



Research article

Loneliness and Facebook use: the role of social comparison and rumination

B. Dibb^{*}, M. Foster

School of Psychology, University of Surrey, Guildford, UK



ARTICLE INFO

Keywords:

Loneliness
Social comparison
Rumination
Social media use
Facebook

ABSTRACT

There is conflicting evidence as to whether Facebook, one of the most popular social networking sites, either promotes social connectedness or contributes to the rising prevalence of loneliness. This study aimed to understand the association between Facebook use and loneliness. Two hundred and fourteen active Facebook users ($M_{age} = 35.65$; 80.8% female) completed a cross-sectional questionnaire measuring the nature of their Facebook use, how frequently they ruminate, the tendency to compare themselves to their Facebook friends, and upward and downward social comparison. The results showed that rumination and upward social comparison on Facebook were significantly associated with loneliness. The type of activity users engaged in when using Facebook was not significant. The study therefore demonstrates that Facebook users who ruminate and compare themselves to their perceived superiors on Facebook are more likely to experience loneliness. Suggested solutions include raising awareness and using algorithms on Facebook to deliver targeted interventions.

1. Introduction

The number of people experiencing loneliness is growing, with some researchers describing it as a public health problem [1]. Research into the effects of loneliness has highlighted negative physical and emotional consequences, and this has driven a search for factors associated with loneliness. One of such factors, which has become the focus of recent research, is the use of social media. In this paper we explore the association between social media and loneliness.

Loneliness, defined as the discrepancy between desired and actual social relationships [2], is reported to be a growing problem; one in four adults report feeling lonely at least once a week [1, 3]. These numbers are concerning considering the long-term effects of loneliness, which include anxiety, depression, low self-esteem, and reduced well-being [1, 4]. Further to this, loneliness has also been found to be associated with risky health behaviours, such as smoking which, of course, also have implications for health [5].

Social media is increasingly becoming part of everyday modern life, forming part of the social support networks of those who use them. More and more people are joining such sites and spending more and more time using them [6, 7]. Whilst research into the effects of social media is still

relatively new, some studies have identified negative psychological consequences. For example, using Facebook has been found to have a negative association with well-being [8, 9, 10, 11, 12, 13, 14] and a positive association with depression [8]. Social anxiety levels have also been shown to be higher in people who spend more time using Facebook and for those who use Facebook passively (e.g. scrolling through the news feed) [15, 16].

However, research showing a link between social media use and loneliness is less conclusive. Some studies have shown that social media use can lead to feelings of stronger relationships with others [17] while other studies have found social media use to be associated with higher feelings of social isolation and loneliness [18]. These inconclusive results fuel the debate on whether lonely people use social media or whether loneliness is the result of using social media. In support of the former, lonely people have been found to use Facebook [19, 20, 21] as they have a reduced face-to-face social network [22]. However, this is not always the case, as higher levels of loneliness have also been found to predict not creating an account on social media [23].

The counter argument is that using social media influences how lonely we feel. Some studies show that social media use decreases perceptions of loneliness [21, 24], whilst others have found people report

^{*} Corresponding author.

E-mail address: b.dibb@surrey.ac.uk (B. Dibb).

lower levels of social support after using Facebook [15]. One explanation for these differing results is that the effect on loneliness is moderated by the way an individual uses Facebook. Frison and Eggermont [15] found that those who engage in active use (for example, posting and commenting) reported reduced loneliness, whereas those who are passive users of social media (for example, scrolling through posts) reported increased levels of loneliness [15]. In contrast, further studies provide evidence that actively using social media (for example, general posts not to specific individuals) is associated with feeling lonely. While, those who interact with individuals or browse report lower levels of loneliness [25].

Further possible explanations for the association between loneliness and social media have been proposed. Antoci and colleagues [26] suggest that time spent engaging in social media interaction is time spent not engaging in face-to-face interaction, thus leading to higher feelings of perceived loneliness. In addition, individuals have a tendency to judge the people they see on social media sites as better-off and happier than themselves [27] and as people who lead more exciting lives than they do [28]. This view of others leaves the individual feeling worse-off [29]. Social comparison therefore appears to be a key component of the association between social network use and loneliness.

Social comparison is a process whereby we compare ourselves with others to judge how we are doing on given dimensions [30]. Upward comparison, when we compare with others doing better than ourselves, and downward comparison, when we compare with others doing worse than ourselves, can be interpreted positively or negatively, which can result in positive and negative affect respectively [31]. Lateral comparison is where we compare with those we see as at a similar level to ourselves. We know that people do socially compare on Facebook [7, 32] and this comparison tends to be in an upward direction, as people tend to portray themselves at their best on these sites [8, 33, 34, 35]. However, we know less about the valence of the interpretation of this comparison, i.e. we know less about whether this information is interpreted positively or negatively. This is important, as in cases where the valence of both positively and negatively interpreted comparison on social media was measured, participants reported engaging in both via social media, showing that a negative interpretation can occur [36].

Individual differences in social comparison have also been identified [37, 38], where uncertainty is proposed to lead to more comparison [38, 39]. Early work in this area showed that those who compared more also scored low on self-esteem [40] and scored high on depression [39]. However, only one study [25] has assessed the tendency to socially compare and feelings of loneliness. In this study, the tendency to socially compare was not directly associated with loneliness, however it was found to mediate the association between social media use and loneliness. Social media use was related to loneliness where those who engaged more with social comparison on social media were less lonely while those who socially compared less on social media were more lonely. This shows that social comparison (the tendency to do so) was only influencing perceptions of loneliness for those who engaged in more social comparison.

The second mechanism under consideration is rumination, which is the tendency to dwell on past matters [41]. Rumination is considered a factor as there is evidence that it is linked to social media use. Tran and colleagues [42] showed that negative affect after ruminating while on sites such as Facebook was more likely for high ruminators. The process of rumination was also the proposed explanation for an increase in depressive symptoms after social comparison on Facebook [41]. This supports other studies which show some evidence for moderation between social network use, rumination and depression [41] and mediation between social media use and social anxiety [16].

Although we know that rumination is linked to depression and social network use, there is less evidence for rumination influencing loneliness. Given the strong evidence for a relationship between rumination and depression, depression and Facebook use, and depression and loneliness, this link seems probable. This study sought to understand this

association. Hypotheses were, (1) that Facebook use, rumination and upward social comparison would be associated with feelings of loneliness, and (2) that rumination would moderate the association between and upward social comparison and loneliness.

2. Materials and methods

2.1. Design

Using a cross-sectional design 214 Facebook users completed an online questionnaire.

2.2. Participants

Two hundred and fourteen Facebook users (80.8% female) participated in the study. The mean age was 35.65 years (SD = 15.10; range 18–72 years). Fifteen participants (7%) lived alone and 87.9% (188) considered themselves to be White British, 7.9% (17) White Other, 1.9% (4) Indian, and 1.4% (3) Other. The mean time spent using Facebook was 88.44 min per day (SD = 114.12; range 1 min to 1000 min). The number of Facebook friends ranged from 2 to 2000 (M = 404.63, SD = 370.11).

2.3. Measures

Loneliness was measured using the eight-item version of the University of California, Los Angeles (UCLA) Loneliness Scale [20, 43]. It is scored one (I never feel this way) to four (I often feel this way). The internal consistency in this study was $\alpha = .86$.

Rumination was measured with the Reflection-Rumination Questionnaire (RRQ; [44]). Participants rated their level of agreement with eight statements, such as “sometimes it is hard for me to shut off thoughts about myself”, on a scale from one (strongly disagree) to five (strongly agree). A higher score indicates greater rumination ($\alpha = .90$).

Depression was measured with the Centre for Epidemiologic Studies Depression Scale (CES-D; [45]). Participants indicated how often they had experienced 10 depressive symptoms (such as “my sleep was restless”) over the past week using a four-point Likert scale ranging from one (rarely) to four (all of the time). A higher score indicates more depressive symptoms ($\alpha = .84$).

Social comparison on Facebook was measured with three scales. The *tendency to socially compare* was measured with the Iowa-Netherlands Comparison Orientation Scale (INCOM) [37] with 11 items measuring one's general tendency to socially compare themselves with others on Facebook ($\alpha = .86$). Participants were instructed to answer the questions about when ‘you compare yourself with other people when using Facebook.’ An example of an item from the INCOM is ‘When I am on Facebook, I often compare what I have accomplished in life with what others have accomplished.’ The items were scored on a 5-point scale from strongly disagree to strongly agree.

Two further subscales measured directional social comparison on Facebook (upward ($\alpha = .67$) and downward ($\alpha = .56$)). These subscales (2 items each) were adapted items of the INCOM [29]; *Upward comparison* (for example, The last time I used Facebook I felt less confident about what I have achieved compared to other people. The *Downward comparison* subscale (for example, last time I used Facebook I believed that I had accomplished more than other people had). These items were scored on a 5-point scale from strongly disagree to strongly agree. A higher score indicated a stronger tendency to compare for all subscales.

Active and passive Facebook use were measured using a Social Network Activity scale [46]. Participants rated how often they engaged in eight active (e.g. “post something”) and four passive (e.g. “look through the News Feed”) activities from one (almost never) to five (almost always). The reliability for the subscales was good, with an alpha of .77 for Passive Use and an alpha of .80 for Active Use.

2.4. Procedure

Ethical approval was given by the Faculty of Health and Medical Sciences Ethics Committee, University of Surrey. The study complied with the ethical regulations of the University of Surrey and the British Psychological Society. Participants were recruited using a link to the electronic questionnaire which was posted on Facebook. Convenience and opportunistic sampling were used to recruit participants to the study. An advert was posted on Facebook and a snowballing technique was used where people were invited to participate and to share the advert on their Facebook page, so disseminating the advert. No adverts were bought and no specific audience was sought, the inclusion criteria required participants to be Facebook users (to have used Facebook within the last month) and to be over 18 years of age. After viewing the advert within their Facebook Newsfeed, participants clicked on the link within the advert which took them to the electronic questionnaire. Participants were first presented with the participant information sheet, followed by the informed consent statements and then the questionnaire. Access to the questionnaire itself required participants to first give their informed consent by ticking 'yes' to a series of statements (e.g. indicating they had read and understood the participant information sheet, were agreeing to participate, and were aware of their right to withdraw). The questionnaire itself consisted of 61 items which took an average of 15 min to complete.

2.5. Data analysis

The data were then screened for univariate normality and Time spent on Facebook, number of Facebook friends and Upward Comparison did not have a normal distribution however, log, square-root and inverse transformations did not correct these distributions to within the acceptable cut-off. Furthermore, transforming the data would have hindered the interpretation of number of Facebook friends and time spent on Facebook because each score represented a real person or unit of time [47]. Regression analyses conducted with the non-transformed and square-root transformed variables (which lead to the most improvement) resulted in the same models and predictor variables reaching significance. Thus, the non-transformed data were used in the analysis. Analysis of the data included descriptive statistics and bivariate correlations to determine the sample characteristics and the association between the study variables respectively. Hierarchical multiple regression was used to determine the association of the independent variables with loneliness. Rumination and social comparison were entered at the last step in order to determine the association with loneliness after controlling for the other variables entered into the equation (these included age, gender, living situation, depression, time on Facebook, number of Facebook friends, active Facebook use and passive Facebook use). Variables were entered in the following order: age, gender, living situation and depression were entered at block 1, time spent on Facebook, number of Facebook friends, active Facebook use and passive Facebook use were entered at block 2, and social comparison (upward, downward and tendency to socially compare) and rumination were entered at block 3.

In addition, moderation analysis (using process in SPSS) was carried out to determine whether rumination moderated the effect of social comparison on loneliness.

3. Results

Table 1 below shows the Means and Standard Deviations for the study variables. A wide range of ages participated in the study. The average time spent on Facebook was just over an hour and there is a large range of the number of Facebook friends.

Table 2 below shows the bivariate correlations. Loneliness shows a significant association with rumination, depression, two of the social comparison variables (the tendency to socially compare and Upward comparison), and passive Facebook use.

Table 1. Means, standard deviations and ranges for study variables.

Variable	M	SD	Range
Age	35.65	15.10	18–72
Time on Facebook	88.44	114.12	1–1000
Number of Facebook Friends	404.64	370.11	2–2000
Loneliness	15.80	4.99	8–30
Rumination	26.33	7.54	8–40
Depression	18.51	5.40	10–34
Tendency to Socially Compare	27.81	8.84	11–48
Upward Social Comparison	4.91	2.22	2–10
Downward Social Comparison	4.84	1.85	2–10
Active Facebook use	19.26	4.63	8–33
Passive Facebook use	12.75	3.10	4–20

Table 3 below presents the regression results for Loneliness. The final model accounted for 55.8% of the variance and shows that depression, social comparison and rumination have a significant association with loneliness ($F(12,199) = 20.92, p < .000$), partially supporting Hypothesis 1. However, active and passive Facebook use, are not significantly associated with loneliness. Upward comparison shows a positive association with loneliness which means that the more one socially compared on Facebook with those perceived to be better-off the lonelier the person felt. Although the direction of the association is correct, where those who felt positive after comparing with others worse-off felt less lonely, downward comparison was not significantly associated with loneliness. Rumination was also positively associated with loneliness showing that those who engage more in rumination also feel lonelier. The addition of rumination and social comparison contributed 13.0% ($p < .000$) to the overall variance accounted for by this model.

Hypothesis 2 was not supported. Process [48] (in SPSS) was used to test for moderation and the change in R^2 was not significant ($R^2 = .0003; p = .82$) indicating that there was no moderation and rumination and upward comparison independently contributed to loneliness.

4. Discussion

This study aimed to understand the association between Facebook use and perceptions of loneliness. We were interested to see whether social media use was associated with increased or decreased feelings of loneliness, and in particular, we wanted to determine the mechanisms that may account for the association. Based on the literature and previously determined associations with negative health outcomes, we measured rumination and social comparison on Facebook as possible mechanisms. The results show that Hypothesis 1 was partially supported and Hypothesis 2 was not supported.

With regard to social comparison, hypothesis 1 proposed that social comparison would be associated with feelings of loneliness. The hypothesis was supported as the regression results showed that the participants who engage in upward social comparison and who ruminated were significantly more likely to feel lonely.

The bivariate correlation analyses showed that both the tendency to socially compare and upward social comparison were significantly associated with loneliness. This was a positive association which shows that those who engaged more in self-evaluative social comparison also experienced more loneliness. However, the *tendency* to compare did not show a significant association in the regression results, showing that there was no association between those who tend to compare more than others and feeling lonely. These results do not support the literature, which show that those who compare more tend to report negative psychological outcomes [25, 39]. These results are also contrary to other studies which have found these associations to be important [25]. However, the significant positive association between upward social comparison and feelings of loneliness was maintained in the regression

Table 2. Bivariate Correlations between study variables.

	1	2	3	4	5	6	7	8
1. Loneliness	-							
2. Rumination	.571**	-						
3. Depression	.628**	.586**	-					
4. Tendency to socially compare	.391**	.476**	.404**	-				
5. Upward comparison	.544**	.460**	.399**	.528**	-			
6. Downward comparison	.069	.093	.014	.354**	.328**	-		
7. Active Facebook use	-.043	.036	.000	.211**	-.076	-.041	-	
8. Passive Facebook use	.157*	.285**	.166*	.433**	.191**	.158*	.388**	-

*p < .05; **p < .01.

Table 3. Regression coefficients for predictors of loneliness.

Step		ΔR2	B	SE	β	t	Sig.
1		.41					.000
	Gender		-.92	.69	-.07	-1.34	.184
	Age		-.01	.02	-.03	-.45	.618
	Living situation		-1.43	1.07	-.07	-1.34	.182
	Depression		.57	.05	.62	10.85	.000
2		.02					.102
	Gender		-1.02	.69	-.08	-1.48	.139
	Age		-.02	.03	-.05	-.64	.526
	Living situation		-2.01	1.08	-.10	-1.86	.064
	Depression		.55	.05	.59	10.36	.000
	Number of Facebook friends		-.00	.00	-.13	-1.88	.062
	Time on Facebook		.00	.00	.05	.80	.422
	Passive Facebook Use		.20	.11	.12	1.86	.064
	Active Facebook Use		-.08	.07	-.08	-1.22	.223
3		.13					.000
	Gender		-1.20	.61	-.09	-1.96	.051
	Age		.01	.02	.02	-.30	.768
	Living situation		-1.82	.98	-.09	-1.86	.064
	Depression		.33	.06	.36	5.79	.000
	Number of Facebook friends		-.00	.00	-.10	-1.64	.102
	Time on Facebook		.00	.00	.09	1.71	.090
	Passive Facebook Use		.06	.20	.04	.57	.567
	Active Facebook Use		-.05	.06	-.05	-.82	.412
	Rumination		.15	.04	.22	3.41	.001
	Tendency to Socially Compare		.01	.04	.02	.26	.796
	Upward Social Comparison		.71	.14	.32	5.10	.000
	Downward Social Comparison		-.14	.15	-.05	-.96	.338

model, supporting the hypothesis. We know that social comparison on social media is usually upward in direction, due to the tendency of people to post positive and successful pictures and comments, making them upward targets (i.e. people who are better-off in some way) [33]. The measure of upward comparison used in this study contained items measuring negatively interpreted comparison and research shows that upward comparison that is interpreted negatively can leave the individual feeling negative about themselves [31, 49], so these participants felt negative, rather than feeling inspired and optimistic after the comparison. Upward social comparison on Facebook therefore appears to have the same negative effect on loneliness as it does on depression [8], life satisfaction [50] and self-esteem [51]. This supports Buunk et al.'s Identification/Contrast model [31] which proposes that the mood experienced after comparison depends on the interpretation of the comparison information.

With regard to rumination, hypothesis 1 was upheld as there was a positive association with loneliness, where those who ruminated more also felt more lonely. The addition of rumination improved our model, showing that rumination is an important factor to consider in future studies. In addition, given the work on interventions, such as mindfulness which are aimed at targeting rumination, these interventions could also potentially reduce feelings of loneliness by association with rumination.

For Facebook use, although the bivariate results showed a positive correlation between level of engagement with Facebook (passive use) and feelings of loneliness, this did not maintain significance after the regression analysis. This means that the level of engagement with the posts on the news feed was not associated with feeling lonely. This contradicts other studies which show such an association, such as Verdun and colleagues [14], who found passive use to be associated with reduced subjective wellbeing, and Frison and colleagues [15], who found

a significant association between passive social network use and depressive mood.

With regards to the moderation analysis, there was no significant moderation effect of rumination on the association between social comparison and loneliness, which means that Hypothesis 2 was not supported.

Regression analysis also showed a third significant association: depression was associated positively with loneliness, where those reporting more depressive symptoms also felt more lonely. This supports other studies showing this association [1, 4] and highlights the importance of controlling for depression in studies on loneliness.

These results have important implications and recommendations for social media and mental health. They suggest that interventions aimed at reducing rumination may also be helpful in reducing loneliness. Mindfulness has been found to significantly reduce ruminative thinking [52, 53, 54], hence, while rumination in this study was not specifically Facebook-based, it may be beneficial for Facebook to promote accessible advice on how to be more mindful via users' News Feeds. In addition, raising awareness of the effects of using social media to make people more aware of their motivations for their use may help to reduce the negative effects and increase the positive effects. Facebook could publish reminders that people often share only the most positive aspects of their life online, and thus the content on Facebook does not always accurately reflect reality [33]. Furthermore, as artificial intelligence is now being used to identify suicidal individuals through their Facebook posts [55], there is a potential for algorithms to be developed which identify users to be at a greater risk of experiencing loneliness, derived from the way they interact with Facebook. Targeted interventions could thus be provided.

The limitations of this study include the cross-sectional design which means that the direction of the association cannot be determined, and it is possible that loneliness leads to depression, rumination and upward comparisons. Kross et al. [11] and Song et al. [19] found loneliness predicted Facebook use, and individuals who use Facebook more will have greater opportunities to make upward social comparisons. A longitudinal design would improve the robustness of the results by allowing us to infer causality, and future studies should therefore aim to follow a longitudinal design. In addition, the social comparison measures used in this study did not allow us to determine who or what the target of the comparison was, meaning we do not know what it is that the participant tends to look at or the type of information people draw upon when making upward comparisons. The sample was predominantly female and while other studies have also recruited more women than men [9, 13], the percentage in this study is high. Future studies should attempt to recruit a more equal gender distribution. This greater level of understanding will enable researchers to develop more targeted interventions. Also, as the ways in which people use social media are continually evolving, it will be helpful for future research to examine a range of different social media platforms, rather than focusing solely on Facebook. Finally, factors such as personality and culture would be interesting to investigate, as both may influence social media use.

5. Conclusions

This study has extended the current research into social media use and psychological well-being by identifying the associations between Facebook use and loneliness: those who make upward comparisons on Facebook and engage in rumination, also experience feelings of loneliness. These findings have important implications, given the ubiquity of social media use, the rising prevalence of loneliness and the negative health implications associated with loneliness. If longitudinal studies confirm the direction of the association, there is a potential for algorithms and artificial intelligence on Facebook to be used to identify those most at risk of experiencing loneliness. Ultimately, this study has provided an explanation for how Facebook, the online social network designed to connect people with their friends and family, is paradoxically associated with a rise in loneliness within society.

Declarations

Author contribution statement

B. Dibb: Conceived and designed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

M. Foster: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data.

Funding statement

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Data availability statement

Data will be made available on request.

Declaration of interests statement

The authors declare no conflict of interest.

Additional information

No additional information is available for this paper.

References

- [1] J.T. Cacioppo, The growing problem of loneliness, *Lancet* 391 (10119) (2018) 426.
- [2] D. Perlman, L.A. Peplau, Toward a social psychology of loneliness, in: S. Duck, R. Gilmour (Eds.), *Personal Relationships in Disorder*, Academic Press, 1981, pp. 31–56.
- [3] C.R. Victor, K. Yang, The prevalence of loneliness among adults: a case study of the United Kingdom, *J. Psychol.* 146 (1-2, SI) (2012) 85–104.
- [4] J. Holt-Lunstad, T.B. Smith, M. Baker, T. Harris, D. Stephenson, Loneliness and social isolation as risk factors for mortality: a meta-analytic review, *Perspect. Psychol. Sci.* 10 (2) (2015) 227–237.
- [5] J.T. Cacioppo, L.C. Hawkley, G.G. Berntson, et al., Do lonely days invade the nights? Potential social modulation of sleep efficiency, *Psychol. Sci.* 13 (4) (2002) 384–387.
- [6] N. Haferkamp, N.C. Kraemer, Social comparison: examining the effects of online profiles on social-networking sites, *Cyberpsychol., Behav. Soc. Netw.* 14 (5) (2011) 309–314.
- [7] S.Y. Lee, How do people compare themselves with others on social network sites?: the case of Facebook, *Comput. Hum. Behav.* 32 (2014) 253–260.
- [8] H. Appel, A.L. Gerlach, J. Crusius, The interplay between Facebook use, social comparison, envy, and depression, *Curr. Opin. Psychol.* 9 (2016) 44–49.
- [9] W. Chen, C.-Y. Fan, Q.-X. Liu, Z.-K. Zhou, X.-C. Xie, Passive social network site use and subjective well-being: a moderated mediation model, *Comput. Hum. Behav.* 64 (2016) 507–514.
- [10] C. Huang, Time spent on social network sites and psychological well-being: a meta-analysis, *Cyberpsychol., Behav. Soc. Netw.* 20 (6) (2017) 346–354.
- [11] E. Kross, P. Verduyn, E. Demiralp, et al., Facebook use predicts declines in subjective well-being in young adults, *PLoS One* 8 (8) (2013).
- [12] L. Perez, K.H. Morales, H. Klusaritz, et al., A health care navigation tool assesses asthma self-management and health literacy, *J. Allergy Clin. Immunol.* 138 (6) (2016) 1593+.
- [13] H. Stead, P.A. Bibby, Personality, fear of missing out and problematic internet use and their relationship to subjective well-being, *Comput. Hum. Behav.* 76 (2017) 534–540.
- [14] P. Verduyn, D.S. Lee, J. Park, et al., Passive Facebook usage undermines affective well-being: experimental and longitudinal evidence, *J. Exp. Psychol. Gen.* 144 (2) (2015) 480–488.
- [15] E. Frison, S. Eggermont, Toward an integrated and toward an integrated and differential approach to the relationships between loneliness, different types of Facebook use, and adolescents' depressed mood, *Commun. Res.* 42 (2015) 1–28.
- [16] A.M. Shaw, K.R. Timpano, T.B. Tran, J. Joormann, Correlates of Facebook usage patterns: the relationship between passive Facebook use, social anxiety symptoms, and brooding, *Comput. Hum. Behav.* 48 (2015) 575–580.
- [17] F.G. Deters, M.R. Mehl, Does posting Facebook status updates increase or decrease loneliness? An online social networking experiment, *Soc. Psychol. Personal Sci.* 4 (5) (2013) 579–586.
- [18] B.A. Primack, A. Shensa, J.E. Sidani, et al., Social media use and perceived social isolation among young adults in the U.S., *Am. J. Prev. Med.* 53 (1) (2017) 1–8.
- [19] H. Song, A. Zmyslinski-Seelig, J. Kim, et al., Does Facebook make you lonely?: a meta analysis, *Comput. Hum. Behav.* 36 (2014) 446–452.

- [20] R.B. Clayton, R.E. Osborne, B.K. Miller, C.D. Oberle, Loneliness, anxiousness, and substance use as predictors of Facebook use, *Comput. Hum. Behav.* 29 (3) (2013) 687–693.
- [21] L.L. Lou, Z. Yan, A. Nickerson, R. McMorris, An examination of the reciprocal relationship of loneliness and Facebook use among first-year college students, *J. Educ. Comput. Res.* 46 (1) (2012) 105–117.
- [22] J.L. Skues, B. Williams, L. Wise, The effects of personality traits, self-esteem, loneliness, and narcissism on Facebook use among university students, *Comput. Hum. Behav.* 28 (6) (2012) 2414–2419.
- [23] P. Sheldon, Profiling the non-users: examination of life-position indicators, sensation seeking, shyness, and loneliness among users and non-users of social network sites, *Comput. Hum. Behav.* 28 (5) (2012) 1960–1965.
- [24] L.R. Baker, D.L. Oswald, Shyness and online social networking services, *J. Soc. Pers. Relat.* 27 (7) (2010) 873–889.
- [25] C. Yang, Instagram use, loneliness, and social comparison orientation: interact and browse on social media, but don't compare, *Cyberpsychol., Behav. Soc. Netw.* 19 (12) (2016) 703–708.
- [26] A. Antoci, F. Sabatini, M. Sodini, See you on Facebook! A framework for analyzing the role of computer-mediated interaction in the evolution of social capital, *J. Soc. Econ.* 41 (5) (2012) 541–547.
- [27] A.H. Jordan, B. Monin, C.S. Dweck, B.J. Lovett, O.P. John, J.J. Gross, Misery has more company than people think: underestimating the prevalence of others' negative emotions, *Pers. Soc. Psychol. Bull.* 37 (1) (2011) 120–135.
- [28] S. Deri, S. Davidai, T. Gilovich, Home alone: why people believe others' social lives are richer than their own, *J. Pers. Soc. Psychol.* 113 (6) (2017) 858–877.
- [29] M.-L.N. Steers, R.E. Wickham, L.K. Acitelli, Seeing everyone else's highlight reels: how Facebook usage is linked to depressive symptoms, *J. Soc. Clin. Psychol.* 33 (8) (2014) 701–731.
- [30] L. Festinger, A theory of social comparison processes, *Hum. Relat.* 7 (1954) 117–140.
- [31] B.P. Buunk, S.E. Taylor, G.A. Dakof, R.L. Collins, N.W. VanYperen, The affective consequences of social-comparison - either direction has its ups and downs, *J. Pers. Soc. Psychol.* 59 (6) (1990) 1238–1249.
- [32] E.A. Vogel, J.P. Rose, B.M. Okdie, K. Eckles, B. Franz, Who compares and despairs? The effect of social comparison orientation on social media use and its outcomes, *Pers. Individ. Differ.* 86 (2015) 249–256.
- [33] H.-T.G. Chou, N. Edge, "They are happier and having better lives than I Am": the impact of using Facebook on perceptions of others' lives, *Cyberpsychol., Behav. Soc. Netw.* 15 (2) (2012) 117–121.
- [34] N. Ellison, R. Heino, E. Gibbs, Managing impressions online: self-presentation processes in the online dating environment, *J. Comput. Commun.* 11 (2) (2006).
- [35] A.L. Gonzales, J.T. Hancock, Mirror, mirror on my Facebook wall: effects of exposure to Facebook on self-esteem, *Cyberpsychol., Behav. Soc. Netw.* 14 (1–2) (2011) 79–83.
- [36] B. Dibb, Social media use and perceptions of physical health, *Heliyon* 5 (1) (2019).
- [37] F.X. Gibbons, B.P. Buunk, Individual differences in social comparison: (Development) of a scale of social comparison orientation, *J. Pers. Soc. Psychol.* 76 (1) (1999) 129–142.
- [38] S. Schachter, *The Psychology of Affiliation*, Stanford University Press, 1959.
- [39] S.R. Swallow, N.A. Kuiper, Social-comparison and negative self-evaluations - an application to depression, *Clin. Psychol. Rev.* 8 (1) (1988) 55–76.
- [40] H.A. Wayment, S.E. Taylor, Self-evaluation processes - motives, information use, and self-esteem, *J. Pers.* 63 (4) (1995) 729–757.
- [41] B.A. Feinstein, R. Hershenberg, V. Bhatia, J.A. Latack, N. Meuwly, J. Davila, Negative social comparison on {Facebook} and depressive symptoms: {Rumination} as a mechanism, *Psychol. Pop. Media Cult.* 2 (3) (2013) 161–170.
- [42] T.B. Tran, J. Joormann, The role of Facebook use in mediating the relation between rumination and adjustment after a relationship breakup, *Comput. Hum. Behav.* 49 (2015) 56–61.
- [43] R.D. Hays, M.R. DiMatteo, A short-form measure of loneliness, *J. Pers. Assess.* 51 (1) (1987) 69–81.
- [44] P.D. Trapnell, J.D. Campbell, Private self-consciousness and the five-factor model of personality: (Distinguishing) rumination from reflection, *J. Pers. Soc. Psychol.* 76 (2) (1999).
- [45] L.S. Radloff, The CES-D scale: a self-report depression scale for research in the general population, *Appl. Psychol. Meas.* 1 (1977) 385–401.
- [46] K. Koroleva, H. Krasnova, N.F. Veltri, O. Günther, It's All about Networking! Empirical Investigation of Social Capital Formation on Social Network Sites, *ICIS*, 2011.
- [47] B.G. Tabachnick, S. Fidell, in: P. International (Ed.), *Using Multivariate Statistics*, fifth ed., Pearson Education, Inc, Boston, {MA}, 2007.
- [48] A.F. Hayes, *Process: A Versatile Computational Tool for Observed Variable Mediation, Moderation, and Conditional Process Modeling [White Paper]*, 2012.
- [49] K. Van der Zee, B. Buunk, R. Sanderman, G. Botke, F. van den Bergh, Social comparison and coping with cancer treatment, *Pers. Individ. Differ.* 28 (1) (2000) 17–34.
- [50] J. Gerson, A.C. Plagnol, P.J. Corr, Subjective well-being and social media use: {do} personality traits moderate the impact of social comparison on {Facebook}? *Comput. Hum. Behav.* 63 (1) (2016) 813–822.
- [51] E.A. Vogel, J.P. Rose, L.R. Roberts, K. Eckles, Social comparison, social media, and self-esteem, *Psychol. Pop. Media Cult.* 3 (4) (2014) 206–222.
- [52] J.J. Miller, K. Fletcher, J. Kabat-Zinn, Three-year follow-up and clinical implications of a mindfulness meditation-based stress reduction intervention in the treatment of anxiety disorders, *Gen. Hosp. Psychiatr.* 17 (1) (1995) 192–200.
- [53] M. Deyo, K.A. Wilson, J. Ong, C. Koopman, Mindfulness and Rumination: (Does) Mindfulness Training Lead to Reductions in the Ruminative Thinking Associated with Depression, 2009, pp. 265–271.
- [54] S. Jain, S.L. Shapiro, S. Swanick, et al., A randomised controlled trial of mindfulness meditation versus relaxation training: {Effects} on distress, positive states of mind, rumination, and distraction, *Ann. Behav. Med.* 33 (1) (2007) 11–21.
- [55] V. Callison-Burch, J. Guadagno, A. Davis, *Building a Safer Community with New Suicide Prevention Tools*, 2017.