


FoMO, but not self-compassion, moderates the link between social media use and anxiety in adolescence

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ABSTRACT

Objective: Social media use is ubiquitous during adolescence, and emerging research suggests an association with anxiety symptoms in some individuals. Two psychological constructs which may moderate this relationship are Fear of Missing Out (FoMO) and self-compassion. Higher FoMO tendencies may exacerbate the link between social media use and anxiety symptoms through greater fixation on social comparison, whereas higher self-compassion may weaken this link. The purpose of this study was to examine whether FoMO and self-compassion independently moderate the relationship between social media use and anxiety symptoms in adolescents.

Method: Participants included 951 adolescents ($M_{\text{age}} = 13.69$, $SD = 0.72$; 54% male). Online questionnaires assessed frequency of social media use, anxiety symptoms, FoMO, and self-compassion.

Results: FoMO moderated the relationship between social media use and anxiety, $\Delta R^2 = .022$, $\Delta F(1,945) = 26.26$, $p < .001$. Increased social media use was associated with increased anxiety symptoms in adolescents high in FoMO and reduced anxiety for adolescents low in FoMO. Self-compassion was not a significant moderator.

Conclusion: These findings have implications for social media use, public guidelines and clinical practice and support adoption of a discerning approach to adolescent's social media use.

KEY POINTS

What is already known about this topic:

- (1) Whilst some studies demonstrate an association between social media use and anxiety, depression or self harm, other studies suggest social media is beneficial to wellbeing.
- (2) Previous research suggests that Fear of Missing out mediates the association between anxiety and social media use.
- (3) Self compassion is associated with less time spent on social media.

What this topic adds:

- (1) This study identified students who are adversely affected by social media use amongst Australian adolescents and differentiated them from students who derive some benefit from social media use.
- (2) Students who were concerned by a fear of missing out showed that social media use was associated with increased levels of anxiety. In contrast, for students who were not concerned with missing out, increased social media use was associated with reduced levels of anxiety.
- (3) Self-compassion did not moderate the association between increased social media use and anxiety symptoms.

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Approximately 45% of teens report being nearly constantly online (Anderson & Jiang, 2018; Anderson et al., 2022), with social media use as a frequent online activity (Anderson et al., 2022; E-Safety Commissioner, 2021). Social media use refers to the use of internet-based platforms such as Facebook, Twitter, Instagram, Pinterest, and Snapchat, amongst others (Oberst et al., 2017). These platforms allow users to create a public or

semi-public personal profile to make and maintain connections with others online (Boyd & Ellison, 2007). The link between high social media use and wellbeing in adolescents is the subject of debate (Schemer et al., 2021). Studies demonstrate a link with anxiety or depressive symptoms and increased risk of self-harm behaviour (Barry et al., 2017; Barthorpe et al., 2020; Boers et al., 2019; Frison & Eggermont, 2016; Hong

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et al., 2019; Lee-Won et al., 2015; Pantic et al., 2012; Woods & Scott, 2016; Yan et al., 2017). However other studies question the magnitude and direction of this link (Coyne et al., 2020; D. Liu et al., 2019; Valkenberg et al., 2022) with inconsistent results attributed to self-report and omission bias. An alternative hypothesis has emerged suggesting that students respond to social media in different ways, and only a portion are vulnerable to the negative effects of social media (Valkenburg et al., 2022).

Over the past 15 years use of technology has become integral to families and anxiety levels have increased in adolescence (Australian Bureau of Statistics [ABS], 2017–2018, 2020–2021; Bitsko et al., 2018; Charmaraman et al., 2020¹). Given the prevalence of both, attaining clarity on factors which indicate whether use of social media will contribute to, or relieve anxiety is essential. FoMO is characterised by apprehension about being excluded from shared enjoyable experiences (Przybylski et al., 2013), with prevalence rates of 50% in adolescence (APS, 2015). FoMO was first operationalised in 2013 in response to social networking sites which enabled people to continually see what others are doing. Self-compassion is defined as a healthy way of relating to oneself with care and kindness as opposed to self-criticism (Gilbert, 2014; Neff, 2009).

Anxiety disorders in adolescence are characterised by excessive worries or heightened fear responses which do not represent typical child development (American Psychiatric Association, [APA], 2013). The link between adolescent social media use and anxiety symptoms raises particular concern because the onset of most anxiety disorders is during adolescence (Beesdo et al., 2009; Kessler et al., 2007) and anxiety symptoms such as social anxiety are associated with the emergence of loneliness and depression (Danneel et al., 2019). Moreover, anxiety symptoms, including subclinical levels of anxiety, are associated with significant distress and affect daily functioning (Balázs et al., 2013).

Belongingness theory and FoMO

Belongingness theory posits the need to belong is a fundamental psychological need which motivates human behaviour, and is achieved through frequent positive connections with others, and ongoing relationships that are stable and caring (Baumeister & Leary, 1995; Baumeister & Robson, 2021). The integrative framework posited by Allen et al. (2021) explains that an individual's sense of belonging is related to their perceptions of others, their social competencies, the opportunities to mix with others and their own motivation. Social media may provide an accessible platform for deepening or

undermining a sense of belonging in three of these four areas. First, it proffers more opportunities to develop lasting, meaningful, positive relationships with people outside the individual's face to face community when there is a sense of identification (Allen et al., 2021; Q. Liu et al., 2018). This is valuable if the number of face-to-face communities are restricted (for example by location) or are not perceived to be inclusive (for example, within a particular school). Secondly, for some individuals who lack social competency (for example adolescents with social anxiety), supportive relationships can be more easily established by removing barriers to self-disclosure that emerge in face-to-face friendships. These adolescents may be more willing to share feelings, worries and vulnerabilities due to reduced visual, auditory and contextual cues (Allen et al., 2021). Early research showed online disclosure to be associated with higher quality friendships (Valkenburg & Peter, 2009). Finally, social competency may be enhanced through the influx of information an individual picks up in their area of interest via social media. This occurs through reading and watching content that is interest specific. However, one's sense of belonging may also be threatened by social media through online ostracism. This has the potential to negatively impact self worth and mood. Importantly, research has shown that when a sense of belonging is a central motivating factor for social media use, habits are formed and strengthened over time when belongingness needs are met. For these individuals, belonging is crucial for ongoing frequent social media use (Q. Liu et al., 2018; Smith et al., 2021). According to Baumeister and Leary (1995), wellbeing is predicted if belongingness needs are satisfied, whereas ill-being and negative affect are predicted if belongingness is not achieved.

There are a group of individuals who use social media compulsively without their belongingness needs being met. Przybylski et al. (2013) found a relationship between low need satisfaction and increased social media use in adults ($N = 2,079$, $M_{\text{age}} = 43.21$) and Roberts and David (2019) found a similar link between increased social media use and lower general mood and subjective wellbeing in university students ($N = 458$, $M_{\text{age}} = 20.35$). These findings emphasise the mental health risks of high social media use across the lifespan. Further work is required to understand mechanisms of action which may place some adolescents at higher risk of poor mental health outcomes compared to other adolescents.

FoMO has been strongly linked with compulsive social media use (Oberst et al., 2017; Wolniewicz et al., 2017; Zhou, 2019). In research highlighting the negative effects of social media use, strong associations were found between FoMO and social media use

[($r = .40$; Przybylski et al., 2013) and ($\beta = .52$; Roberts & David, 2019)]. Across a range of cultures this link has been replicated. In a German longitudinal study ($N = 822$, $M_{\text{age}} = 12.09$ years), FOMO was negatively related to social well-being over time (Schmuck, 2021). Oberst et al. (2017) found that FoMO mediated the relationship between anxiety symptoms and social media use by accounting for most of the variance in social media use in Latin-American adolescents ($N = 1,468$, $M_{\text{age}} = 16.59$, $SD = 0.62$). In American adolescents ($N = 133$, $M_{\text{age}} = 15.3$ years) parent reports showed that high social media use was more strongly associated with anxiety symptoms when adolescents were high in FoMO (Barry et al., 2017). In Chinese adolescents ($N = 1,050$, $M_{\text{age}} = 13.77$, $SD = 1.62$), Hong et al. (2019) found that increased social anxiety was associated with increased social media use on mobile phones particularly if adolescents perceived that higher usage enabled them to achieve a greater sense of belonging.

How does FoMO moderate the effect of social media use on anxiety?

There are a significant portion of adolescents who describe being unable to disengage from social media at night due to FoMO. They worry about the impact of switching off, ignore bedtimes and feelings of tiredness (Scott et al., 2019). Relatedly, Przybylski et al. (2013) found that individuals with a high overall level of FoMO attained lower need satisfaction, lower general mood and lower life satisfaction despite increased social media engagement. One possibility is that they are overly reliant on constant connection to maintain a sense of belonging. FoMO may mean they do not trust in their ability to miss conversations and remain within their group. Due to constant use, they do not have the opportunity to learn that they have a secure place in the group in the absence of continual online participation.

A related pathway, which may explain an alternate pattern, is that high FoMO adolescents overload themselves with social connections. Across several studies, Tandon et al. (2021) observed that an individual experiencing an advanced level of FoMO may use a greater number of social media platforms and suffer distress from problematic use. With such a high load, social media use no longer has a positive impact on well-being. In support of this pathway, Chai et al. (2019) showed that while social media use had a direct positive effect on wellbeing, there was an indirect negative impact caused by social overload moderated by FoMO. Taken together, preliminary research suggests experiencing FOMO may place adolescents who frequently

engage in social media use at higher risk of poor mental health outcomes. Thus FOMO may be a mechanism of action which exacerbates the risks associated with high social media use.

The role of self-compassion as potential moderator

Social media connects adolescents to both the wider world and to their peer group. It has the capacity to assist the individual develop a sense of common humanity. Increasing a self-compassionate mindset through psychological intervention has been found in a recent meta-analysis to be associated with a reduction in anxiety symptoms (Ferrari et al., 2019). It is a growing area of intervention within clinical psychology. Studies have shown that self-compassion plays a role in emotion regulation (Finlay-Jones, 2017; Finlay-Jones et al., 2015; Gilbert, 2014) and that it is associated with reduced anxiety symptoms and less time on social media (Bates et al., 2021; Keyte et al., 2021; MacBeth & Gumley, 2012; Phillips & Wisniewski, 2021). Explorations of the moderating role of self-compassion in the use of technology are sparse. Self-compassion was found to moderate anxiety symptoms in Chinese adolescents ($N = 489$, $M_{\text{age}} = 12.67$) experiencing cyberbullying (Chu et al., 2018). In an Australian university sample, moderate users of social media who had low levels of self-compassion were highly anxious, whereas anxiety was lower in participants with higher self-compassion (Phillips & Wisniewski, 2021). These preliminary findings may suggest that adolescents who are more self-compassionate may be better able to cope with the effect of social media use on anxiety symptoms, and thus be less susceptible to such symptoms. The impact of self-compassion on the individual's sense of belonging in social settings has the potential to guide the focus of clinical interventions (Allen et al., 2021).

Aims and hypotheses

The present study aimed to examine whether FoMO and self-compassion moderate the relationship between social media use and anxiety symptoms in adolescents. This extends the Barry et al. (2017) findings by using self-report measures for social media use (SM-frequency) and anxiety symptoms, and by using an in-depth anxiety measure allowing for the measurement of anxiety subtypes. Moreover, the study aimed to fill the gap in adolescent research which has not yet

investigated self-compassion as a potential moderator in this relationship.

It was hypothesised that FoMO would moderate the relationship between SM-frequency and anxiety symptoms, such that at high levels of FoMO, there would be a significant positive association between SM-frequency and anxiety symptoms. It was also hypothesised that self-compassion would moderate the relationship between SM-frequency and anxiety symptoms. For this moderation, it was anticipated that at low levels of self-compassion, there would be a significant positive association between SM-frequency and anxiety symptoms. The present study also aimed to further explore the relationship between SM-frequency and symptoms of different anxiety subtypes, such as generalised anxiety or social anxiety, at changing levels of the moderators.

Method

Participants

This study used a convenience sample. Adolescents completed online questionnaires as part of a baseline measure for several psychoeducational intervention studies (Einstein et al., 2022). Five of the six schools approached the first author to participate in the research, whilst the sixth school was approached by the first author to increase the number of males in the sample. A smaller subset of this data has been analysed elsewhere ($n = 541$; Ferrari et al., 2018). As the baseline data were collected prior to the intervention, these data reflect general functioning in a community sample and is not affected by the intervention.

Students and their primary caregiver agreed to participate through signing information and consent forms outlining the purpose of the intervention study. Students did not receive any form of reimbursement for their participation in completing the questionnaires.

Of the 1,998 students invited to participate in the study, 1,060 students and their parents provided informed written consent to participate (53%) from six independent Australian high schools. After excluding 109 participants whom had not provided any questionnaire responses, the final sample included 951 students comprised of 509 males (54%) and 442 females (46%). Their ages ranged from 12 to 16 years ($M = 13.69$, $SD = 0.72$). Seven participants did not report their age. The majority were born in Australia ($N = 849$, 89%). The next most common countries of birth were China ($N = 24$, 2.5%), the UK ($N = 23$, 2.4%), and the USA ($N = 9$, 0.9%).

Materials

Four measures were presented in randomised order within a larger online survey reported elsewhere (Einstein et al., 2022).

Frequency of social media use (SM-Frequency)

SM-frequency was measured using a single item asking, "How often do you use social media?" Responses, on a 6-point Likert scale, ranged from 1 (Constantly) to 6 (Once a week or less). Responses were reverse-coded prior to analysis so larger numbers reflected higher SM-frequency. Self-report measures have been widely used in previous studies assessing frequency of social media use (e.g., Pantic et al., 2012).

Fear of missing out (FoMO)

Five FoMO social media items were taken from the APS Stress and Wellbeing in Australia Survey (APS, 2015). An example question is, "I am afraid I will miss out on something if I don't stay connected to my online social networks". Responses were on a 5-point Likert scale ranging from 1 (*Never true*) to 5 (*True all the time*). Total scores ranged from five to 25. High scores signified high FoMO levels. Reliability in the present sample confirmed good internal consistency ($\alpha = .81$).

Self-compassion

Self-compassion was measured using the 12-item short-form of the Self-Compassion Scale (SCS-SF; Raes et al., 2011). The SCS-SF is comprised of three positive subscales including self-kindness, common humanity, and mindfulness, and three negative (reverse-scored) subscales including self-judgement, isolation, and over-identification (Raes et al., 2011). Example items are, "When I'm going through a very hard time, I give myself the caring and tenderness I need" (self-kindness) and, "I'm disapproving and judgemental about my own flaws and inadequacies" (self-judgement). Items were rated using a 5-point Likert scale ranging from 1 (*Almost never*) to 5 (*Almost always*). Emerging findings favour a two-factor scoring method, using separate total scores for the positive and negative subscales (Brenner et al., 2017; Muris et al., 2018), thus the current study combined the positive subscales scores to create a total score for Compassionate Self-Relating (CSR), and combined the negative subscales scores to create a total score for Uncompassionate Self-Relating (USR). Internal consistencies in the present sample for CSR ($\alpha = .82$), and USR ($\alpha = .90$) were good.

Anxiety symptoms

Anxiety symptoms were measured using the Spence Children's Anxiety Scale (SCAS; Spence, 1998) comprising of 44 items. The SCAS includes six subscales measuring generalised anxiety, social anxiety, separation anxiety, panic attack/agoraphobia, physical injury fears, and obsessive – compulsive disorder (OCD). An example SCAS item is, "I worry that something bad will happen to me". Items were rated on a 4-point Likert scale ranging from 0 (*Never*) to 3 (*Always*). Total scores ranged from zero to 114. High scores indicated high levels of anxiety symptoms. Internal consistency in the present sample for total SCAS was excellent ($\alpha = .94$), and values for the subscales were: generalised anxiety ($\alpha = .83$), social anxiety ($\alpha = .78$), separation anxiety ($\alpha = .70$), panic/agoraphobia ($\alpha = .85$), physical injury fears ($\alpha = .53$), and OCD ($\alpha = .81$).

Procedure

Students were supervised during class to complete online questionnaires through the Qualtrics online platform.

Planned analyses

IBM SPSS v.25 was used for data screening, assumption testing, and the main analyses. As recommended by Aiken et al. (1991), moderation was assessed with hierarchical multiple regression followed by simple slopes analysis using the PROCESS[®] macro for SPSS (Hayes, 2018). This regression-based procedure for investigating moderation is suitable for categorical or continuous variables (Hayes, 2018), including Likert scales (Norman, 2010). Gender and age were included as covariates to control for their potential effects on the outcomes. Centred variables were computed for SM-frequency, FoMO, CSR, and USR to avoid multicollinearity. Interaction variables were created by multiplying centred SM-frequency with each centred moderator variable. Three-step hierarchical multiple regressions were conducted with total SCAS scores as the dependent variable. Gender and age were entered in the first step, SM-frequency and the moderator were entered in the second step, and the interaction was entered in the third step. The third step made it possible to assess the change in variance resulting from the interaction. Significant interaction effects were further investigated using the PROCESS[®] macro to examine the Johnson-Neyman boundaries of significance and plotting simple slopes.

Additional follow up analyses of significant moderations were planned on the anxiety subscales using IBM SPSS Amos v.26. The comparative strength of

relationship between SM-frequency and each anxiety subscale was assessed at three levels of the moderator. Since there was no a priori hypothesis, a saturated path analysis ($df = 0$) was used (Raykov et al., 2013). The overall model comprised of six regression paths examined across three groups of participants, split according to average, moderate, or high scores on the moderator, based on the Johnson-Neyman boundaries of significance. The exogenous variable was SM-frequency and the endogenous variables were generalised anxiety, social anxiety, separation anxiety, panic/agoraphobia, physical injury fears, and OCD. To address multicollinearity, error terms for the anxiety subscales were allowed to be correlated.

Results

Missing values analysis and assumption testing

No variable was missing more than 2.5% of data. Little's MCAR test indicated that any missing data was completely at random (Little's MCAR test $\chi^2 = 57.01$, $df = 68$, $p = .827$). Missing values were imputed using Expectation Maximisation (EM) which is superior to the regression method which may artificially inflate correlations (Schafer & Olsen, 1998).

SM-frequency and self-compassion scores were normally distributed. Positive skew was evident for FoMO scores, SCAS total scores, and the anxiety subscales, except social anxiety. This skew, indicating that the majority of students were not experiencing high FoMO or anxiety symptoms, was not surprising given the non-clinical nature of the community sample. Square-root transformations were conducted on FoMO, total anxiety, separation anxiety, OCD, panic/agoraphobia, and physical injury fears, reducing the impact of extreme scores and ensuring that no z-score values after transformation exceeded 3.29. Case-wise diagnostics for the hierarchical regressions revealed three potential outliers ($z_{resid} > \pm 3.29$), but they did not exceed critical values for influence statistics or Mahalanobis scores and thus were retained. There were no further major violations of the assumptions for multiple regression and path analysis.

Social media use

Most participants reported that they used social media "about one to four times a day" (25%), and 21% reported using it "about five to ten times a day" (see Table 1). Raw FoMO total scores ranged from five to 25 ($M = 10.48$, $SD = 4.08$).

Table 1. Participant SM-frequency statistics.

Frequency of Social Media Use	Number of Participants	Percentage
Once a week or less	90	9
Several times a week	105	11
About one to four times a day	237	25
About five to ten times a day	197	21
More than ten times a day	168	18
Constantly	154	16

Percentages calculated based on full sample ($N = 951$).

Correlations

Results showed a strong positive correlation between FoMO and SM-frequency ($r = .45$), a moderate positive correlation between FoMO and anxiety symptoms ($r = .34$), and a weak positive correlation between SM-frequency and total anxiety symptoms ($r = .08$). Anxiety symptoms were negatively correlated with Total SCS-SF ($r = -.47$), weakly correlated with CSR ($r = .08$), and strongly positively correlated with USR ($r = .60$; see Table 2).

Examination of FoMO as moderator

FoMO was examined as a moderator of the relationship between SM-frequency (independent variable) and anxiety symptoms (dependent variable), controlling for gender and age. The model including FoMO, SM-frequency, and the interaction was found to be significant, $F(5,945) = 46.26$, $p < .001$, $R^2 = .20$. Inclusion of the interaction in the third step of the analysis contributed significantly to the model and accounted for an additional 2.2% of the variance compared with model two, $\Delta R^2 = .022$, $\Delta F(1,945) = 26.26$, $p < .001$. Overall, SM-frequency, FoMO, and the interaction together explained 20% of the variance in

anxiety symptoms, all making statistically significant unique contributions (see Table 3 for regression coefficients). These results suggested that FoMO does moderate the relationship between SM-frequency and anxiety symptoms in adolescents, therefore, follow up simple slopes analysis was conducted.

Simple slopes analysis

The moderating role of FoMO was examined using simple slopes analysis to investigate the nature of the interaction. The conditioning values for moderator levels were set at the 16th, 50th, and 84th percentiles, which corresponded to raw FoMO scores of 6, 10, and 15 respectively. When the value of FoMO was 6, the unstandardised simple slope for SM-frequency was $-.25$ ($p < .001$). This suggests a significant negative relationship between social media use and anxiety symptoms when FoMO is low. At average levels of FoMO (raw score = 10), the unstandardised simple slope for SM-frequency was $-.08$ ($p = .026$). This suggests a weak significant negative relationship between social media use and anxiety symptoms at average levels of FoMO. At FoMO of 15, the unstandardised simple slope for SM-frequency was $.09$ ($p = .066$), suggesting a nonsignificant relationship between SM-frequency and anxiety symptoms at high FoMO.

Further inspection of the Johnson-Neyman significance regions, however, indicated that the relationship between SM-frequency and anxiety symptoms became significant and positively correlated at raw FoMO scores over 15.30 ($B = .10$, $p = .05$). This positive relationship continued to strengthen as FoMO scores increased (see Table 4 for the conditional effect of SM-frequency at values of the moderator). In summary, the

Table 2. Correlations, means, and standard deviations for variables.

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Gender	–												
2. Age	-.19***	–											
3. SM-frequency	.10**	.16***	–										
4. FoMO ^a	.18***	.04	.45***	–									
5. CSR	.17***	.00	-.09**	.09**	–								
6. USR	.13***	.04	.03	.30***	.24***	–							
7. Total Anxiety (SCAS) ^a	.28***	-.06*	.08*	.34***	.08*	.60***	–						
8. Generalized Anxiety	.26***	-.03	.11**	.31***	.08*	.60***	.87***	–					
9. Social Anxiety	.23***	-.04	.07*	.31***	.03	.56***	.83***	.70***	–				
10. Separation Anxiety ^a	.27**	-.08*	.05	.27***	.09**	.39***	.75***	.59***	.56***	–			
11. Panic/Agoraphobia ^a	.24***	-.02	.09**	.23***	.06	.49***	.83***	.72***	.60***	.55***	–		
12. Physical Injury ^a	.25***	-.09**	.02	.20***	.04	.24***	.58***	.38***	.40***	.45***	.41***	–	
13. OCD ^a	.13***	-.03	.04	.27***	.06	.51***	.80***	.64***	.59***	.54***	.62***	.34***	–
<i>M</i>	–	13.69	3.75	3.18	2.86	2.64	5.20	6.83	7.20	1.58	1.59	1.56	2.09
<i>SD</i>	–	0.71	1.52	0.62	0.80	0.99	1.56	3.78	3.73	0.85	1.16	0.82	0.92
<i>SE</i>	–	0.02	0.05	0.02	0.03	0.03	0.05	0.12	0.12	0.03	0.04	0.03	0.03

$N = 951$. SM-Frequency = Frequency of social media use. FoMO = Fear of Missing Out. SCS-SF = Self-Compassion Scale, short-form. CSR = Total positive subscales of SCS-SF. USR = Total negative subscales of SCS-SF. SCAS = Spence Child Anxiety Scale.

For gender, 1 = male and 2 = female.

^aSquare-root transformed scale. Means displayed for these scales are the square-root values of the mean raw scores.

* $p < .05$, ** $p < .01$, *** $p < .001$, 2-tailed.

Table 3. Hierarchical regression analysis predicting anxiety symptoms (SCAS) and probing the interaction between FoMO and frequency of social media use, with age and gender as covariates.

	<i>B</i>	<i>SE B</i>	95% CI for <i>B</i>	β	<i>p</i> -value	<i>sr</i>	<i>sr</i> ²
Model 1							
Age	-0.02	0.07	-0.16, 0.11	-.01	.744	-.01	.000
Gender	0.88	0.10	0.68, 1.07	.28	<.001	.28	.076
Model 2							
Age	-0.04	0.07	-0.17, 0.09	-.02	.546	-.02	.000
Gender	0.71	0.10	0.52, 0.90	.23	<.001	.22	.048
SM-frequency	-0.10	0.04	-0.16, -0.03	-.09	.005	-.08	.007
FoMO	0.86	0.08	0.70, 1.02	.34	<.001	.30	.092
Model 3							
Age	-0.04	0.07	-0.17, 0.09	-.02	.564	-.02	.000
Gender	0.68	0.10	0.49, 0.87	.22	<.001	.21	.043
SM-frequency	-0.07	0.03	-0.14, -0.01	-.07	.033	-.06	.004
FoMO	0.84	0.08	0.68, 1.00	.34	<.001	.30	.088
SM-frequency*FoMO	0.24	0.05	0.15, 0.33	.15	<.001	.15	.022

B = unstandardized regression weight. *SE B* = standard error of regression weight. β = standardized regression weight. *sr* = semi-partial correlation. *sr*² = semi-partial correlation squared.
 Model 1: *R*² = .08, adjusted *R*² = .08, *F* (2, 948) = 40.93, *p* < .001.
 Model 2: *R*² = .17, adjusted *R*² = .17, *F* (4, 946) = 54.58, *p* < .001.
 Model 3: *R*² = .20, adjusted *R*² = .19, *F* (5, 945) = 26.58, *p* < .001.

Table 4. Conditional effect of focal predictor (SM-frequency) at values of the moderator (FoMO), in predicting anxiety symptoms.

Raw FoMO Score	SQRT Centered FoMO	<i>B</i>	<i>SE B</i>	<i>p</i> -value	95% CI for <i>B</i>
5.0	-0.94	-.30	.05	<.001	-0.40 -0.20
5.6	-0.80	-.26	.05	<.001	-0.36 -0.17
6.3	-0.66	-.23	.04	<.001	-0.32 -0.15
7.0	-0.53	-.20	.04	<.001	-0.28 -0.12
7.8	-0.39	-.17	.04	<.001	-0.24 -0.09
8.6	-0.25	-.13	.03	<.001	-0.20 -0.06
9.4	-0.11	-.10	.03	.004	-0.17 -0.03
10.2	0.02	-.07	.03	.050	-0.14 0.00
10.3	0.03	-.07	.03	.053	-0.13 0.00
11.2	0.16	-.03	.04	.346	-0.11 0.04
12.1	0.30	.00	.04	.974	-0.08 0.07
13.1	0.44	.03	.04	.455	-0.05 0.11
14.1	0.58	.06	.05	.164	-0.03 0.16
15.2	0.72	.10	.05	.056	0.00 0.20
15.3	0.73	.10	.05	.050	0.00 0.20
16.3	0.86	.13	.06	.020	0.02 0.24
17.4	0.99	.16	.06	.008	0.04 0.28
18.6	1.13	.20	.07	.003	0.07 0.33
19.8	1.27	.23	.07	.002	0.09 0.37
21.0	1.41	.26	.08	.001	0.11 0.41
22.3	1.55	.29	.08	<.001	0.13 0.46
23.6	1.68	.33	.09	<.001	0.15 0.50
25.0	1.82	.36	.10	<.001	0.17 0.55

SQRT Centered FoMO: Moderation analysis was conducted with FoMO scores after conducting a square-root transformation. The transformed scores were subsequently centred prior to analysis. *B* = unstandardized regression weight. *SE B* = Standard error for *B*. The boundaries of the Johnson-Neyman regions of significance are in bold.

Johnson-Neyman test indicated that at raw FoMO scores below 10.2, there was a significant negative relationship between SM-frequency and anxiety symptoms, and at raw FoMO scores above 15.3, there was a significant positive relationship. See Figure 1 for the Simple slopes plot based on Johnson-Neyman values. These results supported the hypothesis that FoMO moderates the relationship between SM-frequency and anxiety symptoms in adolescents, such that at high levels of FoMO, SM-frequency was significantly and positively associated with anxiety symptoms. And at low levels of FoMO, there was a significant

negative association between SM-frequency and anxiety symptoms.

Path analysis

The moderating role of FoMO was further investigated by comparing the strength of the relationship between SM-frequency and each anxiety subscale for participants with low (FoMO <10.20, *n* = 509), moderate (between 10.20 and 15.30, *n* = 335) and high (FoMO >15.30, *n* = 107) FoMO scores, based on the Johnson-Neyman values. As this analysis was exploratory in nature, a saturated path model (see Figure 2) was created (*df*

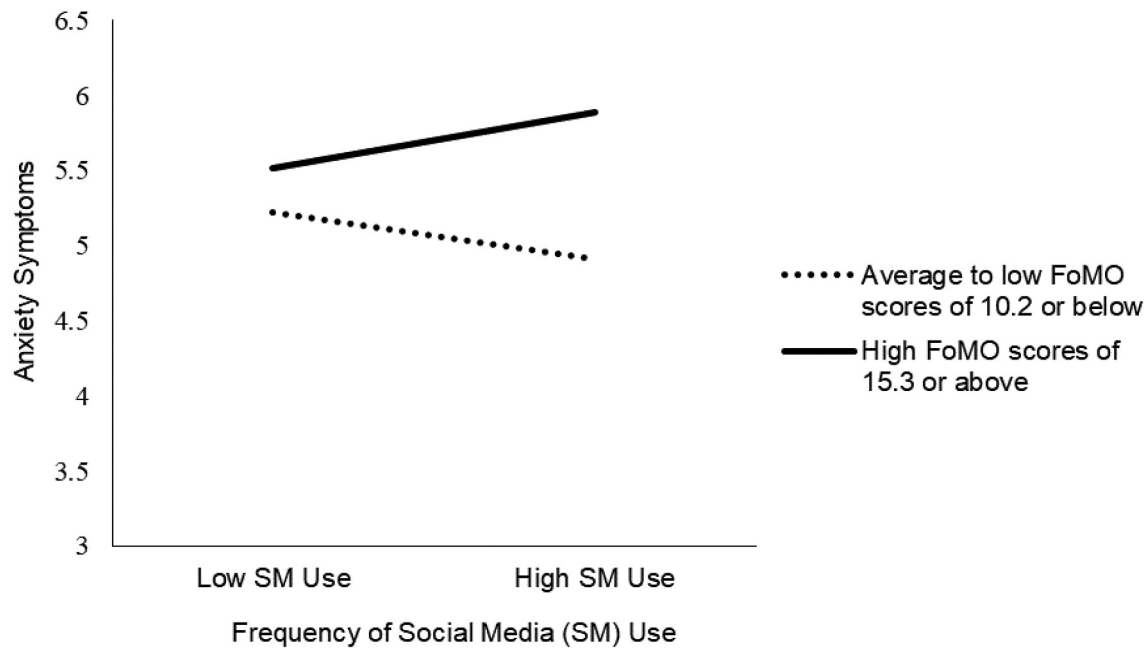


Figure 1. Plot of simple slopes based on FoMO values which bound the regions of significance, calculated by the Johnson-Neyman Test.

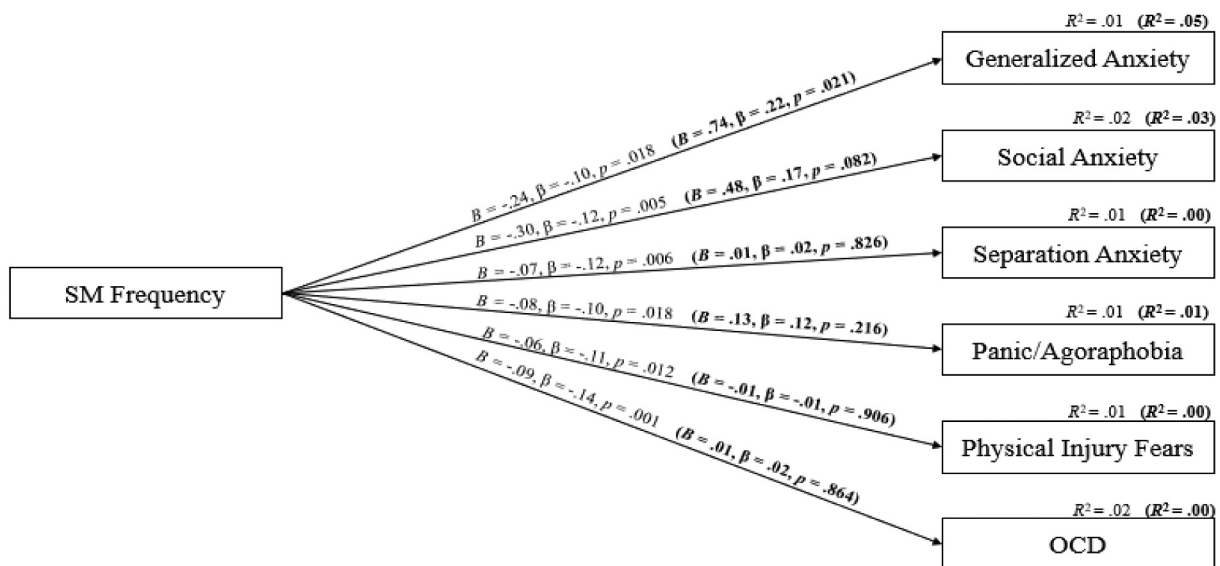


Figure 2. Path model investigating strength of the relationship between SM-frequency and each anxiety subscale depending on FoMO scores.

= 0), producing results equivalent to multiple regression analyses (Myers et al., 2011). Results indicated that at low FoMO, there were significant negative correlations between SM-frequency and each anxiety subscale. At moderate FoMO, there were nonsignificant correlations between SM-frequency and all anxiety subscales. At high FoMO, SM-frequency was most strongly correlated with generalised anxiety ($\beta = .22$, $p = .021$, $R^2 = .05$), explaining 5% of the variance in generalised anxiety symptoms. The social anxiety effect sizes closely

followed generalised anxiety but were nonsignificant ($\beta = .17$, $p = .082$, $R^2 = .03$).

Examination of self-compassion as moderator

Self-compassion was examined as a moderator of the relationship between SM-frequency (independent variable) and anxiety symptoms (dependent variable), controlling for gender and age. The moderating effects of CSR, and USR were analysed in turn. Results showed that the interactions between CSR and SM-frequency,

$\beta = .04$, $t(945) = 1.20$, $p = .229$, and USR and SM-frequency, $\beta = .10$, $t(945) = 1.38$, $p = .169$, were non-significant predictors of anxiety symptoms (see Supplementary Tables S5 and S6). Uncompassionate self-relating showed a significant main effect, explaining 32% of the variance in anxiety scores after taking into consideration the effects of age, gender and social media frequency. Overall, the interactions did not contribute significantly to the regression models for CSR, $\Delta F(1,945) = 1.45$, $p = .229$, and for USR, $\Delta F(1,945) = 1.90$, $p = .169$ indicating neither CSR nor USR were significant moderators in the relationship. Given the null findings, no further simple slopes or path analyses were conducted.

Conclusions

This study aimed to investigate whether FoMO and self-compassion moderate the relationship between adolescent social media use and anxiety symptoms. Results supported the first hypothesis, at high levels of FoMO there was a significant link between greater social media use and anxiety symptoms. Results did not support the second hypothesis as in this adolescent sample self-compassion did not moderate the link between greater social media use and anxiety symptoms. As anticipated, for adolescents high in FoMO (scores greater than 15.30; 11% of participants), greater social media use was significantly linked to higher levels of anxiety symptoms. A nonsignificant relationship was found for 35% of participants with moderate FoMO (scores between 10.20 and 15.30). Interestingly, for adolescents with average or below average FoMO (scores below 10.20; 54% of participants), greater social media use was linked to lower reports of anxiety symptoms. Using self-reported data, the results from the present study provide a more nuanced understanding of the relationship between adolescent social media use and anxiety symptoms not demonstrated previously. That is, social media use may be associated with lower levels of anxiety symptoms at low FoMO, with the association reversing at high FoMO, such that social media use becomes associated with higher levels of anxiety symptoms.

Exploring the moderation across symptoms of six anxiety subtypes showed that at average to low FoMO, social media use was related to less frequent reports of symptoms of generalised anxiety, social anxiety, separation anxiety, panic/agoraphobia, physical injury fears, and OCD, whilst there were no significant relationships at moderate FoMO levels. At high FoMO, results indicated that greater social media use was related to increased reports of symptoms of

generalised anxiety. This finding may relate to generalised anxiety being characterised by multiple concerns across several life-dimensions. Adolescents high in FoMO are already experiencing apprehension about social inclusion. Social media content may raise additional concerns regarding other life-dimensions such as completing schoolwork, planning for the future, or considering news events, thereby increasing symptoms. The nonsignificant finding with social anxiety symptoms is unexpected, given that Hong et al. (2019) linked increased social media use to social anxiety and the psychological need for belongingness. An explanation for the nonsignificant finding in the present study may be due to the small number of participants ($n = 107$) with FoMO scores greater than 15.30. This potentially reduced power to attain significant results across the six regressions in the path analysis for the high FoMO group. A further explanation may relate to the low levels of anxiety symptoms in the present non-clinical sample, which may have influenced the results.

The present study found a significant and strong relationship between USR and anxiety symptoms within an adolescent sample. These results converge with past findings supporting the link between greater USR and greater anxiety symptoms (Chu et al., 2018; Cunha et al., 2016; Phillips & Wisniewski, 2021). The present results did not support the hypothesis that self-compassion moderates the relationship between adolescent social media use and anxiety symptoms. Therefore, as adolescents vary their frequency of social media use, changes in anxiety symptoms were unrelated to their underlying tendency to be self-compassionate or self-critical. Although self-compassion has been found to moderate this relationship in a university sample (Phillips & Wisniewski, 2021) similar moderating effects were not found in the present study. A potential explanation for this is individual social media use would be presumed to be more stable and established in university students (Phillips & Wisniewski, 2021) than in younger secondary school students examined in the current study. The data collected by Phillips and Wisniewski (2021) may also have been influenced by the first set of Australian lockdowns which may have affected undergraduate university students who engaged in more online learning and reported a decline in wellbeing (Dingle & Han, 2021). In this context, self-compassion may be expected to have a greater impact on mental health generally, potentially contributing to the significant findings (Phillips & Wisniewski, 2021).

The finding that FoMO moderates the relationship between social media use and anxiety symptoms

provides further evidence for the capacity of Belongingness Theory to explain mental health outcomes in adolescence. Results supported previous findings with adolescents (Barry et al., 2017; Oberst et al., 2017), demonstrating that high FoMO is strongly related to increased social media use. From the Belongingness Theory perspective, high FoMO may indicate that an adolescent is not experiencing a sense of belonging (Roberts & David, 2019), potentially increasing their risk of experiencing anxiety symptoms (Oberst et al., 2017). This may heighten their motivation to use social media, with anxiety increasing if belongingness needs remain unmet. However, if belongingness needs are met, social media use may not influence anxiety and social media may be useful for social connection (Smith et al., 2021). In Australia, we have observed that many adolescent peer groups require some engagement with social media for the individual to remain current. Moreover, the sharing of knowledge through social media has been cited as healthy (O'Reilly, 2020).

Since the present study is cross-sectional, causation cannot be ascertained, meaning that it is unclear whether increased social media use is the cause or effect of increased anxiety symptoms for adolescents high in FoMO. This highlights the need for future longitudinal research to examine these associations temporally. When considering the moderating role of FoMO, only adolescents high in FoMO (11% of participants) experienced a positive association between social media use and anxiety symptoms. Furthermore, the overall correlation between social media use and anxiety symptoms was weak. This implies that for the majority of adolescents, high social media use is not necessarily associated with increased anxiety symptoms.

The present finding that FoMO, and not self-compassion, plays a moderating role has implications for carers and clinicians whom may have concerns about adolescents with high frequency of social media use. Rather than targeting frequency of use or attempting to increase a self-compassionate way of responding to oneself, assessing and addressing FoMO and the adolescent's sense of belonging may be more helpful to the adolescent in improving anxiety symptoms. The current findings bare no relevance to the relationship between social media frequency and symptoms of depression which have been reported in numerous studies (Feinstein et al., 2013; Nesi & Prinstein, 2015). When clinicians work with adolescents presenting for treatment who concurrently report frequent social media use, separately exploring the effect of social media use and internet addiction on emotions

is key to engagement. After agreeing on the adolescent's personal experience with accuracy (rather than with generalisations), the individual may be willing to audit their level and style of engagement to optimise mental health. Hence, the current findings have the potential to enhance clinical insight by ruling out the impact of social media use on anxiety for those presenting with low or moderate FOMO.

Strengths of the present study include the large, community-based sample with an even gender-mix, aiding generalisability to other community samples. Moreover, the use of a comprehensive scale for measuring anxiety symptoms allowed for exploration of anxiety subtypes, which has not been explored previously in social media research. A limitation is that the self-report measure for social media frequency may have been difficult for adolescents to answer accurately. Future research incorporating the use of phone applications to measure screen-time or worn cameras or tracking devices to objectively measure social media use would provide a more reliable and objective measure for the number of hours spent on social media. Furthermore, another limitation relates to the measurement of FoMO. Since the original questionnaires were primarily developed with a focus on general adolescent wellbeing for a larger project, the five FoMO items were chosen from a general wellbeing survey without having been previously validated. Nonetheless, Cronbach's alpha ($\alpha = .81$) for the present study and the correlation between FoMO and SM-frequency ($r = .45$) were comparable to results using a validated scale ($\alpha = .87$ and $r = .40$ respectively) developed by Przybylski et al. (2013), indicating that the present items performed well. Future research using the FoMO scale developed by Przybylski et al. (2013) and investigating the relationship with generalised anxiety and social anxiety using targeted scales for these specific anxieties would provide more robust insight into the relationships shown in the present study.

In conclusion, this study reveals that FoMO plays a significant role in moderating the relationship between adolescent social media use and anxiety symptoms, whereas self-compassion does not. Moreover, of the six anxiety subtypes explored, generalised anxiety has the strongest positive association with social media use for adolescents high in FoMO. In contrast to findings showing an association between depression and social media use, the present study showed that high social media use was not strongly associated with an increase in anxiety symptoms. Only adolescents high in FoMO, with raw

FoMO scores in the present sample greater than 15.30, demonstrated a positive association between social media use and anxiety symptoms. These findings have implications for treating adolescents with anxiety symptoms with high social media use. Efforts to reduce social media use or improve levels of self-compassion may be better directed to assessing and addressing FoMO and the adolescent's sense of belonging.

Note

1. The Australian Bureau of Statistics noted that 41.3% of females and 21.4% of males aged between 16 and 24 years had experienced an anxiety disorder in the 12 month period of 2020 to 2021. This was over the Covid pandemic. These were the highest rates of all age groups. The rates previously collected by the ABS when asked if they were suffering from an anxiety disorder aged between 15 and 24 years were: females 2014 to 2015 18.9% 2017 to 2018 24.6%; males 2014 to 2015 7.9% 2017 to 2018 13.9%.

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Disclosure statement

No potential conflict of interest was reported by the author(s).

Data availability statement

The data underlying this article are available in the Macquarie University Repository and can be accessed with <https://doi.org/10.25949/20188298.v1>.

Open Scholarship



This article has earned the Center for Open Science badges for Open Data and Open Materials through Open Practices Disclosure. The data and materials are openly accessible at <https://doi.org/10.25949/20188298.v1>.

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