivity with other users); process (gratification from being involved in the activity rather than its content, i.e., allows them to pass time); technology (the suitability and convenience associated with the use of the media); self-presentation (allows the user to show their creativity and present themselves to others) (Bucknell Bossen & Kottasz, 2020; Omar & Dequan, 2020). These dimensions are assessed using an 11-item survey, where responses were rated on an adapted 5-point Likert-type scale (“strongly agree” to “strongly disagree”) (Omar & Subramanian, 2013).

Big Five personality traits

The Big Five model is the most widely accepted model of personality (Nunes et al., 2018). It suggests five personality traits: extraversion, agreeableness, conscientiousness, emotional stability and openness (Costa & McCrae, 1992). One of the most well-used instruments to assess personality is the 10-Item Personality Inventory (TIPI) with over forty-three thousand citations (Google Scholar) (Nunes et al., 2018). The TIPI assesses personality using 5 pairs of 7-point Likert-type items (one standard and one reverse coded) with anchors “disagree strongly” and “agree strongly”. Each trait is scored by taking the average of the standard and reversed coded items that assess the specific trait (Gosling et al., 2003). The utility of the TIPI has been assessed extensively and has been found to have moderate Cronbach alphas, high temporal stability, strong correlation to longer measures (e.g., 44-item Big-Five Inventory) and a five-factor structure verified by factorial analysis (Nunes et al., 2018).

Psychological variables

In this study, two psychological variables were examined, namely, self-esteem and loneliness. Self-esteem was assessed using the Rosenberg Self-Esteem Scale (RSES), which is the most widely used measure of self-esteem in psychology research (Jordan, 2020). The scale assesses global self-esteem as a product of the respondent’s feelings of self-worth and self-acceptance (Rosenberg, 1965; Bányai et al., 2017). The Rosenberg Self-Esteem Scale is represented by 10 items on a 4-point Likert-type (“strongly agree” to “strongly disagree”) items. The score range is between 0-30, and the higher the score, the higher the self-esteem.

Loneliness was assessed using the University of California Los Angeles (UCLA) three-item loneliness scale, which has been accepted and widely used by the academic community (Liu et al., 2020; Igarashi, 2019). The scale consists of three items on a 3-point Likert-type scale

(‘hardly ever’, ‘some of the time’, ‘often’). The score range is 3-9, where a higher score corresponds to greater feelings of loneliness.

Engagement

To assess engagement, duration and frequency of use, questions were adapted from the works of Kim and Haridakis (2009), Bányai et al. (2017), and Smith and Short (2022). The following two questions were developed: 1) In the last 14 days on an average day, how many hours did you spend using Facebook/TikTok? (Choices were ‘0 -15 minutes’, ‘15 – 30 minutes’, ‘30 – 60 minutes’, ‘1 – 2 hours’, ‘2 – 3 hours’, ‘3-4 hours’, ‘more than 4 hours’); 2) How many times per day do you use Facebook/TikTok? (choices were ‘0 – 2 times’, ‘3-5 times’, ‘4-6 times’, ‘7-9 times’, ‘more than 10 times’). Level of engagement was collected separately for Facebook and TikTok.

Analysis

First, descriptive statistic and t-tests were conducted. For this analysis, persons experiencing problematic use were taken as those scoring 18 or more on the BFAS as suggested in previous studies (Andreassen et al., 2012; Bányai et al., 2020; Cuadrado et al., 2020). The two - sided tests (TOST) paired sample t-test was performed to test the hypothesis of equivalence between the problematic Facebook and TikTok, levels of engagement between the two platforms. Furthermore, the TOST independent samples t-test was used to assess gender differences in the level of engagement and problematic use in both platforms. The t-test was performed at an alpha level of 0.05 with lower and upper equivalence bounds of -0.5 and 0.5 respectively.

Second, correlation analysis was performed on the data using all variables. However, rather than using traditional correlation analysis, this study uses Conditional Correlation Analysis (CCR). Traditional correlation analysis is limited as it oversimplifies its consideration of possible relationships by examining only their relationship in the entire underlying data space. As a result, traditional correlation analysis may miss a strong correlation between variables that exist in a small subpopulation of the larger data space (Bhatta, 2017; Lawrance, 1976). Given previous studies have suggested sex and age difference in social media interaction/usage, the ability to identify the existence of relationships unique to a subpopulation (absent from the global population) will be beneficial for future study.

Third, Multivariate Multiple Linear Regression (MMLR) analysis was performed to examine the predictive power of demographic variables (age and sex), gratification (i.e., content, process, social, technology and self-presentation), psychological variables (self-esteem and loneliness) and time spent on Facebook and TikTok addiction using PaST (version 4.04). PaST is a free software for scientific data analysis, developed by the University of Oslo, Norway. MMLR is an analysis method for modelling multiple dependent variables with a single set of predictor variables and determine the numerical relationship between these sets of variables. It is especially useful where the dependent variables have significant inter-correlations, since, in the test of the overall model, this method produces significance tests for the predictors of the dependent variables which control for all other relationships in the model, including via the

other dependent variables (Dattalo, 2013). MMLR allows the researcher to determine the overall effect of the predictors given that persons may tend to use both social media platforms, and there may be correlations between them. Furthermore, the method allows the comparison of coefficients between models to determine the equivalence of effect sizes.

Results

The study found that 0.57% of Facebook users, and 3.70% of TikTok users engage in problematic use of the respective social platform. Notably, only one participant was found to exhibit addiction on both platforms.

Table 1 provides further descriptive statistics showing the mean score and standard error for variables of problematic use, duration of usage, frequency of use, age and sex. Observation of the results in Table 1 suggests that there may be similarities between each platform but differences in the use and experience of the platform between sexes. Therefore, a comparative assessment of the usage of the two platforms, and their associated problematic use was also performed using TOST t-tests (90% CI, $\alpha = .05$).

Table 1

Distribution of respondents according to Facebook and TikTok addiction and demographic data (N=353)

Variables	Mean	SD	Females		Males	
			Mean	SD	Mean	SD
<i>Facebook</i>						
Problematic Use	4.12	4.47	4.49	4.81	3.4	3.93
Duration of use	53 min	60	56.68	61.18	41.19	54.08
Frequency of use	3 times per day	2.5	3.15	2.26	3.07	2.29
<i>TikTok</i>						
Problematic Use	3.84	5.39	4.68	6.16	2.67	3.79
Duration of use	49 min	59	58.23	64.52	32.96	46.0
Frequency of use	3 times per day	2.3	2.99	2.22	2.88	2.08
Age	26.09 years	7.59	25.51	7.26	27.06	8.08

Note: SD = standard deviation

The results of the TOST paired samples t-tests shown in Table 2 suggest that the overall experience of the dimensions of problematic use, duration of usage and frequency of use are statistically equivalent between the two platforms as in all cases.

Table 2

Results of tests of equivalence between Facebook and TikTok

Variable		Low	High	90% Confidence interval	
				Lower	Upper
Problematic use	Cohen's d	-0.500	0.500		
	Raw	-3.395	3.395	-0.561	0.744
Duration	Cohen's d	-0.500	0.500		
	Raw	-1.489	1.489	-0.374	0.198
Frequency	Cohen's d	-0.500	0.500		
	Raw	-0.868	0.868	-0.06	0.272

Gender differences related to usage on the different platforms were also assessed using TOST independent sample t-test. The results of the tests are shown in Table 3. The duration of usage by females was found to be significantly higher than males on both platforms. This higher duration was particularly noticeable between TikTok users (females, $\bar{x} = 58.23$ minutes, males, $\bar{x} = 32.96$ minutes), while gender difference in frequency and higher scores on the problematic use scales were only found with TikTok.

Table 3

Results of tests of gender difference in social media usage

Variable		Low	High	90% Confidence interval	
				Lower	Upper
<i>Facebook</i>					
Problematic use	Cohen's d	-0.500	0.500		
	Raw	-2.220	2.220	0.264	1.977
Frequency	Cohen's d	-0.500	0.500		
	Raw	-0.631	0.631	0.116	0.602
Duration	Cohen's d	-0.500	0.500		
	Raw	-0.995	0.995	0.273	1.037
<i>TikTok</i>					
Problematic use	Cohen's d	-0.500	0.500		
	Raw	-2.577	2.577	1.099	3.025
Frequency	Cohen's d	-0.500	0.500		
	Raw	-0.562	0.562	0.164	0.586
Duration	Cohen's d	-0.500	0.500		

Differences in usage by gender between social media platforms were also examined using TOST paired sample t-tests, the results of which are shown in Table 4. Male and female usage and tendency towards exhibiting dimension of problematic use were found to be statistically equivalent between platforms.

Table 4
Results of test of differences between platforms by gender

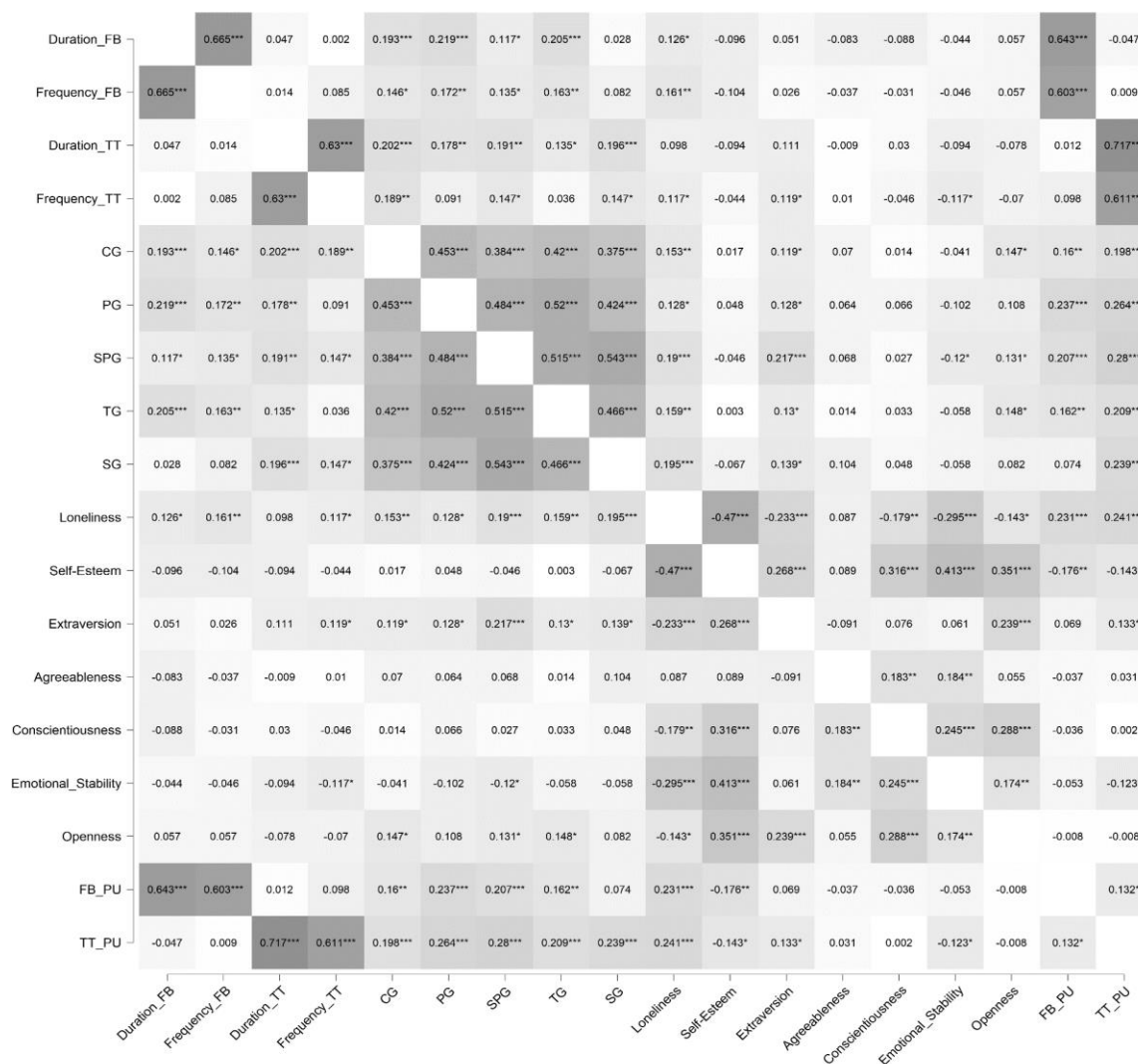
Variable		Low	High	90% Confidence interval	
				Lower	Upper
<i>Male</i>					
Problematic use	Cohen's d	-0.500	0.500		
	Raw	-2.573	2.573	-0.083	1.509
Frequency	Cohen's d	-0.500	0.500		
	Raw	-0.805	0.805	0.050	0.487
Duration	Cohen's d	-0.500	0.500		
	Raw	-1.293	1.293	-0.579	0.123
<i>Female</i>					
Problematic use	Cohen's d	-0.500	0.500		
	Raw	-3.765	3.765	-1.089	0.727
Frequency	Cohen's d	-0.500	0.500		
	Raw	-0.956	0.956	0.033	0.458
Duration	Cohen's d	-0.500	0.500		
	Raw	-1.587	1.587	-0.349	0.358

Correlation analysis was also performed on the data conditioned on sex and age. The results of this analysis are illustrated in the correlation heatmap given in Figure 1. The analysis shows a moderate positive correlation between the problematic use of both platforms and the level of engagement (duration and frequency of use). All motives of social media use (uses and gratifications theory) show a weak positive correlation to problematic use on both platforms except for social gratification which is not related to PFU. The psychological variables show a weak association with problematic use, loneliness having a positive correlation while self-esteem had a negative correlation. Regarding personality traits only, emotional stability and extraversion were found to have statistically significant relationships with problematic use.

Extraversion had a weak positive relationship while emotional stability exhibited a weak negative association (note low emotional stability equates to high neuroticism).

Figure 1

Heatmap of conditional correlations of observed variables with PFU and PTTU



As indicated, the main inferential test in the study is MMLR, which was used to identify the variance explained by the predictors and the comparative effect of these variables on the problematic use of both platforms while accounting for co-variance in the sample. The multivariate test of the overall model gave a Wilk's lambda of 0.1562 ($F = 28.31$, $df1 = 35$, $df2 = 666$, $p < .001$), indicating that the model is statistically significant for the multivariate outcomes.

Table 5

Test of Dependent Variables

Variable	R²	F	df1	df2	p
TikTok	0.6540	34.96	18	333	< .001
Facebook	0.5703	2.56	18	333	< .001

Note: F = F-statistic

Table 5 provides the results of the tests on the dependent variables. The results suggest that each of the two univariate models is statistically significant. Furthermore, from the column labelled R², the 18 predictor variables explain 65% and 57% of the variance in the outcome variables PTU and PFU, respectively.

The first two columns of Table 6 provide the results of the multivariate tests for each of the predictor variables. Thirteen of eighteen predictors were found to be statistically significant overall. Technically, there can be said to be 11 statistically significant predictors as duration (Duration of Facebook use and Duration of TikTok use) and frequency (Frequency of Facebook use and Frequency of TikTok use) can be considered collectively as they correlated only with the respective platform. For example, Frequency of Facebook use correlates to PFU but not PTU. Therefore, the level of engagement (duration and frequency) can be said to be associated with problematic use.

Table 6
Regression Coefficients and Statistics

Variable	Multivariate model		Problematic Facebook Use				Problematic TikTok Use					
	R ²	p-value	β	SE	t	p-value	R ²	β	SE	t	p-value	R ²
<i>Gratification</i>												
Content	0.037	< .001	0.023	0.044	0.528	.598	0.002	0.129	0.037	3.562	< .001	0.036
Process	0.056	< .001	0.043	0.029	1.480	.139	0.009	0.101	0.024	4.155	< .001	0.050
Self-presentation	0.09	< .001	0.085	0.041	2.056	.041	0.017	0.179	0.034	5.276	< .001	0.079
Technology	0.053	< .001	0.043	0.029	1.477	.141	0.009	0.097	0.024	4.027	< .001	0.048
Social	0.051	< .001	-0.016	0.030	-0.525	.599	0.000	0.109	0.025	4.354	< .001	0.051
<i>Personality Traits</i>												
Extraversion	0.02	.032	0.015	0.020	0.716	.474	0.002	0.042	0.017	2.461	.014	0.018
Agreeableness	0.006	.375	-0.019	0.024	-0.773	.440	0.001	0.025	0.020	1.238	.216	0.004
Openness	0.004	.504	-0.007	0.025	-0.273	.785	0.000	0.025	0.021	1.161	.246	0.004
Conscientiousness	0.003	.554	-0.010	0.026	-0.373	.709	0.000	0.024	0.022	1.053	.293	0.003
Emotional Stability	0.009	.209	-0.011	0.024	-0.469	.639	0.001	-0.032	0.019	-1.66	.097	0.008
<i>Psychological Characteristics</i>												
Loneliness	0.099	< .001	0.050	0.028	1.770	.078	0.014	0.136	0.024	5.779	< .001	0.092
Self-Esteem	0.013	0.0920	-0.176	0.100	-1.749	.081	0.009	-0.096	0.084	-1.149	.2510	0.005
<i>Demographics</i>												
Sex	0.037	< .001	-0.009	0.005	-1.811	.071	0.012	-0.013	0.004	-2.982	.003	0.028
Age	0.114	< .001	0.024	0.009	2.820	.005	0.013	-0.046	0.007	-6.333	< .001	0.094
Duration (FB)	0.473	< .001	0.321	0.018	17.616	< .001	0.452	-0.057	0.015	-3.744	< .001	0.007
Duration (TT)	0.516	< .001	-0.029	0.018	-1.607	.109	0.000	0.285	0.015	19.327	< .001	0.513
Frequency (FB)	0.378	< .001	0.188	0.013	14.585	< .001	0.372	-0.020	0.011	-1.899	.058	0.001
Frequency (TT)	0.379	< .001	0.001	0.011	0.153	0.878	0.004	0.137	0.009	14.544	< .001	0.379

Note. β = correlation coefficient; t = value of t-statistic; SE = standard error; FB = Facebook; TT = TikTok

The remaining columns of Table 6 contain the statistical output for each predictor variable in the univariate models grouped by the outcome. As mentioned above, the coefficients produced in the MMLR are interpreted in the same way as coefficients from an Ordinary Least Squares regression are interpreted. Firstly, the demographic factor of sex was found to be significant to PTU but not PFU, with females exhibiting higher problematic use than males. Age was found to be statistically significant for both platforms, with younger persons exhibiting a higher tendency towards problematic use. Duration and frequency were found to be positively correlated with problematic use in both platforms. However, high usage in one platform does not correlate to problematic use in the paired platform.

The examination of associations between problematic use and different types of motives is a further difference in predictors for the two platforms. All five types of motives were found to be correlated with PTU. However, only self-presentation was found to be predictive of PFU. The effect of self-presentation on PFU and PTU was found to be statistically equivalent. Similarly, the relationship (effect) of duration of use appears to be statistically equivalent for problematic use on both platforms. However, the relationship between frequency of use and problematic use differs between the two platforms, with higher frequencies being associated with PFU compared to PTU.

The results of the assessment of the Big Five personality traits generally indicated that the traits are generally not correlated with problematic use on either platform, the exception being extraversion which was found to be positively correlated to PTU. In addition to personality traits, the personality characteristics of self-esteem and loneliness were also examined. Neither self-esteem nor loneliness was shown to be correlated to PFU, while loneliness was positively correlated to PTU.

Overall, the analysis identified that the two platforms shared several predictors of problematic use while TikTok had four additional predictors in comparison to Facebook. PFU and PTU were both correlated to engagement (duration and frequency of use of the specific platform), self-presentation and age. Furthermore, statistical analysis of correlation coefficients given in Table 6 indicate that the effect size and direction of the shared predictors are the same between the two platforms. The additional predictors of content gratification, process gratification, social gratification, technical gratification, extraversion, loneliness, and sex were identified for PTU. Additionally, the findings suggest higher levels of engagement in social media use by females and a higher average problematic use score.

Discussion

This study found an overall association between engagement (duration of use and frequency of use), loneliness, age, and self-presentation with the dimensions of problematic use. However, the predictive pathways for the two platforms were found to be different. Furthermore, the main

findings showed a gender effect favouring females. Approximately 0.57% of Facebook users and 3.70% of TikTok users were found to be at high risk of problematic use. The findings also indicate that only one participant was classified as engaging in problematic use on both platforms. Therefore, it does not appear that high levels of problematic use (addiction) on one platform predisposes a user to addiction on another. This is supported by the observed difference in predictive pathways between Facebook and TikTok identified in this study.

Regarding the association between PSMU and engagement (duration of use and frequency of use), the study found, as expected, that this factor is part of problematic use. While the frequency of use was not examined in previous studies, time spent on social media has generally been shown to correlate with higher problematic use, particularly when the sample had a larger proportion of females (Malik & Khan, 2015; Marino et al., 2018). This is suggestive of an “equivalence” between engagement and problematic engagement. However, the study shows that level of problematic engagement in one platform is not statistically related to problematic use in another. This supports the previous statement suggesting that problematic use can be localized to a platform and not necessarily a generalized phenomenon.

Concerning the individual characteristics of Facebook and TikTok users, results yielded that being female was statistically associated with PTU. However, the usage patterns on both platforms showed females with a higher duration of use and a higher average problematic use profile. Furthermore, in the case of TikTok, frequency of use was also higher among females. These results are in line with the findings of previous studies, although the degree of the effect has been heterogeneous (Blachnio & Przepiorka, 2016; Marino et al., 2018). Given the general higher usage and average problematic use score, it is reasonable to propose that females may have a higher preference for social activities on the Internet, which reduces the barrier between average use and addiction-like symptoms (Marino et al., 2018). This is in line with previous studies that also found sex differences in PSMU (Bányai et al., 2017; Marino et al., 2018).

The application of the Theory of Uses and Gratification allowed the investigation of PSMU in relation to an individual’s motives to use social media. PTU was found to be correlated to all the examined motives. However, findings for Facebook differed from previous studies (Bodroza & Jovanovic, 2016; Ryan et al., 2014; Tang et al., 2016) as only self-presentation was found to be predictive of PFU, while, in line with previous studies, motives were found to be collectively the most meaningful correlate (explained the most variance) to problematic use in TikTok with self-presentation having the largest effect (Marino et al., 2018). The greater strength of association and consistency across platforms of self-presentation supports the findings put forward by Marino et al (2018) that indicate that internal motives showed the strongest association with PSMU.

The difference in the predictive pathways as it relates to motives between Facebook and TikTok may be suggestive that problematic use among social media platforms may be conceptualized in

more than one way. It is possible that, in some instances, it is the result of maladaptive coping strategies (to reduce negative moods and meet emotional needs) and in other cases the result of a proper behavioural addiction (Kardefelt-Winther, 2014; Marino et al., 2018; Ryan et al., 2016). Furthermore, works of Chen (2019), Smith and Short (2022), Wang et al. (2015) and Tarafdar et al (2020) suggested that the differences in the design of the technological medium and its ability to meet specific needs define its potential for addictive use. It has been suggested that TikTok is potentially more addictive than Facebook, because its media feed focuses on providing the user with content that they truly like in order to keep them engaged and online by using artificial intelligence. Unlike Facebook, users are not bound primarily by the content provided by their network, that is, what the network members want to see rather than want the content the user likes and desires.

Furthermore, TikTok's focus on short-form videos that have allowed users to focus on self-presentation through dance (suggestive or otherwise) and song with the reward of 'likes', which is enhanced as the opportunity for 'likes', is not limited to the user's network. The presence of the 'like' button allows instant gratification, and the greater number of 'likes' provides a perception of acceptance and investment by followers which drives habitual use and addiction through positive reinforcement (Ghose, 2015; Wang et al., 2015). Research has shown that the brain responds to social media the same way it responds to real-life connections, with a release of dopamine, a neurotransmitter which positively stimulates the reward centre of the brain (Sherman et al., 2016). Therefore, like substance addiction, the user will seek to acquire more periods of positive stimulation through increased use. Also, the continuous scroll design of TikTok improves on the model presented by Facebook as it is uninterrupted by text/ comments (viewing of comments is optional). This encourages users to enter a flow-like state that is characterized by a fully immersed mental state (high degree of focus, involvement and energy) while using the platform (Csikszentmihalyi, 2002; Huang et al., 2014). Overall, this highlights the importance of structural and contextual aspects of social media platforms, which may be independent contributors to addiction in some instances and exacerbate the risk posed by the dispositional attributes (e.g., psychological factors such as loneliness) of users in other cases.

Regarding the role of personality in PSMU, only extraversion was found to be linked to problematic use in this study. The fact that extraversion was found to be significant across the two platforms adds merit to the findings of Andreassen et al. (2012) and Blachnio et al. (2017) that suggest that this trait plays an important role in predicting problematic use. Findings on the role of personality in previous studies have been inconsistent (Andreassen et al., 2012; Balcerowska et al., 2020; Marino et al., 2018). A meta-analysis of problematic use by Marino et al. (2018) found that the mean age of the sample may moderate the relationship between problematic use and personality traits. Therefore, the observed outcome should be considered in the context of the mean age (26 years) of this sample and may be different for an older or younger group.

Regarding the psychological variables of loneliness and self-esteem, only loneliness was found to be related specifically to PTU. This means that the perception of social separation is predictive of maladaptive social media use. The absence of self-esteem is contrary to most studies that have found at least a weak relationship between low self-esteem and problematic use. However, researchers have highlighted that low self-esteem may not necessarily be predictive of problematic use but rather a potential outcome (Gonzales & Hancock, 2011). Therefore, TikTok again demonstrates a possible link to the need to develop coping strategies. This study is not the first to find loneliness not statistically related to PFU contrary to most studies (Baltaci, 2019; Primack et al., 2017). Researchers proposed that the inconsistency in the statistical relationship between loneliness and PFU is due to its relationship with other psychosocial factors and personality traits. It is proposed that the relationship between loneliness and these factors potentially decreases the predictive power of loneliness (Baltaci, 2019; Smith, 2022).

Rather than doing simple correlation as in previous studies, this study conditioned the correlation on sex and age. This analysis revealed self-esteem was negatively correlated ($p < .01$) to both PFU and PTU. Similarly, loneliness was found to be positively correlated ($p < .001$) to PFU. This suggests that the predictive roles of self-esteem and loneliness may be localised to specific subpopulations, which in this case is defined by sex and age. Specifically, both loneliness and self-esteem have independent sub-populations with sex and age classes in which they are correlated to problematic use. Like loneliness and self-esteem, the possible restriction of the association between variables to specific subpopulations is observed with motives and, to a lesser degree, personality traits.

When conditioned on sex and age, all motives of social media use, except for social gratification with TikTok, were found to be associated with problematic use on both platforms differing from what was presented by the regression. Furthermore, emotional stability (personality trait) was found to be negatively correlated to PTU; that is, neuroticism is positively correlated to problematic use. Interestingly, while like loneliness and self-esteem the variables identified above generally had independent sub-populations for sex and age in which they were correlated to problematic use, emotional stability required a combination of specific sex and age to be significant. These findings possibly explain the observations of Marino et al (2018) during meta-analysis, which indicated that study results showed patterns of inconsistency based on the composition of the sample as it relates to age and sex of participants.

The results of this study in the context of the broader literature offer key cues to the attendant psychological and social implications of social media addiction. Firstly, the problematic use of social media is associated with the high frequency and duration of social media which reduces time for real-world interaction and communication. This potentially leads to decreased attention and performance in normal daily activities. This is especially problematic as there is evidence that risk of addiction increases with decreasing age and that the overall use of social media negatively

affects academic performance (Al-Yafi et al., 2018; Azizi et al., 2019; Upadhayay & Guragain, 2017). Additionally, as highlighted in this study, addictive use of social media can signal underlying psychological issues such as low self-esteem and feelings of loneliness, which can lead to mental and physical health issues like depression, anxiety, and anorexia (Kumar et al., 2018). Social media is particularly problematic as it is self-reinforcing with the 'like' culture that exists, which encourages increased use for the 'high' or euphoria (linked to the dopamine release) associated with peer recognition (Marengo et al., 2021). This positive feedback and the associated increased use of the social media platform do not lead to any action to deal with the underlying social or psychological problems and can potentially exacerbate them as the increased use of social media means decreased connectedness in the real-world and further isolation.

Research also suggests that the constant overstimulation provided by the dopamine response associated with social media disrupts the normal functioning of the nervous system, which can exacerbate disorders such as attention deficit hyperactivity disorder (ADHD) and oppositional defiant disorder (Kardaras, 2016). Furthermore, other notable problems can arise that negatively affect the mental and physical health of users such as insomnia, body image dissatisfaction, depression, anxiety, decreased life satisfaction and suicidal outcomes (Brailovskaia et al., 2021; Hunt et al., 2018; Longobardi et al., 2020). This is even more worrying as females who appear to engage in social media use with greater frequency and are at a higher risk of addiction have a higher tendency towards body dissatisfaction (Quittkat et al., 2019) and depression after puberty (Geiger & Davis, 2019). Additionally, one study specifically identified that teens who spend more time on digital media are more likely to be depressed, and engaged in self-harm, suicidal ideation, suicide attempts, and suicide with the effect being stronger among females (Twenge, 2020).

Limitations

The method of pairing cross-sectional survey data and behavioural traits brings with it several limitations. Firstly, only a correlational relationship can be identified since time order cannot be established to elucidate causal pathways. Therefore, as highlighted in the discussion, the nature of psychological variables such as loneliness and self-esteem as predictors, outcomes or both cannot be differentiated. Only their relationship to PSMU can be established. Additional research using longitudinal design methods will be needed to bring greater clarity. Furthermore, the inclusion of a qualitative dimension to the research approach can add depth and texture to our understanding of the human experience in relation to social media use by understanding behaviour from the informant's perspective. This approach accepts the possibility of a dynamic and negotiated reality between the subject and the target medium and, as such, does not limit the examination of possible interactions and behaviours to those currently known to the researcher. This will be particularly important in understanding the underlying mechanism (and its variation)

that leads to and fosters the continuance of addictive behaviours. Therefore, future research should seek to use a multi-method approach to provide greater insight into this phenomenon.

Secondly, in the current study, although duration and frequency are examined, the nature of the engagement is not collected. Rather than simply level of engagement, it may be the type of engagement that is important. This approach also draws attention to the difference in the offerings between social media platforms, for example, photos only compared to short videos. This is a logical consideration given the empirical evidence that supports the importance of gratification and needs affordance in the underlying mechanism of addiction as the method and ease of use will potentially dictate what the user can derive from engagement with the platform.

Finally, the sample had more females than males and a greater proportion of younger participants. This study along with others has indicated that the configuration of the sample affects the relationships. However, this is addressed to some degree in the use of conditional correlation analysis. Future studies can specifically look at the gender and age differences and how they moderate or mediate the relationship of variables with PSMU.

Conclusion

The work of Balcerowska et al. (2020) suggested that PSMU is completely equivalent to PFU as they refer to the same underlying process. However, this study shows this is limited to the manifestation of maladaptive changes in behaviour associated with problematic use and does not extend to the pathways to predict problematic use. Like the work of Peris et al. (2020) and Smith and Short (2022), this study demonstrates that there are multiple pathways to predict problematic social media use. However, it also shows that some factors (engagement, self-presentation, and age) are consistent across domains, and that the effect size of these predictors is equivalent. This implies that while the grouped analysis of social media platforms may hold utility in its parsimonious approach given equivalence in the manifestation of problematic use, assessment of individual platforms is important to understand the predictive pathways. Therefore, it is unwise to assume that the results of the examination of one social media platform are generalisable to all other platforms (Ryan et al., 2014). Furthermore, this implies that composite examination of social media can result in information loss as the significance of the variable may be dependent on the composition of the sample relative to which services the majority of participants use primarily.

The empirical data makes clear that the potential damage of problematic or addictive use of social media is not limited to the digital space, but rather extends to numerous facets of daily functioning. Social media is predicted by social and psychological problems such as low self-esteem and loneliness but can also lead to serious psychopathologies and physical issues including depression, anxiety, anorexia and self-harm. Therefore, it is imperative that authorities /policymakers (including schools) develop awareness strategies to help children and young adults identify the

risk and signs of the onset of social media addiction. Interventions should also be developed and implemented to help persons who are already exhibiting addictive behaviour by providing recovery mechanisms including professional counselling where necessary to deal with the underlying factors of the addiction such as low-self-esteem, loneliness and depression.

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