Effects of Users' Social Comparison and Envy on Malevolent Creativity on Social Network Sites

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Abstract

Most research on creativity focuses on the benefits, with little attention paid to exploring the negative aspects, such as malevolent creativity. Undoubtedly, social networking sites (SNS) are central to social interaction and information sharing in the digital age. However, they simultaneously invite upward social comparison, eliciting envy among users, which leads to diversified behaviors. We argue that it is an essential issue for social comparison and individuals' malevolent creativity on SNS. Integrating social comparison theory with response styles theory, we hypothesized that SNS social comparison is positively related to online malevolent creativity via SNS envy, and its effects of SNS social comparison on SNS envy depend on individuals' rumination. The results support these hypotheses and provide a more nuanced understanding of how upward social comparison impacts individuals' emotional state and creativity. The theoretical contributions and practical implications of this study are discussed.

Keywords

SNS Social Comparison, SNS Envy, Rumination, Online Malevolent Creativity, Social Comparison Theory

1. Introduction

To date, creativity research has focused squarely on the predictors of creativity for the purpose of informing scholars alike on factors that can facilitate or stifle creativity. Scholars and management still regard creativity as "one of our most precious assets" (Howkins, 2013) in generating novel, original, and useful ideas and products (Amabile, 1996). We agree that creative ideas can promote the growth, effectiveness, and performance of individuals and organizations, in-

cluding employees or students (Amabile, 1997; Montanari et al., 2016; Mumford et al., 2012). However, the extant literature has largely focused on only the beneficial aspects of creativity (Tuori & Vilén, 2011), while neglecting its darker side. Malevolent creativity is defined as the use of ingenuity to pursue vicious, violent, or destructive goals that may cause material, mental, or physical harm to others (i.e., Cropley et al., 2014; Runco, 2010). Previous studies have revealed that computer-mediated platforms allow users to express themselves freely, thus providing unique or breakthrough insights (Lee & Yang, 2015; Zhou et al., 2014). This follows the meaning of creative behavior. However, not all innovative thought is necessarily beneficial to society. Therefore, it is necessary to understand new features of malevolent creativity in virtual environments. Accordingly, we investigated academic research on online malevolent creativity to improve our understanding of this phenomenon.

Approximately 3.96 billion are people connected to social network services worldwide, accounting for more than half of the global population. Social networking sites (SNS) allow individuals to express themselves by posting status updates, videos, and photographs. SNS users can also track others' online presence via regular updates from their family, friends, acquaintances, professional bloggers, social influencers, etc. (Ellison et al., 2007; Smock et al., 2011). However, prior research has pointed out that SNS has made social comparison easier and increased the frequency of upward comparisons (Midgley, 2013), which might be due to the traits of the SNS communications themselves. Based on social comparison theory (Festinger, 1954), "envy" has been highlighted as a typical and the most common negative emotion on SNS (Chou & Edge, 2012). For example, Krasnova et al. (2013) noted that envy was easily triggered for more points of comparison on Facebook, such as the number of friends. In addition, social comparison causes some individuals to become stressed and can be stimulating, leading to emotional responses and negative behavior (Lim & Yang, 2015). With increasing social comparison among SNS users, it seems that the exertion of malicious creativity will produce more ideas and behaviors that disturb and harass other users. Thus, to contribute to an improved understanding of this phenomenon, we argue that paying close attention to the envy and malevolent creativity that occurs on SNS is vital.

In addition to examining the relationship between specific processes (SNS social comparison) in the context of social networking and malicious creativity performance, it is also essential to understand the mechanisms that may influence these connections. Prior research on studies of negative emotions, e.g., anxiety and depression, has shown that rumination plays a moderating role (Liu et al., 2017). However, little research has been conducted on how rumination is linked to social comparisons, envy, and creativity. Further research is warranted, as it may be relevant to individuals' mental health, as well as to their social adaptation and creativity in the age of social network popularity. Thus, we identified rumination in response to SNS social comparison based on the previous

literature and examined its moderating effects. **Figure 1** presents the research model.

This study extends social comparison theory by broadening its application to focus on creativity. This study's first and foremost contribution is to recognize the negative aspects of creativity through the lens of malicious online creativity. We question the default hypothesis in the creativity literature that creativity is typically positive. Specifically, we propose a conceptual model based on social comparison theory (Festinger, 1954) and empirically examine whether SNS social comparison is related to malicious online creativity. Second, this research reveals the mediating role of envy as the most important affective mechanism (Chou & Edge, 2012) to explain why individuals' SNS social comparison leads to malicious online creativity. Previous studies on malicious creativity have primarily focused on the effects of unfair situations, emotional intelligence, motivation tendency, and other factors (Gill et al., 2013; Gutworth et al., 2016; Hao et al., 2020; Jonason et al., 2017) while ignoring an individual's emotional state (Cheng et al., 2021). Hence, by identifying the affective mechanism of envy, we provide insights into how to mitigate the undesired outcomes of malicious online creativity. Third, we examine the negative side of online malicious creativity through an investigation of relational boundary conditions, i.e., rumination. The current study not only provides a lens through which to examine the common phenomenon of SNS social comparison but also demonstrates how individuals and organizations might attenuate their adverse psychological effects.

Overall, the present research proposed and tested a moderated mediation model of SNS social comparison, such that SNS social comparison predicts online malevolent creativity via SNS envy. Moreover, these effects are bounded by rumination. The article is organized as follows: first, our article proposes research hypotheses via a literature review. Second, validates hypotheses through empirical research. Third, further deepening the theoretical and practical significance of the research results. Of course, we will also analyze the limitations of the research at the end, pointing out the direction for future related research.

2. Literature Review and Hypotheses

2.1. Social Comparison Theory

One model that may serve as the theoretical background for the present study is
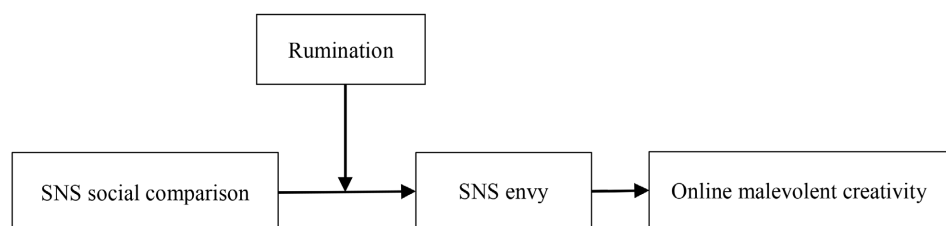
Source: Research team own design, 2023.

Figure 1. Hypothesized research model.

the social comparison theory. Social comparison is an important feature of the human social existence and is widely present in all aspects of daily life. That is to say, it is considered an inevitable element of social interaction among human beings. Festinger (1954) was the first to propose social comparison theory, which focuses on the abilities and opinions of individuals and suggests that they are motivated to evaluate their skills and beliefs. In the absence of an objective way to obtain a self-assessment, individuals tend to judge their opinions and abilities by comparing themselves with others. Schachter (1959) introduced emotional variables into the social comparison theory that greatly expanded the scope of social comparison research. Many researchers posit that social comparisons sometimes highlight flaws and affect individuals' self-esteem levels, even inspiring feelings of envy and low self-esteem on the context of SNS (i.e., Schmuck et al., 2019; Bergagna & Tartaglia, 2018).

2.2. SNS Social Comparison, SNS Envy, and Online Malevolent Creativity

Social comparison via SNS is an extension of offline social comparisons that are now transmitted via the Internet. It is defined as the process of comparing various facets of individuals (i.e., ability, achievement, appearance, popularity) by browsing other users' positive online expressions (Vogel et al., 2014). Those who use SNS to present themselves to the online community may choose to actively self-display practice retrieval (Walther, 2007), which means that they may minimize their negative traits while highlighting their achievements (Wilson et al., 2012). In other words, unlike offline communication, an individual's SNS ego may project only the image they want people to see (Chou & Edge, 2012). This undoubtedly makes social comparison easier and increases the desire to compare oneself with others. An increasing number of studies have focused on the impact of SNS social comparisons on individual psychosocial adaptation (i.e., Feinstein et al., 2013; Stronge et al., 2015). Previous studies indicated that SNS social comparison could lead to negative self-perceptions or feelings such as "you are inferior to others", thus increasing the risk of envying others (Feinstein et al., 2013; Sloman et al., 2003).

Envy is defined as an unpleasant feeling experienced by individuals in the process of social comparison with a person or group of persons who possess something we desire, and is expressed as a mixture of inferiority, hostility, and resentment (Parrott & Smith, 1993; Wu & Zhang, 2012; Yang & Zhang, 2009). Drawing on social comparison theory, envy is a social emotion that results from an unfavorable upward social comparison with others (Dunn et al., 2012). This theory also suggests that the evolutionary process of "survival of the fittest" has made people more concerned about their relative performance in self-evaluations (social comparison, especially comparing themselves to people who excel in certain areas), leading to an increase in envy (He & Cui, 2016; Latif et al., 2020). Extensive empirical research confirms this finding. For example, prior research

has demonstrated that social comparison on SNS is a significant positive predictor of envy on SNS (Latif et al., 2020). SNS information about other users' happy photos, enjoyable trips, and personal achievements induce individuals' envy (Lin & Utz, 2015), and upward SNS social comparison has a significant positive effect on envy (Krasnova et al., 2013). Therefore, we hypothesize the following:

Hypothesis 1: *SNS social comparison is positively related to SNS envy of others.*

The term envy is one of the seven deadly sins outlined in the Bible that is said to lead to disastrous situations or hostile acts (Schoeck et al., 1969). Envy is a nasty emotion; when an individual envies others, he or she is likely to be hostile. Previous studies have found that the level of malicious creativity significantly affects individuals' aggressive behavior (Hao et al., 2016, 2020). Malevolent creativity is a typical manifestation of the "dark side" of creativity, which refers to creativity as way to intentionally harm others, property, processes, and symbols (Cropley et al., 2008; Plucker et al., 2004). The products of malicious creativity are widespread, ranging from new types of fraud and money laundering to murder and terrorist attacks. Owing to the anonymity and indirectness of SNS, malicious behaviors caused by SNS envy naturally occur more on this online format rather than offline. Therefore, it is particularly important to focus on malicious online creativity.

Malicious creativity is not only influenced by unfair situations, emotional intelligence, and motivational tendencies (i.e., Gill et al., 2013; Gutworth et al., 2016) but also by an individual's emotional state. In particular, SNS envy is likely to affect an individual's malicious online creativity. On one hand, malicious creativity requires that an individual's attention be directed toward intentionally harming others, which can be distinguished from general creativity (Anderson and Bushman, 2002). Indeed, envy is a typical hostile emotion that increases the possibility of harmful behaviors (Schoeck et al., 1969; Smith & Kim, 2007). On the other hand, previous studies have shown that envy promotes general creativity performance by testing the remote associates test (Van de Ven et al., 2011). The remote associates test is an effective tool for creative measurement. Some researchers believe that envy enhances an individual's cognitive state, enabling him or her to mobilize more cognitive resources to participate in the task at hand, thus promoting general creative performance (Lim & Yang, 2015). Based on similar logic, it can be speculated that when envied by others, the boost in emotional arousal may cause the individual to call on more cognitive resources for mental processing, thereby improving the performance of malicious creativity. Thus, we tested the following hypothesis:

Hypothesis 2: *SNS envy is positively related to online malicious creativity.*

Integrating the above findings with social comparison theory, we then propose the following mediation hypothesis:

Hypothesis 3: *SNS social comparison has an indirect effect on individuals' malicious online creativity via the SNS envy of others.*

2.3. The Moderating Role of Rumination

Rumination is defined as a passive, ongoing, repetitive process (Nolen-Hoeksema et al., 1999). Response styles theory (Nolen-Hoeksema, 1987), views it as a mechanism of coping with negative moods through self-reflection (Morrow & Nolen-Hoeksema, 1990). Specifically, rumination is the process of people dwelling on the causes and potential negative consequences of adverse life events (upward social comparison), rather than taking more effective problem-solving measures (Teismann et al., 2014). As a relatively stable personality trait, we believe that it is a catalyst for the negative emotions (envy) arising from upward social comparison. Individuals more prone to rumination are more likely to battle envy after encountering an upward social comparison, owing to their repeated focus on its potential causes and consequences.

In contrast, individuals less prone to rumination can mobilize cognitive resources to effectively face upward social comparison and avoid or alleviate envy (Conway et al., 2000). In summary, we derived from relevant studies that rumination generally acts as a moderator between stressors (i.e., upward social comparison and uncertainty tolerance) and negative emotions (i.e., envy, anxiety, and depression) (Liao & Wei, 2011; Vanhalst et al., 2012). Thus, we propose the following hypothesis:

Hypothesis 3: *Rumination moderates the relationship between SNS social comparison and SNS envy such that positive relationships are stronger (weaker) when rumination is high (low).*

Integrating the above findings with the notion that SNS envy has an indirect effect on the relationship between SNS social comparisons and deviant online behaviors, we further propose the following moderated mediation hypothesis:

Hypothesis 4: *Rumination moderates the indirect effects of SNS social comparison on individuals' malicious online creativity via SNS envy, such that the effect is stronger (weaker) when rumination is high (low).*

3. Method

3.1. Participants

We used WeChat (a widely used social application in China) to recruit participants from different industries, occupations, organizations, and locations in China. To articulate the study purpose, we invited people who surfed online daily and were eligible to participate in our study. Before the study, voluntary participation and response confidentiality were ensured and participants were informed that they would receive 3RMB as compensation for completing the survey. We distributed 650 questionnaires and received 582 valid questionnaires (response rate 89.5%). After removing data with less than one hour of browsing time, the final sample size was 578, 251 were female (43.4%), other 327 were male (56.6%), and the age range was 18 - 49 (average age = 23.56 years).

3.2. Measurements

All variables in our study were translated from English to Chinese using a well-established scale that has been validated by three researchers (Brislin, 1980). Respondents reported the extent to which they agreed with the items on a 5-point Likert scale ranging from 1 (totally disagree) to 5 (totally agree).

SNS social comparison. We measured time pressure using Krasnova et al.'s (2013) 4-item social comparison scale, which was further modified for use in prior SNS empirical research projects (Lim & Yang, 2015). A sample item is "I felt unhappy when looking at others' photos and posts on an SNS service." Cronbach's α for this scale was 0.88.

SNS envy. Envy was measured using the 8-item scale developed by Tandoc Jr. et al. (2015). A sample item is "I generally feel inferior to others," where higher scores indicate stronger envy brought about by SNS use. Cronbach's α for this scale was 0.77.

Rumination. We used the ten items adapted from Treynor et al.'s (2003) study to measure individuals' levels of rumination. A sample item is "Think, 'Why can't I handle things better?'." The Cronbach's α for this scale was 0.90.

Online malevolent creativity. The items in the questionnaire were adapted from the 13-item scale created by Hao et al. (2016). A sample item is, "When I use SNS, I have a lot of ideas that pop into my head to tease others." Cronbach's α for this scale was 0.96.

Control variables. The demographic variables (gender and age) and the average number of hours per day devoted to using SNS (time) were controlled to eliminate any bias on an individual's online creativity.

3.3. Power Analysis

Previous experience recommended the sample size of each item should be more than 5 respondents. Therefore, the sample size of 578 participants was adequate for our 35-item measurement. Moreover, according to the power analysis for the Linear multiple regression by G-power 3.1.9.4, type I error rate at 1%, type II error rate at 10%, effect size $f2$ at 0.15, and at least 179 participants should be included. In conclusion, the sample size in this research had sufficient statistical power.

3.4. Data Analysis and Common Method Biases Test

We used the SPSS26.0 and Amos 26.0 statistical tools to analyze and process the data. A self-report method was used for data collection. The procedure used anonymous measurements and random arrangements to avoid common method biases that could interfere with our research results. We used the Harman single-factor test (Podsakoff et al., 2003) with statistical methods to measure the degree of variation of the common method. Our research resulted in five eigenvalues greater than one for all factors; the variance of the first factor was 24.15% (<40%). Therefore, no serious common method deviations were observed in this

study. We then loaded all measured items into a common latent factor using confirmatory factor analysis. The results showed that the four-factor model fit the data (χ^2/df = 3.883, $p < 0.001$, CFI = 0.888, RMSEA = 0.071, GFI = 0.798).

4. Results

Table 1 presents the descriptive statistics and correlations between the variables of interest. The results showed that malevolent online creativity was related to proximal SNS envy (r = 0.56, $p < 0.01$), while SNS envy was significantly correlated with SNS social comparison (r = 0.76, $p < 0.01$).

Rumination was significantly correlated with both SNS social comparison (r = 0.38, $p < 0.01$) and SNS envy (r = 0.42, $p < 0.01$). Thus, these correlations provide initial support for our hypotheses.

Hypotheses testing

We tested our hypotheses using a regression analysis with SPSS 26.0. The results (see Table 2, for Models 2 and 6) demonstrated that SNS social comparison (B = 0.76, $p < 0.001$) was positively related to SNS envy, and the relationship between SNS envy and online malevolent creativity was significant (B = 0.55, $p < 0.001$). Thus, Hypotheses 1 and 2 were supported.

Next, we checked Hypothesis 2 using the method outlined by Preacher, Rucker, and Hayes (2007) using Hayes' (2013) PROCESS macro in SPSS (version 3.3). Using Model 4, we assessed the mediation model (controlling for sex, age, and time). We constructed 95% confidence intervals (CI) around the observed indirect effects using 5000 bootstrapped samples. As presented in Table 3, the results showed that SNS social comparison had significant indirect effects on online malevolent creativity through SNS envy. Thus, Hypothesis 3 was supported.

Based on previous results, we added interaction terms between SNS social comparison and rumination into the model to test the moderated mediation hypotheses (i.e., Hypotheses 4 and 5). The results (Table 2, Model 4) showed that rumination moderated the effects of SNS social comparison (B = 0.06, $p <$

Table 1. Descriptive statistics and correlations.

Variable	M	SD	1	2	3	4	5	6	7
1. Gender	1.43	0.50							
2. Age	23.56	4.51	−0.09						
3. Time	5.40	2.80	0.09*	−0.21**					
4. SNS social comparison	2.66	1.10	−0.14**	0.09*	0.04	（0.88）			
5. SNS envy	3.21	0.72	−0.11**	0.08*	0.07	0.76**	(0.77)		
6. Rumination	2.61	0.64	−0.14**	−0.01	−0.09*	0.38**	0.42**	(0.90)	
7. Online malevolent creativity	2.53	1.08	−0.15**	0.04	0.05	0.62**	0.56**	0.44**	(0.96)

Note. N = 578. For sex, 1 = male and 2 = female. Cronbach's alpha values are reported in parentheses along the diagonal. *$p < 0.05$. **$p < 0.01$. Source: Research team own collects and calculates, 2023.

Table 2. Regression results.

Variables	SNS envy				Online malevolent creativity	
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Gender	−0.12**	−0.01	0.00	−0.00	−0.15***	−0.09*
Age	0.10**	0.02	0.03	0.03	0.54	−0.00
Time	0.10*	0.04	0.06*	0.06*	0.72	0.15
SNS social comparison		0.76***	0.70***	0.44***		
Rumination			0.16***	0.05		
SNS envy						0.55***
SNS social comparison × Rumination				0.33*		
R^2	0.03	0.59***	0.62	0.61	0.03	0.33
ΔR^2	0.02**	0.58***	0.62***	0.61***	0.02**	0.32***
F	5.68**	202.75***	177.58***	149.78***	5.42**	69.00***

Note. N = 578. For gender, 1 = male; 2 = female. Standardized regression coefficients are reported. *$p < 0.05$. **$p < 0.01$. ***$p < 0.001$. Source: Research team own collects and calculates, 2023.

Table 3. Indirect effects based on 5000 Monte Carlo replications.

	Effect	SE	Boot LLCI	Boot ULCI
SNS social comparison				
Indirect effect	0.157	0.040	0.077	0.234
Moderated mediation effect	0.019	0.012	0.000	0.046
High rumination (+1SD)	0.151	0.039	0.075	0.230
Low rumination (−1SD)	0.129	0.034	0.063	0.195

Note. Boot LLCI = bootstrapped lower confidence interval; Boot ULCI = bootstrapped upper confidence interval. *The indirect effect was significant if the confidence interval did not contain zero. Source: Research team own collects and calculates, 2023.

0.05) on SNS envy (see **Figure 2**). Simple slope tests demonstrated that the relationship between SNS social comparison and SNS envy was significant and positive when the level of rumination was high (B = 0.48, se = 0.02, $p < 0.001$), but was significantly weaker when the level of rumination was low (B = 0.40, se = 0.03, $p < 0.001$). Therefore, Hypothesis 4 was supported.

We further tested the moderated mediation hypotheses (Hypothesis 5) with Process Model 7. The results (see **Table 3**) showed that rumination moderated the indirect effects of SNS social comparison on online malevolent creativity
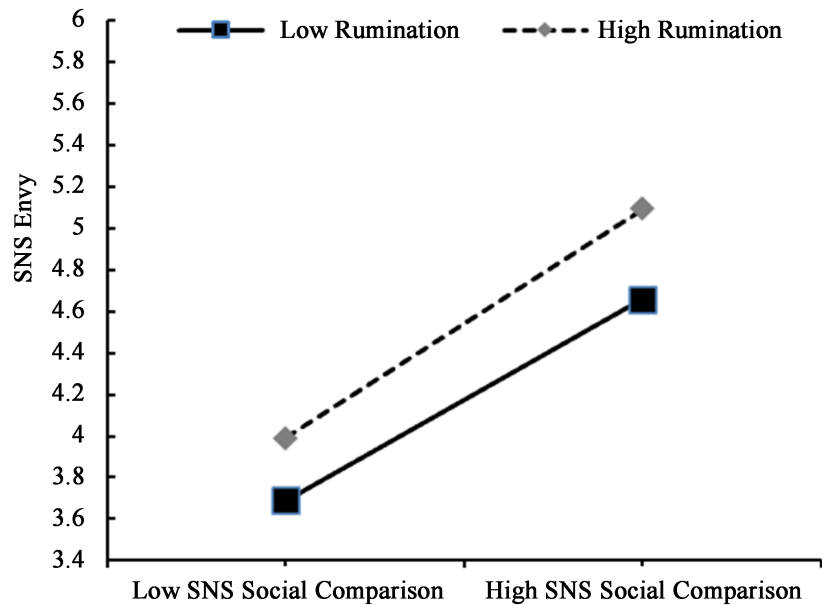
Source: Research team own calculates and draws, 2023.

Figure 2. Moderating effect of rumination on the relationship between SNS social comparison and SNS envy.

(estimate = 0.019, 95% CI = [0.000, 0.046]). Specifically, the indirect effect of SNS social comparison on online malevolent creativity via SNS envy was significant when rumination was high (estimate = 0.151, 95% CI = [0.075, 0.230]). The indirect effect was also significant when the rumination level was low (estimate = 0.129, 95% CI = [0.063, 0.195]), but it was significantly weaker. These findings support Hypothesis 5.

5. Discussion

The primary objective of the current study was to shift the focus of the academic conversation in the creativity literature to the dark side of creativity—online malicious creativity—and specifically to investigate its possible causes in the context of SNS. Based on social comparison theory and previous research results, we examined the impact of SNS social comparison on emotion (SNS envy), which in turn leads to a high level of online malicious creativity. Further, according to the response style theory, we suggest that rumination plays a critical role in determining the link between SNS social comparison and SNS envy. Specifically, we demonstrated that SNS social comparison had a positive relationship with SNS envy when the level of rumination was high but was significantly weaker when it was low. In addition, we found that the indirect effect between SNS social comparison and malicious online creativity via SNS envy was consistent. In particular, the indirect impact was significant when the level of rumination was high but was significantly weaker when it was low. Our study has several intriguing theoretical and practical implications, which are discussed in the next section.

5.1. Theoretical Contributions

The main contribution of the current research is that, instead of focusing on creativity, we explore the dark side of creativity—online malicious creativity on SNS. The extant literature has accumulated a wealth of evidence on the antecedents of individuals' creativity (Amabile, 1997; Montanari et al., 2016; Mumford et al., 2012), largely due to the widespread belief among researchers and the public that creativity is generally positive (Khessina et al., 2018). However, as the current study reveals, true creativity may be more diverse and subtle than previously assumed. Therefore, we are committed to extending the creativity literature by advancing the discourse on malicious online creativity on SNS. Specifically, we take a rare approach to investigate the dark side of individuals' creativity. By combining social comparison theory with the creativity literature highlighting the growing importance of individual creativity, we uncover previously unidentified causes of malicious online creativity on SNS. Our findings suggest that those who maintain higher levels of SNS social comparison are more likely to envy others, which leads to high levels of malicious online creativity. The current empirical study is among the first to examine the interpersonal effects of social comparison on the online dark side of creativity by focusing on individual responses in the context of SNS.

Second, this study directly extends the social comparison theory. Given that SNS upward social comparison is inevitable, researchers must uncover positive and negative emotions and outcomes to better guide individuals on how to mitigate the potential costs of these initiatives (Chou & Edge, 2012; Midgley, 2013). Given that highly negative individual and interpersonal outcomes are known to result from individuals' malicious online creativity (Cropley et al., 2014), it is also important to identify the antecedents and affective mechanisms before they occur (Hao et al., 2020). The current research has shown a positive relationship between SNS social comparison and malicious online creativity through SNS envy. The results also indicate that individuals' malicious online creativity might be affected by stressful life events (i.e., SNS upward social comparison). Therefore, identifying the mechanism of SNS envy that explains how SNS social comparison leads to malicious online creativity is a significant contribution to the literature. Finally, by identifying the boundary conditions of individual characteristics (rumination), we provide insights into how to temper the undesired outcomes of online malicious creativity. Specifically, we found that rumination accentuates the harmful effects of SNS social comparisons. Scholars have noted that rumination may be linked to the key focus of problems and psychological stress responses (Teismann et al., 2014). Suppose individuals have a low level of rumination. In this case, they will be more likely to mobilize cognitive resources to maintain the optimistic arousal needed to achieve goals and meet demands when they suffer comparison upward and seek to avoid or alleviate envy (Conway et al., 2000). We extend this view by articulating how and why rumination, as an individual characteristic, can shape individuals' responses to SNS social compar-

ison. In doing so, we also contribute to response style theory by placing an individual's meditative characteristics under the framework of interpersonal communication.

5.2. Practical Contributions

This study has several practical implications. First, we suggest that SNS upward social comparison has psychological consequences. Given the negative emotions of SNS envy, more attention should be paid to the suffering caused by SNS social comparisons. Thus, on the one hand, SNS policymakers should inform the public of the potentially negative effects (i.e., negative emotions and behaviors) of SNS, rather than simply focusing on increasing the number of users by emphasizing only the ease of use and positive experiences of SNS. This will advantageous in helping users correctly understand SNS, thus preventing negative emotions from being accompanied by feelings of helplessness. Importantly, SNS providers should also enhance SNS systems so that SNS users do not misconstrue their reality through social comparisons. Exaggeration and separation from reality can also be characteristic of sharing on SNS. Therefore, websites should be subjected to more rigorous review to reduce the generation of social comparison that is divorced from reality. In addition, we hope that SNS providers will find ways to effectively offset the envy experienced via social comparison and produce SNS systems that can decrease the cost inherent to ceasing SNS use. Second, our study reveals the boundary condition of rumination, which could further accentuate the devastating psychological and behavioral effects of SNS social comparison. Therefore, organizations and educators should develop targeted interventions to avoid or alleviate SNS envy and malicious online creativity. Interventions could include rumination presentations and how they relate to social comparisons, emotions, and malicious creativity. Such an approach could facilitate students' development of coping skills with low levels of rumination, thereby reducing SNS envy.

5.3. Limitations and Directions for Future Research

Although this study has some theoretical and practical implications, its limitations must be considered when expanding on them. First, the survey was cross-sectional, and causality could not be established. Future studies should employ a longitudinal design to examine how online social comparison experiences change with SNS. Second, we investigated only one interpersonal phenomenon (SNS upward social comparison) and one mediated variable (SNS envy). Future research could explore which other mediating variables frame the effects of SNS social comparison on online malicious creativity and whether there are other causes of online malicious creativity. Third, this study explores only the dark side of creativity. How does this relate to general creativity? This topic is worthy of further study. Finally, all data in the current study were gathered via self-reported surveys, which may lead to the outcome of online malicious creativity

being a behavioral propensity assessment rather than a natural behavioral trajectory. Future research could measure individual malicious online creativity in the form of big data and footprints on SNS.

6. Conclusion

Integrating social comparison theory with response style theory showed that SNS social comparison had a positive relationship with individuals' SNS envy, which was positively related to online malicious creativity. Moreover, rumination accentuated the impact of SNS social comparisons on SNS envy. These findings provide timely and meaningful insights into theory and practice.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

Amabile, T. M. (1996). *Creativity and Innovation in Organizations*. Harvard Business School.

Amabile, T. M. (1997). Motivating Creativity in Organizations: On Doing What You Love and Loving What You Do. *California Management Review, 40,* 39-59. https://doi.org/10.2307/41165921

Bergagna, E., & Tartaglia, S. (2018). Self-Esteem, Social Comparison, and Facebook Use. *Europe's Journal of Psychology, 14,* 831-845. https://doi.org/10.5964/ejop.v14i4.1592

Brislin, R. W. (1980). Translation and Content Analysis of Oral and Written Materials. In H. C. Triandis, & W. Lonner (Eds.), *Handbook of Cross-Cultural Psychology* (pp. 389-444). Allyn and Bacon.

Cheng, R., Kelong, L. U., & Hao, N. (2021). The Effect of Anger on Malevolent Creativity and Strategies for Its Emotion Regulation. *Acta Psychologica Sinica, 53,* 847-860. https://doi.org/10.3724/SP.J.1041.2021.00847

Chou, H. T. G., & Edge, N. (2012). They Are Happier and Having Better Lives than I Am: The Impact of Using Facebook on Perceptions of Others' Lives. *Cyberpsychology, Behavior, and Social Networking, 15,* 117-121. https://doi.org/10.1089/cyber.2011.0324

Conway, M., Csank, P. A., Holm, S. L., & Blake, C. K. (2000). On Assessing Individual Differences in Rumination on Sadness. *Journal of Personality Assessment, 75,* 404-425. https://doi.org/10.1207/S15327752JPA7503_04

Cropley, D. H., Kaufman, J. C., & Cropley, A. J. (2008). Malevolent Creativity: A Functional Model of Creativity in Terrorism and Crime. *Creativity Research Journal, 20,* 105-115. https://doi.org/10.1080/10400410802059424

Cropley, D. H., Kaufman, J. C., White, A. E., & Chiera, B. A. (2014). Layperson Perceptions of Malevolent Creativity: The Good, the Bad, and the Ambiguous. *Psychology of Aesthetics, Creativity, and the Arts, 8,* 400-412. https://doi.org/10.1037/a0037792

Dunn, J., Ruedy, N. E., & Schweitzer, M. E. (2012). It Hurts Both Ways: How Social Comparisons Harm Affective and Cognitive Trust. *Organizational Behavior and Human Decision Processes, 117,* 2-14. https://doi.org/10.1016/j.obhdp.2011.08.001

Ellison, N. B., Steinfield, C., & Lampe, C. (2007). The Benefits of Facebook "Friends": So-

cial Capital and College Students' Use of Online Social Network Sites. *Journal of Computer-Mediated Communication, 12,* 1143-1168. https://doi.org/10.1111/j.1083-6101.2007.00367.x

Feinstein, B. A., Hershenberg, R., Bhatia, V., Latack, J. A., Meuwly, N., & Davila, J. (2013). Negative Social Comparison on Facebook and Depressive Symptoms: Rumination as a Mechanism. *Psychology of Popular Media Culture, 2,* 161-170. https://doi.org/10.1037/a0033111

Festinger, L. (1954). A Theory of Social Comparison Processes. *Human Relations, 7,* 117-140. https://doi.org/10.1177/001872675400700202

Gill, P., Horgan, J., Hunter, S. T., & Cushenbery, L. D. (2013). Malevolent Creativity in Terrorist Organizations. *Journal of Creative Behavior, 47,* 125-151. https://doi.org/10.1002/jocb.28

Gutworth, M. B., Cushenbery, L., & Hunter, S. T. (2016). Creativity for Deliberate Harm: Malevolent Creativity and Social Information Processing Theory. *Journal of Creative Behavior, 52,* 305-322. https://doi.org/10.1002/jocb.155

Hao, N., Qiao, X., Cheng, R., Lu, K., Tang, M. Y., & Runco, M. A. (2020). Approach Motivational Orientation Enhances Malevolent Creativity. *Acta Psychologica, 203,* Article 102985. https://doi.org/10.1016/j.actpsy.2019.102985

Hao, N., Tang, M. Y., Yang, J., Wang, Q. F., & Runco, M. A. (2016). A New Tool to Measure Malevolent Creativity: The Malevolent Creativity Behavior Scale. *Frontiers in Psychology, 7,* Article 682. https://doi.org/10.3389/fpsyg.2016.00682

Hayes, A. (2013). *An Introduction to Mediation, Moderation, and Conditional Process Analysis: A Regression-Based Approach.* Guilford Press.

He, X., & Cui, L. Y. (2016). Fortune Emotions: The Analysis for the Social Comparison & Cognitive Appraisal Process of Envy. *Advances in Psychological Science, 24,* 1485-1495. https://doi.org/10.3724/SP.J.1042.2016.01485

Howkins, J. (2013). *The Creative Economy: How People Make Money from Ideas* (2nd ed.). Penguin Books.

Jonason, P. K., Abboud, R., Tome, J., Dummett, M., & Hazer, A. (2017). The Dark Triad Traits and Individual Differences in Self-Reported and Other-Rated Creativity. *Personality and Individual Differences, 117,* 150-154. https://doi.org/10.1016/j.paid.2017.06.005

Khessina, O. M., Goncalo, J. A., & Krause, V. (2018). It's Time to Sober Up: The Direct Costs, Side Effects and Long-Term Consequences of Creativity and Innovation. *Research in Organizational Behavior, 38,* 107-135. https://doi.org/10.1016/j.riob.2018.11.003

Krasnova, H., Wenninger, H., Widjaja, T., & Buxmann, P. (2013). Envy on Facebook: A Hidden Threat to Users' Life Satisfaction? In *International Conference on Wirtschaftsinformatik.*

Latif, K., Weng, Q., Pitafi, A. H., Ali, A., Siddiqui, A. W., Malik, M. Y., & Latife, Z. (2020). Social Comparison as a Double-Edged Sword on Social Media: The Role of Envy Type and Online Social Identity. *Telematics and Informatics, 56,* Article 101470. https://doi.org/10.1016/j.tele.2020.101470

Lee, K., & Yang, S. (2015). The Role of Online Product Reviews on Information Adoption of New Product Development Professionals. *Internet Research, 25,* 435-45. https://doi.org/10.1108/IntR-11-2013-0238

Liao, K. Y.-H., & Wei, M. (2011). Intolerance of Uncertainty, Depression, and Anxiety: The Moderating and Mediating Roles of Rumination. *Journal of Clinical Psychology,*

67, 1220-1239. https://doi.org/10.1002/jclp.20846

Lim, M., & Yang, Y. (2015). Effects of Users' Envy and Shame on Social Comparison That Occurs on Social Network Services. *Computers in Human Behavior, 51,* 300-311. https://doi.org/10.1016/j.chb.2015.05.013

Lin, R., & Utz, S. (2015). The Emotional Responses of Browsing Facebook: Happiness, Envy, and the Role of Tie Strength. *Computers in Human Behavior, 52,* 29-38. https://doi.org/10.1016/j.chb.2015.04.064

Liu, M., Jiang, Y., Wang, X., Liu, Q., & Wu, H. (2017). The Role of Rumination and Stressful Life Events in the Relationship between the Qi Stagnation Constitution and Depression in Women: A Moderated Mediation Model. *Evidence-Based Complementary and Alternative Medicine, 2017,* Article ID: 7605893. https://doi.org/10.1155/2017/7605893

Midgley, C. E. (2013). *Keeping in Touch or Keeping Score? Social Comparisons on Facebook.* Master's Thesis, University of Toronto.

Montanari, F., Scapolan, A., & Gianecchini, M. (2016). 'Absolutely Free'? The Role of Relational Work in Sustaining Artistic Innovation. *Organization Studies, 37,* 797-821. https://doi.org/10.1177/0170840616647419

Morrow, J., & Nolen-Hoeksema, S. (1990). Effects of Responses to Depression on the Remediation of Depressive Affect. *Journal of Personality and Social Psychology, 58,* 519-527. https://doi.org/10.1037/0022-3514.58.3.519

Mumford, M. D., Hester, K. S., & Robledo, I. C. (2012). Creativity in Organizations: Importance and Approaches. In M. D. Mumford (Ed.), *Handbook of Organizational Creativity* (pp. 1-16). Elsevier Inc. https://doi.org/10.1016/B978-0-12-374714-3.00001-X

Nolen-Hoeksema, S. (1987). Sex Differences in Unipolar Depression: Evidence and Theory. *Psychological Bulletin, 101,* 259-282. https://doi.org/10.1037/0033-2909.101.2.259

Nolen-Hoeksema, S., Larson, J., & Grayson, C. (1999). Explaining the Gender Difference in Depressive Symptoms. *Journal of Personality and Social Psychology, 77,* 1061-1072. https://doi.org/10.1037/0022-3514.77.5.1061

Parrott, W. G., & Smith, R. H. (1993). Distinguishing the Experiences of Envy and Jealousy. *Journal of Personality and Social Psychology, 64,* 906-920. https://doi.org/10.1037/0022-3514.64.6.906

Plucker, J. A., Beghetto, R. A., & Dow, G. T. (2004). Why Isn't Creativity More Important to Educational Psychologists? Potentials, Pitfalls, and Future Directions in Creativity Research. *Educational Psychologist, 39,* 83-96. https://doi.org/10.1207/s15326985ep3902_1

Podsakoff, P. M., MacKenzie, S. B., Lee, J.-Y. Y., & Podsakoff, N. P. (2003). Common Method Biases in Behavioral Research: A Critical Review of the Literature and Recommended Remedies. *Journal of Applied Psychology, 88,* 879-903. https://doi.org/10.1037/0021-9010.88.5.879

Preacher, K. J., Rucker, D. D., & Hayes, A. F. (2007). Addressing Moderated Mediation Hypotheses: Theory, Methods, and Prescriptions. *Multivariate Behavioral Research, 42,* 185-227. https://doi.org/10.1080/00273170701341316

Runco, M. A. (2010). Creativity Has No Dark Side. In A. J. Cropley, J. C. Kaufman, & M. A. Runco (Eds.), *The Dark Side of Creativity* (pp. 15-32). Cambridge University Press. https://doi.org/10.1017/CBO9780511761225.002

Schachter, S. (1959). *The Psychology of Affiliation.* Stanford University Press.

Schmuck, D., Karsay, K., Matthes, J., & Stevic, A. (2019). "Looking Up and Feeling Down" the Influence of Mobile Social Networking Site Use on Upward Social Comparison, Self-Esteem, and Well-Being of Adult Smartphone Users. *Telematics and Informatics, 42,* Article 101240. https://doi.org/10.1016/j.tele.2019.101240

Schoeck, H., Glenny, M., & Ross, B. (1969). *Envy: A Theory of Social Behaviour.* Harcourt, Brace & World.

Sloman, L., Gilbert, P., & Hasey, G. (2003). Evolved Mechanisms in Depression: The Role and Interaction of Attachment and Social Rank in Depression. *Journal of Affective Disorders, 74,* 107-121. https://doi.org/10.1016/S0165-0327(02)00116-7

Smith, R. H., & Kim, S. H. (2007). Comprehending Envy. *Psychological Bulletin, 133,* 46-64. https://doi.org/10.1037/0033-2909.133.1.46

Smock, A. D., Ellison, N. B., Lampe, C., & Wohn, D. Y. (2011). Facebook as a Toolkit: A Uses and Gratification Approach to Unbundling Feature Use. *Computers in Human Behavior, 27,* 2322-2329. https://doi.org/10.1016/j.chb.2011.07.011

Stronge, S., Greaves, L. M., Milojev, P., West-Newman, T., Barlow, F. K., & Sibley, C. G. (2015). Facebook Is Linked to Body Dissatisfaction: Comparing Users and Non-Users. *Sex Roles, 73,* 200-213. https://doi.org/10.1007/s11199-015-0517-6

Tandoc Jr., E. C., Ferrucci, P., & Duffy, M. (2015). Facebook Use, Envy, and Depression among College Students: Is Facebooking Depressing? *Computers in Human Behavior, 43,* 139-146. https://doi.org/10.1016/j.chb.2014.10.053

Teismann, T., Het, S., Grillenberger, M., Willutzki, U., & Wolf, O. T. (2014). Writing about Life Goals: Effects on Rumination, Mood and the Cortisol Awakening Response. *Journal of Health Psychology, 19,* 1410-1419. https://doi.org/10.1177/1359105313490774

Treynor, W., Gonzalez, R., & Nolen-Hoeksema, S. (2003). Rumination Reconsidered: A Psychometric Analysis. *Cognitive Therapy and Research, 27,* 247-259. https://doi.org/10.1023/A:1023910315561

Tuori, A., & Vilén, T. (2011). Subject Positions and Power Relations in Creative Organizations: Taking a Discursive View on Organizational Creativity. *Creativity and Innovation Management, 20,* 90-99. https://doi.org/10.1111/j.1467-8691.2011.00596.x

Van de Ven, N., Zeelenberg, M., & Pieters, R. (2011). Why Envy Outperforms Admiration. *Personality and Social Psychology Bulletin, 37,* 784-795. https://doi.org/10.1177/0146167211400421

Vanhalst, J., Luyckx, K., Raes, F., & Goossens, L. (2012). Loneliness and Depressive Symptoms: The Mediating and Moderating Role of Uncontrollable Ruminative Thoughts. *The Journal of Psychology, 146,* 259-276. https://doi.org/10.1080/00223980.2011.555433

Vogel, E. A., Rose, J. P., Roberts, L. R., & Eckles, K. (2014). Social Comparison, Social Media, and Self-Esteem. *Psychology of Popular Media Culture, 3,* 206-222. https://doi.org/10.1037/ppm0000047

Walther, J. B. (2007). Selective Self-Presentation in Computer-Mediated Communication: Hyperpersonal Dimensions of Technology, Language, and Cognition. *Computers in Human Behavior, 23,* 2538-2557. https://doi.org/10.1016/j.chb.2006.05.002

Wilson, R. E., Gosling, S. D., & Graham, L. T. (2012). A Review of Facebook Research in the Social Sciences. *Perspectives on Psychological Science, 7,* 203-220. https://doi.org/10.1177/1745691612442904

Wu, B. P., & Zhang, L. (2012). Envy: A Social Emotion Characterized by Hostility. *Advances in Psychological Science, 20,* 1467-1478.

https://doi.org/10.3724/SP.J.1042.2012.01467

Yang, L. X., & Zhang, J. K. (2009). The Progress and Trends of the Psychological Research on Envy. *Psychological Science, 32,* 655-657.

Zhou, J., Zuo, M., & Yu, Y. (2014). How Fundamental and Supplemental Interactions Affect Users' Knowledge Sharing in Virtual Communities? A Social Cognitive Perspective. *Internet Research, 24,* 566-586. https://doi.org/10.1108/IntR-07-2013-0143