The emotional responses of browsing Facebook: Happiness, envy, and the role of tie strength

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ABSTRACT

On Facebook, users are exposed to posts from both strong and weak ties. Even though several studies have examined the emotional consequences of using Facebook, less attention has been paid to the role of tie strength. This paper aims to explore the emotional outcomes of reading a post on Facebook and examine the role of tie strength in predicting happiness and envy. Two studies – one correlational, based on a sample of 207 American participants and the other experimental, based on a sample of 194 German participants – were conducted in 2014. In Study 2, envy was further distinguished into benign and malicious envy. Based on a multi-method approach, the results showed that positive emotions are more prevalent than negative emotions while browsing Facebook. Moreover, tie strength is positively associated with the feeling of happiness and benign envy, whereas malicious envy is independent of tie strength after reading a (positive) post on Facebook.

1. Introduction and theoretical background

New communication technologies such as social media have made social news more pervasive (Bazarova, 2012). Facebook continuously keeps users updated with a variety of posts, and passive consumption of news updates is the main Facebook activity that people engage in (Wise, Alhabash, & Park, 2010). The majority of these updates are positive (Barash, Ducheneaur, Isaacs, & Bellotti, 2010; Utz, 2015). There is evidence for emotional contagion, showing happiness can spread through the news updates on online social networks (Coviello et al., 2014; Kramer, Guillory, & Hancock, 2014). However, recent studies also indicate that exposure to positive posts on Facebook may induce envy and lead to depression (Steers, Wickham, & Acitelli, 2014; Tandoc, Ferrucci, & Duffy, 2014) and reduced well-being over time (Kross et al., 2013; Verduyn et al., 2015). Given that Facebook has over 1.35 billion active users (Facebook, 2014) and there are on average 1500 potential stories for users to check per visit (Facebook, 2013), we are eager to understand how Facebook affects users' emotions and identify relevant factors that will determine emotional reactions. We argue that tie strength (relationship closeness) between the user and the poster is one important factor that should affect emotional outcomes.

1.1. Psychological effects of social media usage

The use of social media such as Facebook can cause both positive and negative feelings, and the results of prior studies on the psychological effects of social media usage are quite mixed. From a long-term perspective, the use of social media offers benefits such as the possibility of developing and maintaining social capital and social connectedness (Ellison, Steinfield, & Lampe, 2007; Grieve, Indian, Witteveen, Anne Tolan, & Marrington, 2013; Sheldon, Abad, & Hinsch, 2011); Nevertheless, it may also lead to negative outcomes such as social overload (Maier, Laumer, Eckhardt, & Weitzel, 2012), an over-optimistic perception towards others' lives (Chou & Edge, 2012), and a decrease in life satisfaction (Kross et al., 2013). From a short-term perspective, the use of Facebook can evoke a feeling of flow, which is characterized by high positive valence and high arousal (Mauri, Cipresso, Balgera, Villamira, & Riva, 2011), and "joyful and fun" are the most common positive feelings reported by users while using Facebook (Krasnova, Wenninger, Widjaja, & Buxmann, 2013). Nonetheless, the consumption of social news on Facebook can also trigger invidious emotions such as jealousy and envy (Krasnova et al., 2013; Muise, Christofides, & Desmarais, 2009; Tandoc et al., 2014).

Faced with mixed results from prior research on the psychological effects of Facebook usage, it is important to differentiate between interactive and non-interactive social media behavior (Burke, Marlow, & Lento, 2010; große Deters & Mehl, 2013; Wise et al., 2010). Previous research has shown a consistent relation between using FB for interpersonal interaction and positive

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psychological outcomes (Burke et al., 2010; Hampton, Goulet, Marlow, & Rainie, 2012; Kim & Lee, 2011). However, it remains unclear as to what the psychological outcomes of non-interactive Facebook behavior are.

1.2. Psychological effects of browsing Facebook

In this paper, we focus only on the psychological effects of passive consumption. Previous research has revealed that the more time individuals spent browsing Facebook, the more negative their mood was immediately afterwards, and this was mediated by a feeling of not having done anything meaningful (Sagioglou & Greitemeyer, 2014). Users may experience the feelings of exhaustion and information overload when they are continuously browsing social news (Maier et al., 2012). Also, being exposed to social news on Facebook can evoke feelings of envy (Krasnova et al., 2013). However, when it comes to momentary experiences, users often feel pleasant and positively aroused when browsing Facebook (Mauri et al., 2011; Wise et al., 2010).

In an exploratory study (Krasnova et al., 2013), participants were asked to report their *overall* feelings after their most recent Facebook usage: 43.8% of the respondents reported at least one positive emotional outcome (such as feeling joyful/fun, satisfied, informed, excited, and relaxed), and 36.8% of the respondents reported at least one negative emotional outcome (such as feeling bored, angry, frustrated, guilty, tired, sad, lonely, and envious). However, it is unclear as to whether different feelings are triggered by different posts or whether a post can elicit several feelings. To the best of our knowledge, no research has been done that focuses on momentary feelings of browsing Facebook *on an individual message level*. To get a more comprehensive understanding on whether reading (positive) posts on Facebook leads to more positive emotions such as happiness or more negative emotions such as envy and boredom, we examine the feelings respondents report per post on their Facebook News Feeds. Before we turn to the underlying processes, we examine the prevalence of positive and negative emotions. Our first research question is therefore:

RQ1: What are the most prevalent *momentary* emotional outcomes of reading a post on Facebook?

1.3. Underlying mechanisms and the role of tie strength

More importantly, we are also interested in understanding the underlying mechanisms of the positive and negative emotions caused by passive consumption of social news, and aim to examine the role of relationship closeness in explaining those emotional outcomes (mainly happiness and envy). In a social network context, relationship closeness is often intertwined with the expression of "tie strength" (Gilbert, 2012): A *strong tie* is usually a close friend or family member, that with whom one shares an intimate relationship; and a *weak tie* is usually an acquaintance that one does not feel emotionally close to. As tie strength can also be measured by relationship closeness (Marsden & Campbell, 1984), in this paper, we treat "tie strength" and "relationship closeness" as interchangeable.

On Facebook, users can be exposed to posts from a variety of different people, including acquaintances, colleagues, best friends, and family members. Thus, the emotional outcomes of reading a post might not only depend on the content of the post, but may also be influenced by the relationship between the poster and reader. For example, if your best friend posts good or bad news on Facebook you might react differently to this compared to seeing an acquaintance that you haven't talked to in years posting the same news. No research has been done to examine the role of tie strength in interpreting the emotional outcomes after reading a post. Our second research question is therefore:

RQ2: What is the role of tie strength in explaining emotional outcomes such as happiness and envy?

Facebook users often post about their positive life events, successes, and entertaining status updates (Utz, 2011, 2015), and sometimes even present themselves in overly flatting ways (Barash et al., 2010; Mehdizadeh, 2010; Qiu, Lin, Leung, & Tov, 2012). Especially after reading these types of posts, feelings of happiness and envy are common emotional responses. Two mechanisms can explain this phenomenon: *emotional contagion* and *upward social comparison*. The feeling of happiness can be explained by the effects of emotional contagion (Cheshin, Rafaeli, & Bos, 2011; Hatfield, Cacioppo, & Rapson, 1993), i.e., the tendency for two individuals to emotionally converge; whereas the feeling of envy can be explained as a result of upward social comparison (Festinger, 1954).

In the following parts, we provide further information on these two mechanisms and explain *why tie strength could matter* for the emotions of happiness and envy respectively.

1.3.1. Happiness: emotional contagion and the role of tie strength

Humans, as a species that are embedded in complex social networks, rely on the ability of sharing others' emotions (empathy) to engage in successful social interactions (Norscia & Palagi, 2011; Preston & de Waal, 2002). The ability to catch or experience other's feelings leads to the phenomenon of "emotional contagion", which has been described as "the tendency to automatically mimic and synchronize expressions, vocalizations, postures, and movements with those of another person's, and, consequently, to converge emotionally" (Hatfield et al., 1993). Recent studies found that emotions such as happiness can be transferred from one person to another not only in face-to-face communication (Hancock, Gee, Ciaccio, & Lin, 2008; Hatfield et al., 1993; Neumann & Strack, 2000), but also in computer-mediated-communication (Cheshin et al., 2011; Coviello et al., 2014; Kramer, 2012). Therefore, observing others' positive news on Facebook may lead to happiness via emotional contagion.

Previous research (in offline settings) demonstrates that empathy is more pronounced when the relationship between two individuals within a dyad is closer (Beeney, Franklin, Levy, & Adams, 2011; Norscia & Palagi, 2011; Preston & de Waal, 2002). This is because kin relationships were extremely important to our ancestors' survival. And thus, the ability to empathize with close others would have facilitated social interactions (Norscia & Palagi, 2011). In addition, based on the Perception–Action Model for empathy, individuals with higher similarity and familiarity are more likely to catch emotions from each other (Preston & de Waal, 2002). Therefore, we would expect a positive moderating effect of tie strength on emotional contagion even in the computer-mediated communication context (e.g., when reading a Facebook post). More specifically, positive news may lead to happiness, and negative news may lead to sadness because of mood contagion, and the contagious effect is stronger when the news comes from a strong tie.

1.3.2. Envy: social comparison and the role of tie strength

Envy, a pain caused by the good fortune of others, is another potential emotional outcome of encountering positive news on Facebook (Krasnova et al., 2013), and it might be a reason why browsing Facebook can lead to depression (Tandoc et al., 2014; Verduyn et al., 2015). Hence, we are also interested in understanding the processes underlying envy.

The concept of envy is often confused with jealousy, but clear differences exist: Jealousy arises when one has something but is afraid of losing it or has lost it to another person, while envy arises when another person has something that one does not have (Parrott & Smith, 1993). Recent literature on envy further

established two different types of envy: benign envy and malicious envy (Smith & Kim, 2007; Van de Ven, Zeelenberg, & Pieters, 2009). *Benign envy* leads to a moving-up motivation (i.e., achieving the desired attribute by improving one's own situation), and *malicious envy* leads to a pulling-down motivation (i.e., an intention to damage the position of the superior other).

Envy generally arises from engaging in upward comparison(s) (Nabi & Keblusek, 2014; Van de Ven, Zeelenberg, & Pieters, 2012), i.e., when people compare themselves with better-off others (Mussweiler, Rüter, & Epstude, 2004). Several researchers have investigated the pre-conditions and underlying mechanisms for individuals to experience envy. In Festinger's (1954) classic theory of social comparison, he claimed that people have a desire to know about their own opinions and abilities, and when the reference to the physical world is not clear, people tend to compare themselves to others. In essence, he suggested that people select comparison standards that are similar to themselves on the critical dimension, in order to get diagnostic information for self-evaluation (Festinger, 1954). Similarly, Smith (2004) proposed four pre-conditions for envy: *being similar to the compared person*, perceiving the situation as *self-relevant*, the desired object is hard to achieve (or *low perceived control*), and the feeling that the person does not deserve the object (or one's own inferior situation is perceived to be *undeserved*). The latter two factors were found to be the key appraisals that distinguished benign from malicious envy: The more a situation was perceived as fair and controllable, the more benign envy rather than malicious envy was experienced, while malicious envy was experienced when the situation was appraised as undeserved for the compared person (Van de Ven et al., 2012).

Even though previous research has addressed the role of perceived similarity with the compared person, it is still unclear what role tie strength or relationship closeness plays in predicting the feeling of envy. Tesser (1988) argued in his Self-Evaluation Maintenance theory (SEM) that an upward comparison is most threatening when the superior other is psychologically close, and social comparisons to strong ties may be a double-edged sword. On the one hand, self-evaluation can be damaged when individuals are comparing themselves with a close friend who performs well in a domain that is also important to them, which is called "*comparison process*" in SEM. On the other hand, self-evaluation can be improved when the close others perform well in a domain that is irrelevant to one's self-definition, which is called "*reflection process*" in SEM. Hence, based on the theories of social comparison and self-evaluation, we assume that the relationship closeness or tie strength also plays a role in predicting feelings such as envy in the online communication context; envy should be more intense in response to posts of a strong tie (but only in a domain that is important to self-definition).

To sum up, no empirical research has been done which focuses on the role of tie strength/relationship closeness in interpreting or predicting the user's emotions (mainly happiness and envy) after reading a post on Facebook. In this paper, two studies, one correlational and the other experimental, are presented, aiming to address the research questions on *momentary feelings after reading a post on Facebook* and *the role of tie strength*. The basic research model for both studies is presented in Fig. 1. We expected that tie strength would positively moderate the effect of the content of Facebook posts on users' emotions, such as strengthening the feelings of happiness or sadness; nevertheless, the role of tie strength in predicting envy is dependent on the context and requires further investigation. More explanation on how tie strength matters in the case of envy is presented in the introduction to the second study. Finally, because emotions after reading posts can also be influenced by individual characteristics such as prevailing mood and personality traits, we also measure these factors and include them as control variables in our research.
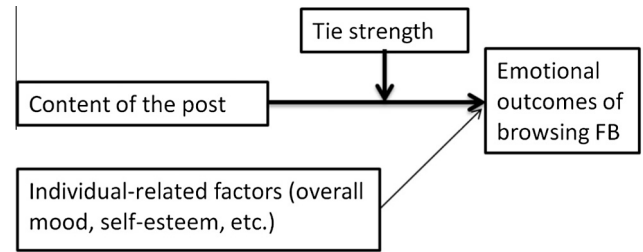

Fig. 1. Research model.

2. Exploratory and correlational examination (Study 1)

2.1. Study overview and hypothesis

In Study 1, we examined the momentary emotional states of Facebook users after reading a post, and investigated the role of tie strength in predicting happiness and envy. We asked participants to report four recent posts from their News Feeds, as well as their feelings after reading each post. As it is still unclear what the most prevalent momentary feelings are, an open research question (RQ1) was posed in this study.

With regard to RQ2, we expected a positive moderating effect of tie strength on the relationship between the content of posts and the feeling of happiness based on the mechanism of emotional contagion. Therefore,

H1. Tie strength positively moderates the relationship between the content of the posts and the feeling of happiness.

The role of tie strength in predicting envy is still ambiguous in such an exploratory setting. As indicated by Tesser's (1988) theory, the effect of tie strength on feeling of envy is further moderated by the compared domain. But it is difficult to know about which domain the Facebook posts are involved with and whether this will be central or not to the users' self-evaluation, therefore no predictions can be made with regard to the feeling of envy in this study.

2.2. Method

2.2.1. Procedure and participants

An online questionnaire for active Facebook users was launched in July 2014. Participants were asked to log into their own Facebook accounts and browse the recent updates in their News Feeds. If they had previously read the recent posts in their News Feeds before, they were asked to recall their feelings at the time that they first read the posts; otherwise, they were asked to report their current feelings after reading those posts. Every respondent was asked to report the *four most recent posts* from four different posters regardless of the source of the post (Facebook Friend vs. Facebook Page). We asked participants to report the posts from Facebook Pages (in addition to Facebook Friends), because that information will be used in another separate paper. However, only the posts from Facebook Friends were included in this paper. We also limited the reporting to four updates because we were concerned that too much repetitive reporting may lead to survey fatigue.

In order to investigate the role of tie strength, we used the feelings of *happiness* and *envy* as the dependent variables; both the valence of post content (e.g., positivity and entertainment) and the perceived relationship closeness between the participant and the Facebook Friend were treated as independent variables.

A total of 207 respondents completed the questionnaire. A majority of them (92.3%) were American. Respondents were mainly recruited from a survey panel called "Tellwut"; some were

recruited by a post on Reddit (http://www.reddit.com/r/SampleSize/). Respondents' average age was 41.7 (SD = 14.6), and 36.2% of them were male. Most of the respondents (81.2%) reported that they visited Facebook daily, and, on average, for 1 hour per day.

2.2.2. Measures

Content of the posts. Participants were asked to copy and paste the original post if they felt comfortable doing so. Then, they were asked to rate whether the content of the post was negative or positive, boring or entertaining, superficial or intimate, and factual or subjective on 7-point semantic differential scales.

Relationship closeness/Tie strength. The relationship between the reader (the participant) and the poster (a Facebook Friend) was measured by two items: "We have a close relationship/ friendship" and "I would categorize him/her as one of my strong ties" (on a 7-point Likert scale, where 1 = "strongly disagree" and 7 = "strongly agree"). A numerical average was taken to present the relationship between the poster and reader (Cronbach's $\alpha = 0.96$).

Emotions. Participants were asked to evaluate their emotions with several items after reading each post; "I feel pleasant" and "I feel envious" were used as key dependent variables for this study. The answers were given on 7-point Likert scales (1 = "strongly disagree" and 7 = "strongly agree"), and it was also possible to select "does not apply", which was treated as a missing value later. We also measured other momentary feelings such as jealousy, frustration, annoyance, and connectedness for exploratory purposes.

Control variables. The *mood* state of the respondents before the questionnaire was measured as control variable. We also measured the respondents' *self-esteem* with 6 items adapted from Rosenberg's (1965) scale (Cronbach's $\alpha = 0.91$), in addition to *demographic* information.

2.3. Results

Among the 828 reported posts (4 cases per person), 598 posts were posted by a Facebook friend (as opposed to a Facebook page), which is the focus of this study; the rest of the reported posts (27.8%) were deleted in the following analysis. With regard to the likelihood of experiencing positive and negative emotions, we treated an answer given between 5 and 7 (on a 7-Likert scale) as experiencing that specific feeling. The descriptive results of the emotional outcomes can be found in Table 1. Respondents felt mostly positive feelings after reading the post: in 384 cases (64.2%), the respondent felt *pleasant* after reading the post. Most respondents agreed that they felt *connected* (66.4%), *informed* (63.7%), and *entertained* (53.7%) after reading a post. The feeling of envy was found in 74 reported cases, which was 12.4% of the total cases. In this study, being envious (12.4%) was the most frequently reported negative feeling, compared with being *jealous* (11.0%), *annoyed* (10.0%) and *frustrated* (9.7%). Overall, findings from this study suggest that browsing Facebook is more likely to trigger various positive feelings as opposed to negative feelings on an individual message level. When it comes to the content of the posts, the result shows that about 72.6% of the content from the News Feeds were positive and 62.2% of them were entertaining.

In the next step of the analysis, we examined the roles of content and tie strength by running several multi-level linear models, because the posts were nested in participants. A descriptive summary of important variables can be found in Table 1 and correlations between these variables are shown in Table 2. The feelings of happiness and envy were treated as dependent variables respectively. We expected an interaction effect between the content of

Table 1
Descriptive statistics in Study 1.

Variables	n	Mean	SD	Min	Max
Happiness (DV)	587	5.18	1.64	1	7
Connectedness	589	5.14	1.74	1	7
Informativeness	582	5.04	1.75	1	7
Entertainment	583	4.63	1.87	1	7
Envy (DV)	574	2.27	1.78	1	7
Jealousy	576	2.20	1.72	1	7
Annoyance	571	2.15	1.66	1	7
Frustration	577	2.14	1.64	1	7
Positive content (IV)	598	5.51	1.87	1	7
Relationship closeness (IV)	598	4.42	1.97	1	7
Mood	598	4.91	1.25	1	7
Self-esteem	598	4.76	1.54	1	7

Table 2
Correlation statistics in Study 1.

Pearson's Correlations	1	2	3	4	5
1. Happiness (DV)	1.00				
2. Envy (DV)	0.13**	1.00			
3. Positive content	0.69***	0.09*	1.00		
4. Relationship closeness	0.32***	0.00	0.22***	1.00	
5. Mood	0.26***	−0.10*	0.16**	0.20***	1.00
6. Self-esteem	0.12**	−0.25***	0.09*	0.10*	0.37***

* $p < 0.05$.
** $p < 0.01$.
*** $p < 0.001$.

the post and relationship closeness on the feeling of happiness, but left the prediction open for envy. In addition, we added prior mood state and self-esteem as control variables. Two random-effects multi-level linear models are presented in Table 3. All variables were standardized, and therefore the effect sizes are based on the unstandardized coefficients.

The first model was constructed to predict the feeling of happiness, overall $R^2 = .54$, Wald $\chi^2(5) = 398.37$, $p < .001$. The results of Model 1 showed that both positive content, $b = 0.62$, $z = 16.30$, $p < .001$, and relationship closeness, $b = 0.09$, $z = 2.89$, $p = .004$, predicted the feeling of happiness, and there was a significant interaction effect between positive content and relationship closeness, $b = 0.08$, $z = 2.22$, $p = .027$, supporting H1. Specifically, respondents were happier after reading positive news from a closer friend; similarly, the respondents were sadder after reading negative news from a closer friend.

With regard to the second model, overall $R^2 = .08$, Wald $\chi^2(5) = 35.32$, $p < .001$, relationship closeness did not play a role in predicting the feeling of envy: there was no main effect of relationship closeness, $b = −0.03$, $z = −0.68$, $p = .497$, nor was there an interaction between relationship closeness and content, $b = 0.02$, $z = 0.48$, $p = .628$. Positive content was a significant predictor of envy, $b = 0.16$, $z = 4.00$, $p < .001$. In addition, Facebook users who have a higher self-esteem were less likely to feel envious, $b = −0.25$, $z = −3.84$, $p < .001$.

2.4. Discussion

The results of Study 1 showed that most of the posts on Facebook are positive and entertaining, which is in line with previous findings (Barash et al., 2010; Utz, 2015), and positive emotions are more prevalent than negative emotions when browsing Facebook. Tie strength was found to moderate the relationship between the content of the post and the feeling of happiness. As predicted by H1, the effect of emotional contagion was stronger when the tie strength is stronger; however, we did not find a moderating effect of tie strength on the feeling of envy.

Table 3
Results of the random-effects multi-level linear models tested in Study 1 (unstandardized coefficient followed by z values based on robust standard errors).

	Happiness	Envy
Positive content	0.625	0.161
	(16.30)[***]	(4.00)[***]
Relationship closeness	0.095	−0.031
	(2.89)[**]	(0.68)
Positive content × Relationship closeness	0.078	0.016
	(2.22)[*]	(0.48)
Mood	0.178	−0.028
	(3.46)[**]	(0.39)
Self-esteem	0.045	−0.258
	(1.08)	(3.84)[***]
Constant	−0.018	0.010
	(0.47)	(0.17)
N	587	574

Note. Random effects models were preferred based on the results of Hausman tests. All variables were standardized before putting into the models.
[*] $p < 0.05$.
[**] $p < 0.01$.
[***] $p < 0.001$.

As the positive emotions outweigh the negative emotions, browsing Facebook – at least on a message level (for a relatively short amount of time) – is not as psychologically harmful as described in certain research (e.g., Konnikova, 2013, September 10). Users are happy after reading positive posts from their Facebook friends, and are even happier if the good news comes from a strong tie; whereas envious feelings are more likely to be predicted by individual characteristics of the user such as low self-esteem, rather than relationship closeness. It seems that tie strength does not play a role in predicting envy. For negative news, Facebook users experience more negative emotions when it comes from a strong tie than a weak tie. This phenomenon was recently described as "cost of caring" in the context of Facebook (Hampton, Rainie, Lu, Shin, & Purcell, 2015). However, one should notice that individuals have to bear the negative news from their strong ties in real life anyway, as Facebook might not be the only communicational channel for strong ties.

Here, we would also like to discuss the strengths and weaknesses of this study. A strength of the study is that we did not use a student sample, but a more heterogeneous sample. A limitation is that it was a correlational study and therefore causality cannot be assumed. For example, it is hard to say whether users feel happy is merely because the post is shared by a strong tie, or it is because positive posts are more likely to be posted by a strong tie. Also, with regard to the null effects of relationship closeness on envy, this could either be explained by a floor effect (the mean value for the degree of envy is relatively low), or that relationship closeness is not influential when predicting envy. In order to further disentangle the puzzle, an experimental study is needed. Moreover, previous research investigating the emotion of envy on social media has not addressed the difference between *malicious and benign envy*. In the next study, we differentiate between benign and malicious envy in the context of Facebook, and add "self-relevance" and "perceived control" as additional control variables. Several hypotheses are proposed with regard to the role of relationship closeness in predicting user's happiness and envy after reading a post.

3. Experimental examination of the role of tie strength (Study 2)

3.1. Study overview and hypotheses

In order to replicate and extend the correlational findings from Study 1, we conducted an experiment with mocked-up Facebook posts, controlling for the content of the post and manipulating tie strength. We focus specifically on scenarios that are positive, such as posts about "travel and leisure" and "success". These types of positive posts can lead to upward comparisons and envy (Krasnova et al., 2013). In addition, most of the posts on Facebook are quite positive and entertaining, as a result of impression management motives and privacy concerns (Barash et al., 2010; Utz, 2015).

As previously discussed, emotions such as happiness are contagious, and this effect is stronger for those who share a close relationship. Therefore, we hypothesize a positive effect of relationship closeness on the feeling of happiness, in order to replicate the findings of Study 1.

H2. The closer the relationship, the happier a Facebook user will be after reading a positive post.

Research has shown that benign envy is an uplifting type of envy: people want to be closer to the comparison other, regardless of the feeling of frustration (Van de Ven et al., 2009). In addition, Mussweiler et al. (2004) claimed that assimilation, i.e., the self is assimilated toward a given standard, is more likely if the target and the comparison other share a close relationship. Based on the definition of benign envy and Mussweiler et al.'s (2004) concept of assimilation, we assume that a close and intimate relationship between the reader and poster helps to develop good will and the motivation of levelling-up; therefore, benign envy is more likely to happen when an envy-inducing post is posted by a strong tie rather than a weak tie. Whereas for malicious envy, we would expect an opposite effect: people are less likely to experience malicious envy, a pulling down motivation, towards their strong ties/best friends compared with other less-intimate friends. As suggested by Tesser's (1988) theory, individuals may do things, such as pulling down other's performance, in order to reduce the decrease in self-evaluation. Whether someone will get in way of other's performance is dependent on the closeness of the individuals and the relevance of the compared domain. When the compared domain is not central to one's self-definition, the reflection process is more important than the comparison process (Tesser, 1988). We assume that most of Facebook posts, such as a vacation picture, are not self-evaluation threatening, and less malicious envy is expected when it comes from a close friend. Hence,

H3. The closer the relationship, the more a Facebook user will experience benign envy.

H4. The closer the relationship, the less a Facebook user will experience malicious envy.

Although envy is a common emotion felt by most people, there are important individual differences in the tendency to feel it (Smith, Parrott, Diener, Hoyle, & Kim, 1999). For Facebook users with higher *dispositional envy*, we would expect that they are more likely to engage in upward social comparisons and experience more (benign & malicious) envy after reading a positive post on Facebook. Also, we included *self-relevance* and *perceived control* as control variables based on the social comparison literature. As described earlier, four preconditions are relevant: perceived similarity, self-relevant, perceived control, and perceived deservedness/unfairness (Smith, 2004). However, perceived similarity is highly correlated with tie strength, and perceived unfairness is an item used in measuring malicious envy. Therefore, we only controlled for self-relevance and perceived control when predicting envy. For predicting feelings of happiness, we used dispositional happiness and mood as control variables.

3.2. Method

3.2.1. Participants and procedure

An online experiment was launched in Germany on Sep 22nd, 2014. Participants were mainly German students who use Facebook at least once a month, and they were recruited via a local panel. The experiment took about 20 min to complete, and for their participation, respondents were entered into a lottery pool (with a 20% chance of winning a 10 Euro Amazon voucher). In total, 194 participants completed the questionnaire. We deleted the cases that failed the manipulation checks (see details in the end of procedure session) and those who finished the questionnaire and important questions too fast (by excluding 5% of cases with the lowest response time for specific pages). Hence, 146 cases were left for the analysis. The average age was 25 years old (SD = 6.3). About 16.4% of respondents were male. About 82% of respondents use Facebook at least once a day. The average daily usage time is about 40 min, slightly less than that of the American sample in Study 1.

In the online experiment, participants were first asked to report three of their Facebook friends (a strong tie, a weak tie, and a middle tie) that they were not living with or romantically involved with. We included the third group of middle ties in order to create a continuum connecting the two ends, strong and weak ties, as proposed by Huszti, Dávid, and Vajda (2013). Since this study was launched after the summer vacation for German college students and slightly after the launch date of iPhone 6 (Sep 19th, 2014), we adopted two realistic scenarios based on the findings of Krasnova et al. (2013): one involved reading a post from a Facebook friend who posted a vacation picture, and, the other scenario involved a picture of a newly bought iPhone 6. For each scenario, we randomly assigned one of the reported Facebook friends to it. Latin square (3×2) was used to equally distribute different type of ties into two scenarios, and each participant received only two scenarios, with each scenario assigned with one type of tie. Therefore, the scenarios are a within-subjects factor and tie strength was a within- and a between-subjects factor.

For each scenario, participants were asked to report some general information about the assigned Facebook friend and then to imagine that this person just posted a certain picture on Facebook (a mocked-up post was shown to the participant). The feelings after seeing the post were recorded accordingly. After finishing two scenarios, the participants were asked to evaluate their emotional closeness to the three Facebook friends that they had reported in the beginning of the survey. We further used this question as a manipulation check, by excluding cases with a wrong order in ranking the perceived relationship closeness for strong, middle, and weak ties.

3.2.2. Measures

Relationship closeness/Tie strength. The tie strength between the poster and reader (participant) was a manipulated variable, but we also measured the relationship closeness by asking "to what extent do you feel emotionally close to XX" at the end of the questionnaire. The answers were given on a scale ranging from 0 to 100. Because this item is also used as the manipulation check, the range of the scale is highly extended.

Emotions. Participants were asked to rate their feelings after reading the post in each scenario. They indicated to what extent they agree or disagree with: "I feel happy for XX" and "I feel envious". In addition, malicious envy was measured with three items: "I felt malicious envy towards XX", "I had negative thoughts about XX" and "It is unfair that XX can go on such a vacation/have an iPhone 6 while I cannot" (Cronbach's α = 0.84 for vacation scenario, and Cronbach's α = 0.67 for iPhone scenario). Benign envy was measured by 3 items: "I felt benign envy towards XX", "I admire XX", "I wanted to try harder to have such a vacation as well/ to

have a new iPhone" (Cronbach's α = 0.74 for vacation scenario, and Cronbach's α = 0.45 for iPhone scenario). These items were adapted from the scales used in Crusius and Lange's (2014) study. Both benign and malicious envy were calculated by taking a numerical average of the respective three items. Responses were measured on 7-point Likert scales ranging from "strongly disagree" to "strongly agree".

Control variables. Again, we treated the *mood* of the respondents and the *demographical* information of the respondents as control variables. Furthermore, *dispositional envy* was measured with an 8-item scale (Cronbach's α = 0.85) developed by Smith et al. (1999) and *dispositional happiness* was measured with a 6-item scale (Cronbach's α = .88) developed by Shiota, Keltner, and John (2006). One sample item for measuring dispositional envy is "feelings of envy constantly torment me", and for dispositional happiness is "I often feel bursts of joy".

We also controlled for *self-relevance* and *perceived control* in this study. In the vacation scenario, we asked the participants "In general, how much would you like to travel to places like this?" as a measure of self-relevance and "Currently, how difficult is it for you to arrange such a vacation?" (reverse coded) as a measure of perceived control. In the iPhone 6 scenario, self-relevance was measured by "In general, how much would you like to have an iPhone 6?", and perceived control was measured by the question of "Currently, how difficult is it for you to buy an iPhone 6?" (reverse coded). These two variables were measured with a scale ranging from 0 to 10.

3.3. Results

3.3.1. Descriptive results

The descriptive results for Study 2 are shown in Table 4. Because the nature of these two scenarios is slightly different, we analyze them separately. As can be seen in the descriptive summary, the vacation scenario triggered more happiness, $t(146) = 5.02$, $p < .001$, envy, $t(146) = 8.51$, $p < .001$, and benign envy, $t(146) = 15.22$, $p < .001$ than the iPhone 6 scenario, whereas malicious envy, $t(146) = 0.38$, $p > .05$, did not differ across scenarios. Perceived self-relevance was much higher in the vacation scenario than iPhone 6 scenario, $t(146) = 17.65$, $p < .001$, and perceived control was slightly lower in the vacation scenario rather than the iPhone 6 scenario, $t(146) = 4.14$, $p < .001$. Most respondents did not show interest in buying a new iPhone, neither did they envy other iPhone 6 owners. Again, the mean values for the

Table 4
Descriptive statistics in Study 2.

Variables	Scenario	n	Mean	SD	Min	Max
Happiness	Vacation	147	5.93	1.41	1.00	7.00
	iPhone	147	5.05	1.78	1.00	7.00
Envy	Vacation	147	3.11	1.87	1.00	7.00
	iPhone	147	1.70	1.35	1.00	7.00
Benign envy	Vacation	147	3.64	1.58	1.00	7.00
	iPhone	147	1.60	0.82	1.00	4.67
Malicious envy	Vacation	147	1.32	0.62	1.00	5.00
	iPhone	147	1.29	0.66	1.00	4.67
Relationship closeness	Vacation	147	47.90	36.41	0.00	100.00
	iPhone	147	52.23	37.14	0.00	100.00
Self-relevance	Vacation	147	5.43	2.82	0.00	10.00
	iPhone	147	0.70	1.56	0.00	8.00
Perceived control	Vacation	147	2.95	2.90	0.00	10.00
	iPhone	147	4.14	3.60	0.00	10.00
Mood		146	6.99	1.85	1.00	10.00
Dispositional envy		147	2.13	0.98	1.00	6.00
Dispositional happiness		147	4.56	1.17	1.00	7.00
Age		143	24.86	6.29	18.80	65.10
Male		147	0.15	0.36	0.00	1.00

feeling of happiness were much higher than the mean values of envy for both scenarios. This suggests that the positive emotion of happiness is more prominent than the negative emotion of envy in both cases, even though we had chosen scenarios that were likely to trigger envy.

3.3.2. Hypotheses testing

Table 5 shows the mean values for emotions (happiness, envy, benign envy, and malicious envy) based on the *manipulated* conditions (strong tie, weak tie, and mid-tie group). ANOVAs were used to test the group differences. In line with H2 and H3, there was a significant effect of tie strength on the feeling of the happiness, $F(2, 144) = 27.36$, $MSE = 1.21$, $p < .001$, $\eta^2 = .28$, and benign envy, $F(2, 144) = 10.52$, $MSE = 1.48$, $p < .001$, $\eta^2 = .13$, for the vacation scenario. The results of Scheffe post hoc test showed that the mean values for happiness differed for all three groups (i.e., happiness for strong ties > happiness for mid ties > happiness for weak ties). The post hoc test for tie strength on benign envy was slightly different (benign envy for strong ties & benign envy for mid ties > benign envy for weak ties) (see subscripts in Table 5). For the iPhone 6 scenario, no effect of tie strength was found. In addition, we found no group differences in both scenarios for malicious envy, thus H4 is not supported.

Furthermore, we ran linear regressions by using the continuous measurement of relationship closeness as a predictor and including the control variables. *T*-values were estimated by the robust standard error in order to avoid the problem of heteroscedasticity. Table 6 presents the results of the linear regressions on the feeling of happiness for both scenarios. In both scenarios, relationship closeness was a significant predictor of the feeling of happiness, for the vacation scenario, $\beta = .55$, $t(136) = 7.52$, $p < .001$, and for the iPhone 6 scenario, $\beta = .27$, $t(136) = 3.27$, $p = .001$. Therefore, H2 is supported. In addition, age also positively predicted the feeling of happiness.

The regression models for the feeling of envy are presented in Table 7. In line with H3, relationship closeness predicted *benign envy* in both scenarios: for the vacation scenario, $\beta = .30$, $t(136) = 5.17$, $p < .001$ for the iPhone 6 scenario, and $\beta = .23$, $t(136) = 2.90$, $p = .004$; whereas for *malicious envy*, relationship closeness did not show any effect for the vacation scenario, $\beta = -.05$, $t(136) = -0.49$, $p = .622$ or for the iPhone scenario, $\beta = -.05$, $t(136) = -0.54$, $p = .591$, therefore H4 is rejected.

Table 5
Descriptive results of the dependent variables by group (mean values followed by standard deviation) and ANOVA tests in Study 2.

	Scenario	Strong tie group	Mid tie group	Weak tie group	$F(2, 144)$	Bartlett's test chi^2
Happiness	Vacation	6.78$_a$ (0.51)	6.12$_b$ (1.11)	5.00$_c$ (1.66)	27.36***	53.10***
	iPhone	5.47 (1.75)	4.84 (1.91)	4.80 (1.61)	2.25	0.14
Envy	Vacation	3.57 (1.81)	3.04 (1.84)	2.77 (1.91)	2.30	1.42
	iPhone	1.72 (1.39)	1.47 (1.14)	1.93 (1.50)	1.43	11.89**
Benign envy	Vacation	4.22$_a$ (1.33)	3.86$_a$ (1.59)	2.90$_b$ (1.51)	10.52***	1.43
	iPhone	1.71 (0.97)	1.59 (0.73)	1.48 (0.73)	0.90	3.68
Malicious envy	Vacation	1.33 (0.62)	1.27 (0.45)	1.35 (0.75)	0.23	5.13
	iPhone	1.33 (0.66)	1.23 (0.58)	1.33 (0.74)	0.39	2.64

Note. Means in the same row that do not share subscripts differ at $p < .05$ in Scheffe multiple-comparison test.
** $p < 0.01$.
*** $p < 0.001$.

Table 6
Results of the regression models on happiness tested in Study 2 (unstandardized coefficient followed by *t* values based on robust standard error).

	Happiness (vacation)	Happiness (iPhone)
Relationship closeness	0.022 (7.52)***	0.013 (3.27)**
Mood	0.080 (1.26)	0.135 (1.55)
Age	0.039 (4.25)***	0.042 (2.28)*
Male	−0.208 (1.17)	−0.123 (0.25)
Dispositional happiness	0.058 (0.66)	0.150 (1.09)
Constant	3.126 (6.25)***	1.735 (2.41)*
R^2	0.38	0.15
N	142	142

* $p < 0.05$.
** $p < 0.01$.
*** $p < 0.001$.

Dispositional envy was positively associated with both benign and malicious envy, which is also in line with our prediction. Self-relevance was a significant predictor for benign envy but not for malicious envy. That means users are more likely to experience benign envy when it is more self-relevant. Perceived control had a slightly negative influence on the experience of malicious envy. That means users with higher perceived control are less likely to experience malicious envy. Overall, the models on malicious envy revealed that malicious envy is highly related to personal traits, regardless of tie strength or self-relevance.

Similar to the results of the correlational study, tie strength/relationship closeness did not show a role in predicting the *overall feeling of envy* after browsing Facebook. Again, feeling envious after reading a post was more likely to be predicted by individual factors such as dispositional envy and age.

4. General discussion

4.1. Summary of research

In this paper, we aimed to explore the momentary emotional outcomes of browsing Facebook on an individual post level, and we were interested in whether the relationship closeness between the poster and reader can predict those emotional outcomes. In the first study, we found that, in general, positive emotions outweighed the negative ones after reading a post on Facebook. Tie strength played a role in predicting the feeling of happiness after reading a post: the closer the relationship, the happier one felt after reading a positive post; and the sadder one felt after reading a negative post.

The second study manipulated the tie strength between the poster and reader. With two mocked-up positive (envy-inducing) scenarios, we re-tested whether this type of news may trigger more happiness if it comes from a strong tie rather than a weak tie. To the best of our knowledge, this is also the first study to differentiate malicious and benign envy in the context of Facebook use. The results in the second study not only confirmed the preliminary findings of the correlational study in an experimental setting, but also revealed that tie strength predicts benign envy, but not malicious envy.

4.2. Theoretical implications

This paper provided some explanations for the mixed findings from prior research on social media usage (passive consumption),

Table 7
Results of the regression models on envy tested in Study 2 (unstandardized coefficient followed by t values based on robust standard error).

	Envy		Benign envy		Malicious envy	
	Vacation	iPhone	Vacation	iPhone	Vacation	iPhone
Relationship closeness	0.007	0.001	0.013	0.005	−0.001	−0.001
	(1.80)[†]	(0.49)	(5.17)[***]	(2.90)[**]	(0.49)	(0.54)
Dispositional envy	0.633	0.320	0.209	0.167	0.251	0.158
	(5.37)[**]	(2.68)[**]	(2.19)[*]	(2.76)[**]	(4.22)[***]	(2.64)[**]
Self-relevance	0.243	0.343	0.294	0.187	0.020	0.049
	(4.78)[***]	(4.19)[***]	(7.95)[***]	(4.70)[***]	(1.26)	(0.92)
Perceived control	−0.112	−0.059	−0.081	−0.010	−0.023	−0.023
	(2.53)[*]	(2.48)[*]	(2.31)[*]	(0.63)	(1.78)[†]	(1.74)[†]
Age	−0.052	0.003	−0.004	0.025	−0.010	−0.005
	(4.19)[***]	(0.30)	(0.33)	(3.19)[**]	(1.82)[†]	(0.72)
Male	−0.091	−0.105	−0.256	0.126	0.297	0.014
	(0.24)	(0.44)	(0.80)	(0.69)	(1.34)	(0.08)
Constant	0.615	0.304	0.559	0.133	0.761	0.955
	(1.21)	(0.71)	(1.35)	(0.43)	(3.53)[**]	(3.73)[***]
R^2	0.38	0.26	0.49	0.23	0.23	0.11
N	143	143	143	143	143	143

[†] $p < 0.1$.
[*] $p < 0.05$.
[**] $p < 0.01$.
[***] $p < 0.001$.

and filled the research gap in the emotional outcomes of browsing Facebook on an individual message level. Krasnova et al. (2013) inferred that the invidious feeling of envy on social networking sites can lead to a decrease in users' life satisfaction. They worried that if too many negative feelings were triggered by envy-inducing posts (e.g., vacation pictures), users might quit using Facebook. However, the present study found that positive feelings are more prevalent than negative emotions, even when Facebook users were presented with a vacation picture, which is the biggest cause of envy on Facebook based on Krasnova et al.'s (2013) study.

Moreover, this paper filled the research gap on the role of tie strength in predicting the emotional outcomes of browsing Facebook. We investigated the *role of tie strength (i.e., the relationship between the poster and reader)* in interpreting or predicting user's emotions of *happiness* and *envy* after reading a post. Based on a sample of 207 American respondents and a sample of 194 German students, we found that if positive news is posted by a strong tie, users are more likely to be happy for their friends and experience only benign envy, which is a positive type of envy that has a levelling-up effect (at least in short-term). The finding on happiness contributes to the theory on emotional contagion, and, consistent with previous research, suggests that emotional contagion is stronger when the relationship between individuals is closer. The finding with regard to benign envy also contributes to the literature on social comparison and tie strength, by showing that benign envy, rather than malicious envy, is more likely to be experienced when the relationship is closer.

With regard to the malicious envy, there was no effect of tie strength. The null finding may be explained by a floor effect, as the mean values for malicious envy were quite low in both scenarios ($M = 1.33$). It may be due partly to the scenario design. Malicious envy in real life is relatively low, and more extreme manipulations are required to trigger it. Future research could specifically focus on malicious-envy-inducing scenarios in order to examine the role of tie strength in predicting malicious envy. Malicious envy is more likely to emerge when the envied object was perceived as undeserved (Van de Ven et al., 2012). However, from a realistic point of view, not many Facebook users would write posts in a way suggesting that their own achievement is undeserved. The main goal of the present study was to examine the feelings that are induced by Facebook use by using selected scenarios (vacation and iPhone) that are more representative of actual Facebook posts. We assumed that these posts, in most cases,

are not central domains for one's self-identification, and we found a lower degree of malicious envy than benign envy.

Furthermore, we would like to address the role of self-relevance and the compared domain in predicting benign and malicious envy. Self-relevance was a significant predictor of both envy and benign envy, but not for malicious envy. Instead, dispositional envy predicted malicious envy in our models. Taken together, this seems to indicate that malicious envy is rather a personality trait that is independent of situational factors such as tie strength or self-relevance; whereas emotions such as happiness and benign envy are more situational dependent (there is an effect of tie strength and self-relevance, but no effect of dispositional happiness). More fine-grained research is required to disentangle the relationships between the tie strength and self-relevance. Also, based on Tesser's (1988) SEM model, there should be an interaction effect between relationship closeness and domain-relevance on envy. In other words, whether a close relationship magnifies or dilutes the feeling of (malicious) envy also depends on the compared domain. In this study, we only used scenarios, such as vacation pictures, that are more likely to be a low relevant domain for most Facebook users. High relevant domains are usually related to skills and performance, but we should also keep in mind that whether a domain is relevant to self-definition is a very personal and variable. Nevertheless, these issues are beyond the current research question, and we hope future research can be conducted to test these effects.

4.3. Practical implications

4.3.1. Psychological implications

The results from our studies have implications for teachers and parents who are worried about young adolescents' social media use. Because the positive effects of browsing Facebook *outweigh* the negative effects, they do not need to worry too much about the negative psychological effects as long as the users do not browse Facebook excessively (with an "appropriate" amount of usage time). Also, we found that self-esteem and dispositional envy played a significant role in predicting Facebook envy. For users who have a high dispositional envy or low self-esteem, we would suggest them do not obsessively use Facebook in a passive way.

With regard to the findings on the role of tie strength, one practical implication is that if Facebook users receive more posts from their close friends, they will experience more happiness. Further,

while individuals might experience envy towards their close friend, it may be less detrimental as once expected (e.g., Krasnova et al., 2013) since benign envy generally motivates individuals to self-improve.

4.3.2. Applied implications

Because most Facebook users cannot read all the potential stories from their Facebook friends and pages, a News Feed ranking algorithm was created, adjusting the sequence of posts rather than using the chronological order (Facebook, 2013). However, it is still technically difficult to determine what kinds of stories are relatively important for individual users and what kinds of posts can make users happier, rather than triggering negative feelings such as envy (as described in Chou & Edge, 2012). It is often the case that, even reading the same status update can lead to different feelings for different individuals.

The research showed that the emotional outcomes of browsing Facebook were significantly influenced by three components: the content of the post, the personal traits of the Facebook browser, and relationship between the poster and reader. Hopefully, these findings can also offer some insights for the further improvement of the Facebook News Feed algorithm. For example, the Facebook algorithm can display more positive posts from strong ties to Facebook users who have a lower degree of dispositional envy. In addition, future research can also retest these results in other social media sites such as Twitter or LinkedIn. We hope that these studies together can contribute to the construction of a better online-communication environment and eventually improve the individual well-being of social media users.

4.4. Limitations and future research

Several limitations need to be addressed. First, the scenario of iPhone 6 may actually not be the best scenario for triggering envy in a German sample. Most of the respondents rated this scenario low in self-relevance, and very few participants reported any type of envious feelings afterwards. This is also a potential reason for why most hypotheses were not supported by the ANOVA tests in the iPhone 6 scenarios, as the average self-relevance in the iPhone scenarios was quite low. Future research could also examine the relationship between self-relevance and happiness. Second, the reliabilities of the scales for malicious and benign envy were relatively low (especially the scale of benign envy) in the iPhone scenario in Study 2. More research is required to develop a scale for measuring malicious and benign envy that is robust across various domains (e.g. money, success, beauty, relationship, etc.). Third, both studies rely on self-reporting as a measure of emotions. There is a possibility that respondents might not be honest about reporting their negative/bad feelings (social desirability). This could also be another potential reason for why the hypothesis on malicious envy was not supported. Putting participants into a third-person's perspective might be helpful for measuring malicious envy. Nonetheless, our participants do honestly reveal a relatively high degree of envy and benign envy in the vacation scenario (see Table 5). Fourth, we did not use the same item for measuring happiness across these two studies. The item of "I feel pleasant" was used in the first study as a way to measure an overall feeling, and the item of "I feel happy for the person" was used in the second study in order to be in line with the experimental context. The target of the emotions was slightly different between the two studies. Last but not least, whereas the first study is relatively high in ecological validity, it is hard to generate any causality; while the second study isolated other factors and controlled for the tie strength, the external validity is low. We did not distinguish participants who had already seen the posts from those who saw the posts first time in Study 1. There might be some biases between recalling feelings and reporting current feelings, as recalling is not as accurate as reporting. In addition, there might have been too much priming of the tie strength in the experimental design, as we asked a few questions about the Facebook friend before each scenario. Based on these limitations, future studies should adjust the experimental design (e.g., by measuring the feeling of envy in a third-person perspective, by using different items for relationship closeness and emotions, or trying to avoid the effect of priming), and also retest the external and internal validity of this study. Finally, this paper only focused on the momentary feelings of browsing Facebook, future research is required to investigate the implications for long term use of Facebook on emotional outcomes.

5. Conclusion

In this paper, we examined the momentary feelings after reading a post on Facebook, and the role of relationship closeness in predicting the feelings of happiness and envy. Over two studies, with different methods (correlational and experimental) and different samples (American and German), we found that positive emotions are more pronounced than negative emotions, and tie strength moderates the feeling of happiness after reading a post on Facebook, as well as the feeling of benign envy.

Acknowledgements

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