Social comparisons: A potential mechanism linking problematic social media use with depression

BRIEF REPORT

ADELE SAMRA* , WAYNE A. WARBURTON and ANDREW M. COLLINS

Macquarie University, Australia

ABSTRACT

Background and aims: The majority of Australians are regular users of social media, especially young adults. Of concern, is that a minority of people appear to use social media in an addictive or problematic way which is associated with negative psychological outcomes such as depression. Social comparisons, where users compare themselves to others on social media, have also been linked with depression. Therefore, the key aim of the study was to determine whether social comparisons mediate the relationship between Problematic Social Media Use (PSMU) and depression. *Method:* In a two-part study 144 participants (65 females) answered a series of self-report questions assessing factors relating to PSMU and then came into the lab to view a series of social media images, (pre-tested to be upward or downward comparisons). *Results:* Females used social media more problematically, liked more upward than downward comparison images and compared themselves more negatively to others on social media than did males. Higher PSMU scores were associated with depression and low self-esteem and comparing oneself more negatively to others on social media. Finally, focusing on upward comparisons and a tendency to make negative comparisons to others on social media partially mediated the association between PSMU and depression. *Discussion and conclusions:* Social comparisons may function as a mechanism linking PSMU with negative psychological outcomes. Clinical interventions for individuals with PSMU which reduce the focus on upward social comparisons may also reduce negative psychological outcomes such as depression.

INTRODUCTION

Although social media is a relatively new phenomenon the rate of uptake has been very high, especially for young adults. As 'digital natives' they have grown up immersed in digital technology, and around 90% use social media platforms such as Instagram, Facebook, Tik-Tok, Snapchat and YouTube (Yellow, 2018). Whilst benefits are reported, such as greater feelings of connectedness (Ryan et al., 2017), concerns have also been raised about problematic levels of social media use (Hussain & Griffiths, 2018). Designers of social media utilise the individual's prior viewing patterns to build sophisticated predictive models designed to maximise engagement with their platform. Business models require that they keep users at the screen as long as possible to view advertising and much functionality serves this purpose. Sean Parker, Facebook's first president, acknowledged in an interview (Allen, 2017) that likes and comments intentionally create 'a social validation feedback loop' that keep users wanting more. In addition, features such as banners, prompts, notifications and

*Corresponding author.
E-mail: adele.samra@mq.edu.au

autoplay are uniquely targeted to the individual's preferences to keep people returning to the screen (Warburton, 2021). For some people this may cause issues around Problematic Social Media Use (PSMU) including compulsive use despite unfavourable consequences to health, mental health and relationships Andreassen et al., 2016; Andreassen, Pallesen, & Griffiths, 2017.

PSMU is more common for females perhaps due to a gender-specific vulnerability to addiction to activities involving social interaction (Andreassen et al., 2016). A further concern relates to potential links between social media use and depression. Whilst recent metanalyses and systematic reviews seem to support a link between social media use and depression (Ivie, Pettitt, Moses, & Allen, 2020; Keles, McCrae, & Grealish, 2020; McCrae, Gettings, & Purssell, 2017; Yoon, Kleinman, Mertz, & Brannick, 2019), the correlational nature of most studies precludes causal conclusions. Links between depression and PSMU appear stronger than links between depression and time spent using social media (Shensa et al., 2017) and a systematic review by Hussain and Griffiths (2018) found a PSMU-depression link in six out of seven studies. Longitudinal studies suggest bidirectionality: PSMU may lead to depression and depression may increase PSMU (Li et al., 2018). However, longitudinal data analyses also suggest PSMU may be causal for depression (Li et al., 2018; Raudsepp & Kais, 2019). The latter is the focus of this paper: the ways that PSMU may influence depression.

Social media encourages social comparisons as users are exposed to an abundance of peer-shared images and content with which to compare. Such comparisons typically fall into one of three categories, upward (where the target is deemed superior to oneself), downward (where the target is deemed inferior to oneself) or lateral (where the target is deemed equal to oneself) (Gerber, Wheeler, & Suls, 2018). Comparisons made on social media are more likely to be upward as many users tend to present an idealised version of themselves and their lives. Thus, social media users are likely to believe that others are happier and living a better life then they are (Chou & Edge, 2012). Upward social media comparisons have been linked to negative psychological outcomes such as low self-esteem and depression (Andreasson et al., 2017; Feinstein et al., 2013; Yoon et al., 2019). Importantly, research suggests that social comparisons may be a mechanism mediating the link between social media use and negative psychological effects (Fardouly & Vartanian, 2015; Lian, Sun, Niu, & Zhou, 2017; Liu et al., 2017). Whilst the relationship between PSMU and social comparisons has not been previously examined, it seems plausible that social comparisons may be a mechanism linking PSMU with depression.

In the current study it was expected that females and participants with higher PSMU scores would demonstrate a preference for upward comparison images and would compare themselves more negatively to others on social media, and that social comparison tendencies would mediate the relationship between PSMU and depression.

METHODS

Participants

Participants were 138 undergraduate psychology students participating in return for course credit and 19 male participants recruited through flyers to achieve greater gender balance in the data and paid $20 AUD. Data from thirteen participants were removed due to non-completion, multiple survey attempts or completion in an unrealistically low time, leaving 144 participants (MAge = 20.15, SD = 3.94; 45% female), of whom 123 completed both parts of the study (104 undergraduate students, 19 recruited through flyers). Forty-seven participants (39% of the final sample) had been invited to participate because they had high scores on the Bergan Social Media Addiction Scale (Andreassen et al., 2016), in undergraduate psychology pretesting.

Measures

Frequency of social media use. In order to assess frequency of social media use, participants were asked to indicate how often on average they check social media, from never to hourly.

Problematic social media use (PSMU). The Bergan Social Media Addiction Scale (BSMAS: Andreassen et al., 2016) is a measure of social media addiction and was used as a measure of PSMU. It consists of six items answered on a 5-point Likert scale (e.g, "how often have you felt an urge to use social media more and more"). The BSMAS measure has demonstrated very good reliability (Andreassen et al., 2016), including in the current study ($\alpha = 0.87$).

Depression. The Short Promis 8b is an 8-item measure of depression (e.g. "I felt worthless") answered on a 5-point Likert scale. Demonstrated internal consistency has been excellent (Teresi, Ocepek-Welikson, Kleinman, Ramirez, & Kim, 2016), including in the current study ($\alpha = 0.95$).

Upward comparison focus. Two Social Comparisons on Social Media (SCSM) items assess upward and downward comparison tendencies on social media (e.g. "When comparing yourself to others on social media, to what extent do you focus on people who are better off than you?" (Vogel, Rose, Roberts, & Eckles, 2014). Both are answered on a 5-point scale and are analysed separately.

Self-esteem. The Rosenberg Self-Esteem (RSE) scale is a 10-item measure of self-esteem (e.g. "I feel that I am a person of worth"). The RSE has excellent demonstrated reliability (Rosenberg, 1979), including in the current study ($\alpha = 0.91$).

Negative Social Media Comparison Scale (NSMCS). The 7-item NSMCS was developed to measure how negatively participants compared themselves to others on social media (e.g. when I use social media I feel less satisfied with my own life) and is answered on a 6-point Likert scale (see Appendix for full scale). Higher scores indicate a tendency to compare

oneself more negatively to others. EFA and CFA analyses using two independent samples (N = 239; 235) confirmed the structural validity of the scale, with data also showing good convergent validity with existing scales measuring similar constructs (results available at Open Science Framework (OSF) [https://osf.io/c8mra/] and in Supplementary material 1). In this study the internal consistency was very good (α = 0.89).

Social media images. Screenshots of images publicly listed on Instagram were piloted as to whether they elicited either an upward (attractive subject, many likes) or downward (less appealing subject, few likes) comparison. As individuals are most likely to compare themselves to members of their own sex (Jones, 2001), participants viewed same sex images. The piloted images were edited in Photoshop to remove existing comments and likes, with new comments and likes being added to further establish the images as either upward or downward comparisons. The number of comments was equalised across upward and downward comparison images so that overall there was the same amount of text to read for both conditions. The final set of stimuli consisted of 72 female and 72 male images hosted on separate webpages (males images can be viewed at https://art.mickeyc.me/sm/smprofiles.html# and females images can be viewed at https://art.mickeyc.me/smm/swprofiles.html), evenly split between upward and downward comparisons. The amount of time participants spent looking at each image, and whether the participant liked the image or not were recorded.

Procedure

To avoid response bias, the deception that the study related to the effect of social media on memory was used in advertisements. In Part 1, participants completed an online survey in their own time (SMU frequency, BSMAS, Promis, SCSM, RSE), a minimum of one week before the lab session to avoid influencing lab responses. In Part 2 participants viewed and responded to the social media images in a lab and completed the NSMCS before being debriefed.

Statistical analyses

Bivariate correlations between variables were calculated and then a series of Analyses of Covariance (ANCOVAs) were run to see whether being female or male or having higher PSMU scores were associated with the following: a preference for upward compared to downward comparisons, a tendency towards negative comparisons to others, and increased depression scores. A double mediation analysis was then used to determine whether a tendency to focus on upward comparisons and a tendency towards negative comparisons to others mediated the relationship between PSMU and depression.

Ethics

The study was approved by the university ethics committee (ref: #5201950477322) and informed consent was obtained from all participants both prior to assessment and then after the disclosure of the deception.

RESULTS

Preliminary analyses showed that recruitment groups did not vary as a function of recruitment method. PSMU scores were moderately positively correlated with depression (N = 120, r = 0.47, $P < 0.001$), low self-esteem (N = 119, r = 0.35, $P < 0.001$) and a tendency to focus on upward comparisons (N = 119, r = 0.44, $P < 0.001$) (all correlations in Table A2 in Appendix). The correlations between the frequency of checking social media with depression (N = 120, r = 0.18, P = 0.052) and self-esteem (N = 119, r = 0.14, P = 0.122) were smaller than the correlations between PSMU with depression and self-esteem and did not reach significance.

Initial analyses indicated that females (M = 20.00, SD = 5.58) had significantly higher PSMU scores than males (M = 18.05, SD = 5.68; $t(140)$ = 2.26, P = 0.025) (See Table A1 in Appendix for other descriptive statistics). When pre-existing groups (like gender) differ on a covariate, error rates for the effect of the covariate are valid but Type I error rates for ANCOVA main effects can be inflated (Schneider, Avivi-Reich, & Mozuraitis, 2015). Thus, Analyses of Variance (ANOVAs) were used to determine the effect of gender on each outcome and ANCOVAs were used to determine the effect of PSMU by gender on each outcome (See Table 1). Assumptions were met for all ANOVAs except for time spent viewing upward comparisons images versus downward comparison images for which we report Welch's F. In checking the ANCOVA assumptions there was some evidence of heteroscedasticity, therefore MacKinnon and White's (1985) HC3-corrected results are reported for time spent viewing upward compared to downward comparison images and the number of upward compared to downward comparisons liked.

In the model examining the relationship of gender and PSMU with the number of upward compared to downward comparison images liked, females liked more upward than downward comparison images and the relationship between higher PSMU scores and liking more upward comparison images approached significance (t = 1.81 P = 0.074, see Table 1).

In the model examining the relationship of gender and PSMU with the amount of time spent viewing upward compared to downward comparison images there was no effect of either gender or PSMU (see Table 1).

In the model examining the relationship of gender and PSMU with depression there was a significant association between higher PSMU scores and depression but not gender and depression (see Table 1).

In the model examining the relationship of gender and PSMU with a tendency to make negative social comparisons, females and those with higher PSMU scores compared themselves more negatively to others on social media (see Table 1).

A post-hoc power analysis was conducted using the Monte Carlo Power Analysis for Indirect Effects (Schoemann, Boulton, & Short, 2017) to test the indirect effect of PSMU via upward comparisons and NSMCS on depression with a sample size of 119 at an alpha of 0.05. Results showed

Table 1. Descriptive statistics and ANOVAs & ANCOVAs

	Group								
	Male			Female					
Predictor	M	SD	n	M	SD	n	F	t	df
Outcome: Number of Upward Comparison Images Liked versus Downward Comparison Images N = 123									
Gender$_1$	5.67	9.80	70	11.34	9.31	53	10.54**		1
PSMU$_2$								1.81$_a$	
Outcome: Time Spent Viewing Upward Versus Downward Comparison Images N = 123									
Gender$_1$	0.50	0.04	70	0.49	0.06	53	0.80$_b$		1
PSMU$_2$								−0.49$_c$	1
Outcome: Depression N = 143									
Gender$_1$	19.41	7.65	79	19.47	6.91	64	<0.01		1
PSMU$_2$							27.46**		1
Outcome: Negative Social Media Comparisons N = 122									
Gender$_1$	23.97	7.46	70	28.30	7.86	53	9.71**		1
PSMU$_2$							20.09**		1

Note. PSMU = Problematic Social Media Use.
ANOVA results indicated by $_1$. ANCOVA results indicated by $_2$.
All ANOVA results use regular F-tests except for $_b$ which uses Welch's F.
All ANCOVA results use regular F-tests except for $_a$ and $_c$ which use an HC3 correction.
$^*P < 0.05$, $^{**}P < 0.01$.

that a sample size of 119 achieved an indirect effect with a power of 0.95 which is adequate to detect an effect.

We tested the hypothesized double mediation model using the PROCESS macro (Hayes, 2018) in SPSS, using a bootstrapping model with 5,000 iterations. Assumptions were assessed prior to running the model. Inspection of residual scatterplots from the regressions that underpin the model revealed some heteroscedasticity in each of the regressions, and one leverage case in one of those regressions. If left uncorrected, this would bias P-values and standard errors for direct effects. We therefore corrected for this heteroscedasticity and leverage case in PROCESS by using the HC4 standard error estimator (Cribari-Neto, 2004), which is

suitable with OLS regression where there are cases with high leverage (Hayes & Cai, 2007). Accordingly, the P-values and confidence intervals we report for direct effects in this analysis have been corrected by HC4. Upon running the model, PROCESS revealed that the indirect effect of meeting criteria for PSMU on depression via a focus on upward comparisons and comparing oneself more negatively to others on social media was significant (see Table 2; Total model $R^2 = 0.24$, $F = 36.12$). Social comparison tendencies also significantly mediated a link between PSMU and reduced self-esteem (see Table 2; Total model $R^2 = 0.21$, $F = 30.8$, the full mediation analysis is available at OSF [https://osf.io/c8mra/] and in Supplementary material 2).

Table 2. Direct indirect and total effects of the double mediation models with outcomes depression$_1$ and low self-esteem

Outcome	Effect	β STD	t	95% CI for Mean Difference	df
Depression$_1$	Direct effect of PSMU on FocusUP	0.44	5.59**	0.06, 0.12	117
	Direct effect of FocusUP on NSMCS	0.56	6.84**	2.62, 4.76	116
	Direct effect of NSMCS on depression	0.38	3.53**	0.16, 0.57	115
	Direct effect of PSMU on depression	0.36	3.58**	0.20, 0.70	115
	Total effect of PSMU on depression	0.49	5.75**	0.40, 0.83	117
	Indirect effect of PSMU on depression via FocusUP and NSMCS	0.10	*	0.04, 0.16	
Low self-esteem					
	Direct effect of PSMU on FocusUP	0.46	4.66**	0.06, 0.13	117
	Direct effect of FocusUP on NSMCS	0.56	7.00**	2.66, 4.77	116
	Direct effect of NSMCS on low self-esteem	0.43	4.25**	0.16, 0.44	115
	Direct effect of PSMU on low self-esteem	0.15	1.72	−0.02, 0.31	115
	Total effect of PSMU on low self-esteem	0.36	4.20**	0.18, 0.51	117
	Indirect effect of PSMU on low self-esteem via FocusUP and NSMCS	0.11	*	0.05, 0.18	

Note. STD = Standardised. PSMU = Problematic Social Media Use. FocusUC = Focus on Upward Comparisons. NSMCS = Negative Social Media Comparison Scale.
$^*P < 0.05$, $^{**}P < 0.01$.
P-values and confidence intervals for the mediation model$_1$ with outcome depression are based on HC4 correction.

DISCUSSION

The links found between PSMU and depression accords with other studies finding this effect (Hussain & Griffiths, 2018; Li et al., 2018). Interestingly, the correlation between the frequency of checking social media and depression was smaller than the correlation between PSMU and depression and did not reach significance in this sample. This may explain why some previous studies examining the relationship between social media use and depression produced ambiguous results (e.g., Baker & Algorta, 2016; Frost & Rickwood, 2017). PSMU may more consistently predict negative psychological outcomes then simple measures of social media use. Consistent with these results, recent longitudinal studies suggest that PSMU may be causal for depression (Li et al., 2018; Raudsepp & Kais, 2019).

The finding that PSMU was more prevalent for females also accords with previous studies (e.g., Andreassen et al., 2016, 2017). In this sample females also demonstrated a preference for upward comparison images, and higher PSMU scores were associated with focusing on upward comparisons. Both females and those with higher PSMU scores compared themselves more negatively to others on social media. This may be clinically significant, as females who use social media problematically may be at greater risk of negative psychological outcomes than other populations because both PSMU and a tendency to make upward comparisons have been consistently linked to depression and low self-esteem (Appel, Crusius, & Gerlach, 2015; Hussain & Griffiths, 2018; Vogel et al., 2014; Yoon et al., 2019).

Importantly, focusing on upward comparisons and comparing oneself negatively to others on social media partially mediated the link between PSMU and depression. This indicates that the relationship between PSMU and depression may be partially explained by the fact that people who use social media more problematically may have a tendency to focus on comparisons with other people on social media they perceive as superior, compare themselves negatively to such "superior people" and then feel more depressed. Because there is a bidirectional relationship between depression and PSMU (Li et al., 2018) this may create a negative feedback loop whereby PSMU causes more depression and depression drives more problematic social media use cyclically. However, although this finding is indicative, it is important that cross-sectional mediation findings such as this are not over-interpreted (O'Laughlin, Martin, & Ferrer, 2018).

The negative relationship between PSMU and self-esteem (e.g., Andreasson et al., 2017) was confirmed, and results suggest that this effect is partially mediated by social comparison tendencies. Thus, the negative impacts of PSMU and negative social comparisons seem to extend to other areas of mental health impacts than depression.

Although this appears to be the first study to examine whether social comparisons mediate the relationship between PSMU and depression, these findings concord with recent research suggesting that upward social comparisons partially mediate the relationship between social media usage and wellbeing (Wang, Wang, Gaskin, & Hawk, 2017) and that negative comparisons fully mediate the relationship between Facebook use and negative self-perceptions around social competence and physical attractiveness (de Vries & Kühne, 2015). These findings suggest that the tendency towards negative social comparisons may be a key determinant in whether problematic levels of use lead to depression and low self-esteem, as social comparisons may function as a mechanism linking PSMU to negative psychological outcomes. This offers support for interventions focused on reducing PSMU as well as helping those with PSMU to reduce their focus on upward social comparisons.

Apart from the usual limitations to interpreting the correlational data, the current study had one issue that should be rectified in future replications. Images could be scrolled through quite quickly, and this may be the reason that people looked at upward and downward comparison images for roughly the same amount of time, creating a lack of variance. Future studies should consider using more detailed social media pages that entice viewers to look at images for longer, which should provide more variation in responses.

The present study adds to the screen addiction debate by confirming the link between PSMU and negative psychological outcomes such as depression and low self-esteem. Importantly, it identifies social comparison tendencies as a potential mechanism by which PSMU leads to negative psychological outcomes.

SUPPLEMENTARY MATERIAL

Supplementary data to this article can be found online at https://doi.org/10.1556/2006.2022.00023.

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Appendix

Negative Social Media Comparison Scale (NSMCS)

Response scale:

1 = Strongly disagree
2 = Slightly disagree
3 = Disagree
4 = Agree
5 = Slightly agree
6 = Strongly agree

This scale was developed for this study in order to assess how negatively participants compared themselves with others on social media.

Table A1. Descriptive statistics

Variable	*M*	SD
PSMU	19.04	5.72
NSMCS	25.84	7.90
Depression	19.44	7.30
Upward Comparison Focus	3.29	1.17
Low Self-esteem	22.48	5.58
Time	0.50	0.05
Likes	8.11	9.96

Note. PSMU = Problematic Social Media Use. NSMCS = Negative Social Media Comparison Scale. Time = Time Spent Viewing Upward Versus Downward Comparison Images. Likes = Number of Upward Comparison Images Liked Versus Downward Images Liked.
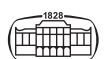
When I use social media….
… I feel like other people's lives are better then mine.
… I feel like other people are having more fun then I am.
… I feel like other people have more friends then I do.
… I feel like other people are more attractive then I am.
… I feel like other people have a better body then I do.
… I feel less satisfied with my own life.

When I look at other people's photos on social media I feel worse about myself.

[1]When I look at other people's photos on social media I feel better about myself.

[1] Was omitted after EFA analyses performed.

Table A2. Correlation matrix (N = 118)

	PSMU	FSM Use	Depression	Focus UC	NSMCS	Low Self-esteem
PSMU	–					
FSM Use	0.53**	–				
Depression	0.47**	0.18	–			
Focus UC	0.44**	0.27**	0.35**	–		
NSMCS	0.40**	0.25**	0.48**	0.63**	–	
Low Self-esteem	0.35**	0.14	0.72**	0.42**	0.54**	–

Note. PSMU = Problematic Social Media Use. FSM Use = Frequency of Social Media Use. FocusUC = Focus on Upward Comparisons. NSMCS = Negative Social Media Comparison Scale.
$^*P < 0.05$, $^{**}P < 0.01$.