Full length article

"Likes" as social rewards: Their role in online social comparison and decisions to like other People's selfies

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A B S T R A C T

It has been argued that reported negative effects of social networking site use on well-being and depression might be due to the vast opportunities for unflattering social comparison on Facebook. Social media websites offer Likes, a numeric representation of social acceptance, as a form of "online social currency," which can be seen as a secondary reinforcer that drives people's tendency to compare with others. Against this background, we present an experimental study ($n = 118$) in which participants saw and evaluated their own selfies and selfies of other people with and without Likes. Moreover, they saw two selfies with the respective number of Likes in direct (favorable or unfavorable) comparison, and indicated their emotional state and whether they would like the other person's selfie. Results demonstrate that Likes are used for comparisons with the expected affective outcome. Like decisions, however, were rather based on judgments of likability, admiration and positive feelings after comparison rather than the comparison outcome.

1. Introduction

Millions of users interact via social networks like Facebook on a daily basis. Recent studies suggest that such overexploitation can significantly alter subjective well-being and perceived life satisfaction (Kross et al., 2013; Verduyn et al., 2015), possibly leading to addiction (Turel, He, Xue, Xiao, & Bechara, 2014) and depression (Nesi & Prinstein, 2015). It has been argued that these negative effects of social networking site (SNS) use on well-being and depression might be due to the vast opportunities for unflattering social comparison on SNS. Motivated by impression management, Facebook and other SNS profiles are designed to render mainly positive self-portrayals (Walther, 2007), and thereby provide "information (that) is positively skewed" (Appel, Gerlach, & Crusius, 2016, p. 44). Appel et al. (2016) argue that these circumstances increase the probability for unflattering social comparisons (upward social comparison), especially because users interact mainly with friends and peers on SNS which implies similarity to comparison standards and high personal relevance. A review on this topic indeed suggests that painful social comparisons are to some extent linked to decreases in well-being and symptoms of depression (Appel et al., 2016), which has been observed in cross-sectional (Krasnova, Wenninger, Widjaja, & Buxmann, 2013; Lee, 2014; Steers, Wickham, & Acitelli, 2014; Tandoc, Ferrucci, & Duffy, 2015; Vogel, Rose, Okdie, Eckles, & Franz, 2015; Vogel, Rose, Roberts, & Eckles, 2014), prospective (Feinstein et al., 2013; Nesi & Prinstein, 2015), experience sampling (Steers et al., 2014) and experimental studies (Appel, Crusius, & Gerlach, 2015; Fardouly, Diedrichs, Vartanian, & Halliwell, 2015; Haferkamp & Kramer, 2011; Verduyn et al., 2015; Vogel et al., 2015). Moreover, SNS provide so-called one-click tools such as Likes on Facebook or Instagram that have the potential to be of social and affective relevance (Carr, Wohn, & Hayes, 2016; R. A.; Hayes, Carr, & Wohn, 2016; Wohn, Carr, & Hayes, 2016) and might work as yet another (but quantifiable) mechanism to compare oneself with others: did my friend receive more Likes (and hence more social acceptance) for his/her selfie on vacation than I did for my vacation selfie?

Against this background the current study experimentally investigates the impact of Likes in a social comparison paradigm. We assume that receiving Likes is experienced as socially rewarding and that users observe how many Likes their own and other users' pictures receive. Moreover, we assume that this information is used for social comparison, and that users experience positive or negative affect as a result of the social comparison outcome.

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2. Related work

2.1. Social comparison theory

Humans have an innate drive to evaluate themselves by examining their abilities in comparison with others (Festinger, 1954). In doing so, individuals reduce uncertainty in the comparison domain which is a crucial process because "the holding of incorrect opinions and/or inaccurate appraisals of one's abilities can be punishing or even fatal in many situations" (p. 117). Comparing oneself with others and thereby assessing one's relative standing has an influence on a person's self-concept, level of aspiration and feelings of well-being amongst other relevant outcomes (Suls & Wheeler, 2000, cf. p.159). Hence, social comparison is not only motivated by gaining accurate self-perception (Kruglanski & Mayseless, 1990), but by other motives such as self-enhancement (Wood, 1989), self-improvement (Wood, 1989), and social comparison as coping strategies and mechanisms for mood regulation (Wood, Taylor, & Lichtman, 1985). Comparers seek upward (comparison with superior others; Wheeler 1966) or downward (comparison with inferior others; Wills, 1981) social comparisons based on their motivations for social comparison and in dependence of a) highly influencing personality traits such as self-esteem and b) situational factors (e.g. recent experienced threat to self-esteem). In this regard, early work suggested that upward comparisons lower self-regard (Tesser, Millar, & Moore, 1988) and downward comparisons elevate self-regard (Gibbons, 1986). However, the affective outcome of a comparison is not necessarily determined by its direction (upward vs. downward) but by the more salient implication of this social comparison as Suls, Martin, and Wheeler (2002) conclude. Which implication is rendered more salient might be determined by the situation in which the social comparison takes place as well as by the comparer's personality. For instance, research showed that people with high self-esteem benefited from upward comparisons, because it provided them with more motivation and hope than downward social compariso, until they experience a self-esteem threatening situation after which upward comparisons resulted in a more negative affect than downward comparisons (Aspinwall & Taylor, 1993). This complexity of affective outcomes will be discussed in the following.

2.2. Social comparison and affect

As described before, affective outcomes of social comparisons vary greatly and are not simply positive or negative. Both downward and upward comparisons can cause both positive and negative experiences. Hence, Upward comparison can result in a range of pleasant experiences (cf. Smith, 2000) such as inspiration and admiration (e.g., Brickman & Bulman, 1977; Lockwood & Kunda, 1997) or unpleasant experiences such as envy and resentment (e.g., Crosby, 1976; Folger, 1987). Similarly, downward comparison can result in the pleasant experience of pride and schadenfreude (e.g., Smith et al., 1996; Tesser, 1991) or unpleasant experiences such as pity (e.g., Wood & VanderZee, 1997). Identified factors that determine the affective outcome of a social comparison, besides the direction of the comparison (upward vs. downward), are: i) the desirability for the self (i.e. the assessment of the salient comparison implication), ii) desirability for the other (i.e. deservingness of fortune or misfortune), iii) the focus of attention (focus on self, on other or dual focus), and iv) the assimilative or contrastive nature of the affective outcome (e.g. optimistic or worried about reaching the other person's ability level).

In summary, after *upward* social comparison, people experience either inspiration, optimism or admiration (assimilative emotion) or depression, shame, envy or resentment (contrastive emotions). Whereas, after *downward* social comparison people experience either pity, fear, worry or sympathy (assimilative emotions) or contempt, Schadenfreude or pride (contrastive emotions). More recent work in neuroscience demonstrates the pervasive nature of social comparison, since this mechanism takes also place in situations in which it makes only limited sense to compare oneself with others. For instance, in a game based on immediate monetary gains or losses, players evaluated their absolute gains or losses in relation to the gains and losses of a second fake player. Neither of the players had an influence on the gains and losses in terms of abilities, but gains and losses were based on luck (choosing one of three doors with gains and losses hidden behind). Results demonstrated the importance of positive social comparison outcomes, because even when participants actually lost money, they expressed more schadenfreude and joy if the other player had lost more money than when they actually won money, but the other player had won more. Hence, not the absolute gain or loss of money was important, but the "relative value of a reward or punishment, implying that sometimes losing may be even more rewarding than winning, provided the other person loses more" (Dvash, Gilam, Ben-Ze'ev, Hendler, & Shamay-Tsoory, 2010, p. 1746). This pattern was also reflected in the neuronal correlates with differential ventral striatal responses in upward and downward social comparison, despite the fact that the other player's gains and losses were irrelevant for the game outcome (the actual money a participant received at the end of the game). So regarding the comparison of actual gains and relative gains when a person "looses money, merely adding information about another person's greater loss may increase ventral striatum activations to a point where these activations are similar to those of an actual gain." (Dvash, Gilam, Ben-Ze'ev, Hendler, & Shamay-Tsoory, 2010, p. 1741). Hence, winning a social comparison can be as rewarding as actually winning money.

2.3. Reward processing, social rewards and online social rewards

Among the first needs to be fulfilled, besides physiological needs to guarantee survival and reproduction, are safety needs and social belonging. Hence, it is not surprising that not only so-called primary reinforcers such as food and sex are rewarding when obtained, but also secondary reinforcers such as money or social acceptance because they are indicators for fulfillment of these needs. Secondary reinforcers acquire their rewarding value by learned associations with primary reinforcers. From neuroscience research, we know that social stimuli are rewarding analogue to primary reinforcers. Activations in the brain's reward network can be found not only when seeing food or sex pictures, but also when seeing smiling faces (Rademacher, Salama, Gründer, & Spreckelmeyer, 2014; Spreckelmeyer et al., 2009), sharing with a friend (Fareri, Niznikiewicz, Lee, & Delgado, 2012), being liked (Izuma, Saito, & Sadato, 2008), and disclosing information to others (Tamir, Zaki, & Mitchell, 2015; Tamir et al., 2015). This exactly reflects what people see and do on social networking sites: they look at other people's pictures, disclose information to others and experience that their content is being liked by others. Especially experiencing social acceptance in form of positive feedback should therefore be perceived as rewarding. However, this feedback does not always come in the traditional form of smiles or positive verbal feedback, but to a great extent in form of the common facebook one-click feedback: "likes". Indeed, first studies showed that people expect to receive feedback on their content and that expectations are higher for content they evaluated as more important and/or more personal (Grinberg, Kalyanaraman, Adamic, & Naaman, 2017). Expectations also depended on participants' age, gender, and level of activity on Facebook,and receiving more feedback relative to participants' expectations correlated with a greater feeling of connectedness to one's Facebook friends (Grinberg et al., 2017). Moreover, participants indicated that Likes are seen as social support: the sheer number of Likes as well as personal satisfaction with the Likes received predicted perceptions of social support (Wohn et al., 2016). Moreover, highly self-conscious people as well as people with high self-esteem were more likely to perceive higher social support. The source of Likes (friends vs. parents) plays a role in the perceived reward Scissors, Burke, and Wengrovitz (2016). Moreover, people seem to be sensitive to the amount of Likes they receive. Although most people thought they

received more than "enough" Likes for their content, individuals with lower self-esteem and high scores in self-monitoring were more likely to think that Likes are important and felt bad if they did not receive "enough" Likes (Scissors et al., 2016; Wohn et al., 2016).

2.4. Providing others with online social rewards

Some recent studies investigated why, when and under which conditions, people provide others with social support by using one-click feedback (Egebark & Ekstrom, 2011; Eranti & Lonkila, 2015). For instance, we are more likely to like a post by a close facebook friend than one by an acquaintance (Egebark & Ekstrom, 2011) and the number and quality of Facebook friends who have previously liked a post have an impact on users' Likes. In an experimental study, people were more likely to like photos (in a fake Instagram-like platform) that already received many Likes compared with those which received few Likes (Sherman, Payton, Hernandez, Greenfield, & Dapretto, 2016). And people like content to express enjoyment (especially those with higher self-esteem) and to please others (especially those low in self-esteem, Lee, Hansen, & Lee, 2016). On the other side, giving Likes can also happen out of habit or "aimlessly" in terms of "Liking something for no real reason at all" (R. A. Hayes et al., 2016, p. 388).

2.5. Social comparison on facebook

Social comparison on facebook has been studied in diverse ways (cf. Appel et al., 2016 for an overview), but mostly in cross-sectional and in some cases in prospective or experience sampling studies (Feinstein et al., 2013; Krasnova et al., 2013; Lee, 2014; Nesi & Prinstein, 2015; Steers et al., 2014; Tandoc et al., 2015; Vogel et al., 2015, 2014), while experimental studies are still scarce (Appel et al., 2015; Fardouly et al., 2015; Haferkamp & Kramer, 2011; Verduyn et al., 2015; Vogel et al., 2015). The latter demonstrated that users use profile information on social networking sites for social comparison. For instance, after briefly looking at a casual friend's Facebook profile, individuals with a high social comparison orientation reported decreases in mood, self-esteem and positive self-views, compared to participants who were looking at their own profile or surfed a non-social website (Vogel et al., 2015). Similar results were reported by Fardouly et al. (2015). Moreover, looking at SNS profiles representing highly attractive comparison standards leads to worse mood and less satisfaction with one's appearance compared to looking at profiles representing unattractive standards (Haferkamp & Kramer, 2011). Also using attractive and unattractive profiles, Appel et al. (2015) found that attractive profiles caused participants to perceive themselves as inferior and to feel more envy, with inferiority predicting envy. This effect was even more pronounced for individuals with depression symptoms. And when being in a bad mood, people seek downward rather than upward social comparisons on facebook (Johnson & Knobloch-Westerwick, 2014). However, along with social comparison information provided by the other profile owners (e.g. flattering profile pictures, selfies, status updates), users have also access to "flattering *interaction* information", such as the number of friends, the quantity and quality of comments on posted content and the number of Likes this content received. With these mechanisms social acceptance becomes measurable. One can easily access whether friends are more likely to interact with other users' contents compared to one's own contents. R. A. Hayes et al. (2016) referred to (Facebook-, Instagram-, or Twitter-) Likes as paralinguistic digital affordances (PDAs) that "are lightweight means of communication activated by a single click and represented by a single static icon." (Carr et al., 2016, p. 387). However, receiving Likes might not be as lightweight as it is to give them. While participants in focus groups and interviews (R. A. Hayes et al., 2016) stated that they know that Likes were often given aimlessly just as a response to seeing their Friends, receiving Likes has nevertheless a profound influence on users. Participants reported that receiving a Like on their content made them feel

better (although this effect can wear off over time), and that receiving Likes was associated with boosts in social status. It seems that users generate "expectations for a threshold level of Likes a post needed to receive to be "good."" (R. A. Hayes et al., 2016, p. 177) since Likes are given generously, especially on Facebook. And although one can argue that people follow either no or various communicative strategies when giving a Like, "a Like is a Like". Accordingly, participants in an experimental online study reported that receiving Likes is perceived as receiving social support (Carr et al., 2016).

2.6. Research question and hypotheses

The main research question is whether Facebook users socially compare themselves to others not only by relatively evaluating profile information, but also by comparing the amount of social feedback they receive. Based on the related work reviewed above we assume that being "liked" on Facebook is experienced as socially rewarding by recipients and that Likes work as secondary reinforcers, thereby triggering social comparison processes and their affective outcomes when evaluating one's own relative standing to that of other Facebook users. To examine this research question we designed an experimental study in which participants see and evaluate their own selfies and selfies of other people with and without Likes. Thereby regarding the likability of the displayed person, how many Likes they expect for the picture and how justified the received number of Likes is perceived. In addition to evaluating selfies, participants in our study see two selfies with the respective number of Likes received in direct (favorable or unfavorable) comparison, and indicated their emotional state and whether or not they would like the other person's selfie. We hypothesize that participants in our experiment will use the number of "Likes" received for their own and other people's pictures as a basis for social comparison. Depending on the outcome of the comparison, people will experience the respective affect (Smith, 2000).

H1a. After downward social comparison participants will report to feel more pity, fear, worry or sympathy (assimilative emotions) or contempt, Schadenfreude or pride (contrastive emotions) than after loosing a comparison.

H1b. Participants will experience more inspiration, optimism or admiration (assimilative emotion) or depression, shame, envy or resentment (contrastive emotions) after upward rather than downward comparison.

This effect might be moderated by social comparison processes triggered by subjectively perceived differences regarding the likability of the person displayed on the selfie and the quality of the picture.

H2. The subjectively perceived difference in likability between the two pictures of a comparison trial moderates the emotional affect caused by the Like-based social comparison.

Blease (2015) discussed that having more friends results in a higher frequency and number of "displays of higher status cues observed" and "perceptions of low relative social value". Hence, experiencing a great number of upward social comparisons might lead to feelings of low social value, ostracism and is mood worsening.

H3. After a series of upward social comparisons participants will report a worse mood and higher feelings of ostracism than after a series of downward social comparison.

RQ1. What is the influence of the network size on social comparison processes involving Likes?

The research by Dvash et al. (2010) suggests that the social comparison outcome (winning or loosing) was more important than the absolute gain the person received: sometimes losing was more rewarding than winning, provided the other person lost more. On Facebook people usually do not lose Likes, but it is possible that they receive

a quite low number of Likes. Hence, we will investigate the impact of absolute received Likes (absolute low vs. absolute high) in relation to winning or loosing the social comparison based on the Likes received (relative more or less Likes).

RQ2. What is the relationship between the absolute number of Likes and the relative number of Likes?

Moreover, we want to know what influences whether people like other people's selfies. Potential influencing factors could be the outcome of the social comparison and the resulting emotional affect, perceived devervingness of the Likes already received (Smith, 2000), the number of Likes already received (Sherman et al., 2016), and the evaluation of the picture also in relation to one's own picture.

RQ3. What influence do have picture ratings, personality traits and social comparison outcome on Like decision?

3. Method

3.1. Experimental design

In order to test our hypotheses, participants saw and evaluated their own selfies (self-selfies) and selfies of other people (other-selfies) with and without Likes. In addition, they saw two selfies (self-selfie & other-selfie) with the respective number of Likes in direct comparison. Social comparisons were either favorable or unfavorable for the participant. Participants then indicated their emotional state and whether or not they would like the other person's selfie. The study was set-up in a mixed between-within-subjects design with the between factors *gender* and *number of Likes reference frame* and the within-factors *social comparison outcome* and *absolute number of Likes*. Regarding gender, the study was gender-matched in the sense that female participants were only confronted with female other-selfies and male participants were confronted only with male other-selfies. Regarding the *number of Likes reference frame*, we followed the approach of Sherman et al. (2016) and used a fixed number of possible feedback providers in order to standardize how many likes would be regarded as many or few. However, in our study we used two reference frames, i.e. two different social network sizes: one group of participants was told that their selfies could receive between zero and 50 Likes while the second group was informed about a lower reference frame with possible number of likes between zero and 25. The within-subjects factors *social comparison outcome* and *absolute number of Likes* received is based on the (monetary) social comparison paradigm by Dvash et al. (2010). Hence, there are four categories of social comparison trials. Participants' selfies had either an absolute high or low number of Likes (above or below the average) and could have a higher or lower number of Likes relative to the other-selfie, so that participants relatively won (downward comparison) or lost (upward comparison) the comparison (cf. Fig. 1). The experimental tasks are described in more detail in the respective section (cf. section experimental tasks).

Table 1
Distribution of participants across conditions.

		gender		total
		female	male	
Likes Reference Frame	low	30	28	58
	high	30	30	60
	total	60	58	118

3.2. Participants and procedure

We recruited in total 125 participants for this study that was approved by the local ethics committee. Seven data sets we excluded due to technical problems (e.g., slow Internet connection hindered proper display of comparison trials which are only displayed for 5s). The remaining 118 volunteers were almost balanced in gender (60 female, 58 male) and between 23 and 28 years old ($M = 22.52$, $SD = 1.88$). For a distribution of participants across conditions cf. Table 1. Participants were recruited via advertising on campus to participate in a study on the evaluation of selfies on Facebook.

Before study participation, all participants were instructed that the study was a cooperative project between two universities (University of Duisburg-Essen and the ostensible partner University Technical university of Munich), that participation will require them to provide selfies prior to the actual main experiment and that they will have to look at and evaluate selfies of themselves and of other people during the experiment. Participants received instructions on how to take a proper selfie that can be used in the study to maximize comparability of selfies between participants. For instance, they were asked not to wear sunglasses when taking a selfie. They were supposed to be the only person visible on the selfie (i.e. no group selfies), and the participant and not the background should be dominating the picture. Pictures were handed in seven days prior to the laboratory appointment. They were informed that selfies will only be seen by the researchers and other study participants and not made publicly visible.

Upon arrival all participants were asked to provide written informed consent.

Comparable to the study by Sherman et al., 2016, participants were instructed that all their selfies and those of the other participants had been evaluated by 50 (or 25) students of the partner university. Participants were informed that their pictures were uploaded to a picture database where people could give Likes to content similar to Facebook or Instagram and 50 students from the partner university had seen their pictures. These fictitious students were ostensibly asked to look at the picture and to decide whether or not they would give the picture a Like. Hence, there were references to Facebook and Instagram as platforms, however, our study was then programmed in a standard test environment with no look-and-feel of Facebook or Instagram. Participants only believed that the ratings the pictures received originated from an Instagram/Facebook-like environment.

According to this procedure, each picture could receive between zero and 50 Likes, or 25 Likes in the low reference frame respectively.
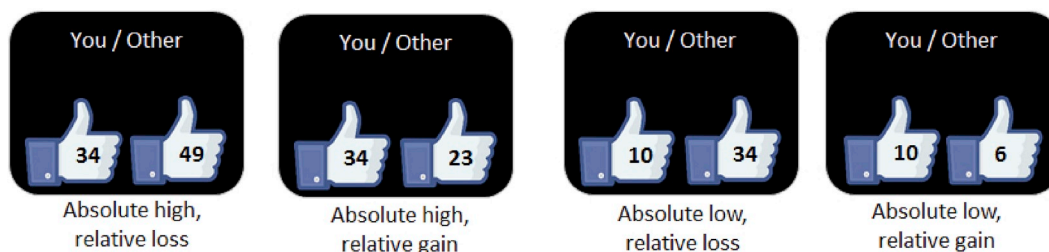

Fig. 1. Social Comparison categories based on Dvash et al. (2010).

However, each selfie was assigned a previously defined number of Likes (cf. experimental task). Participants were informed that the average number of received Likes of all pictures in the experiment was 25.2 Likes, or 12,8 Likes in the low reference frame respectively. This was to give participants an anchor for their ratings that is not exactly 25 (or 12.5) which would be a non-authentic number. After instruction, participants first completed socio-demographic questions and questionnaires assessing personality characteristics. They then completed the experimental tasks and afterwards questionnaires asking for their Facebook usage and social comparison orientation. Afterwards, participants were debriefed and thanked for participation. All participants received an allowance of €15 for study participation.

3.3. Stimulus material

The stimulus material consisted of the six original pictures of the respective participant, i.e., the six selfies that will be called "self-selfies" in the following. Moreover, there were pictures of six individuals (with two pictures each) who were unfamiliar to the participant and were introduced to be volunteers from the partner university, i.e., 12 so-called "other-selfies". The other-selfies were derived from a microstock photography agency (fotolia by adobe) using the search term "selfie." Criteria for the choice of other-selfies were the same as for the participants' self-selfies as described above. All other-selfies were pretested regarding how likable and attractive the depicted individual appears and how likely it is that the respective person could be part of one's own circle of friends. Moreover, participants in the pre-test rated the picture itself regarding how natural the picture looks like and whether the pictures looks like a typical selfie on Facebook. We decided in favor for those six female and six male individuals who scored not too low or high on attractiveness and likability and whose pictures appeared most likely to be actual Facebook selfies as rated by the participants. Since the main study was gender-matched, also the pre-test was gender-matched: pictures of female participants were evaluated by female participants ($n = 37$) and male individuals were evaluated by male participants ($n = 36$).

3.4. Experimental tasks

Participants engaged in two experimental tasks: A rating task and a social comparison task.

3.4.1. Rating task

Each rating task trial was composed of two presentations of one of the 18 stimuli (six self-selfies and twelve other-selfies). First, the self-selfie or other-selfie was presented alongside with questions about how they like the picture and what number of Likes they would expect for that picture (cf. measurements section). Afterwards, the same self-selfie or other-selfie was presented again with the previously assigned number of Likes (cf. Fig. 2). Participants had to indicate how justified

they thought the number of Likes was (cf. measurements section). From the six self-selfies, three were assigned numbers of Likes that are below and three received numbers that are above the announced average of 25.2 (high reference frame) and 12.8 (low reference frame). The submitted selfies were assigned to one of these six values. Similarly, the other-selfies were assigned numbers of Likes above and below the average of 25 Likes, or 12,8 Likes respectively. These numbers were also assigned to the other-selfies.

3.4.2. Social comparison task

During the social comparison task, participants saw one self-selfie and one other-selfie and the respective number of Likes both selfies received in direct comparison for exactly five seconds (c.f. Fig. 3). Afterwards, participants were asked to indicate how they feel (cf. measurements section) and then had to decide whether or not they want to give a Like to the other-selfie.

Based on a (monetary) social comparison paradigm by Dvash et al. (2010), there were four categories of social comparison trials. Participants either had an absolute high or low number of Likes (above or below the average of 25.2, or 12.8 respectively). Moreover, they could have a higher or lower number of Likes relative to the other-selfie, so they relatively won or lost (cf. Table 2 for composition of trials). There were three trials for each social comparison categories resulting in 12 social comparison trials in total. Participants completed two blocks of pseudo-randomized rating and social comparison tasks. In the first block, participants predominantly experienced unfavorable social comparisons in which they received lower Likes compared to the other person in five of six comparison trials. In the second block, participants experience predominantly favorable social comparisons with more Likes than the other person in five of six trials. After both blocks we measured perceived ostracism (cf. measurements section).

3.5. Measurements

3.5.1. Evaluation of selfies

Participants rated all selfies in the rating task on three items: "How likable do you think you are (is the person) on this picture?," "How do you like the picture altogether?" (both rated on a 6-point Likert scale) and "How many Likes would you expect for this specific picture?" (free entry of number of Likes). Moreover, participants had to indicate how justified they thought the number of Likes was (rated on a 6-point Likert scale).

3.5.2. Evaluation of social comparison - emotional affect

After each social comparison trial, participants were asked to indicate how they feel on a 10-point Likert scale from 1 "negative" to 10 "positive".

Moreover, they filled in a 12 item questionnaire providing a more precise assessment of their emotional state (adapted from the depression adjective checklist (DACL), Lubin, 1981, also used by, e.g., Dvash

Fig. 2. Stimulus material example: Other-selfie without and with the assigned number of Likes.
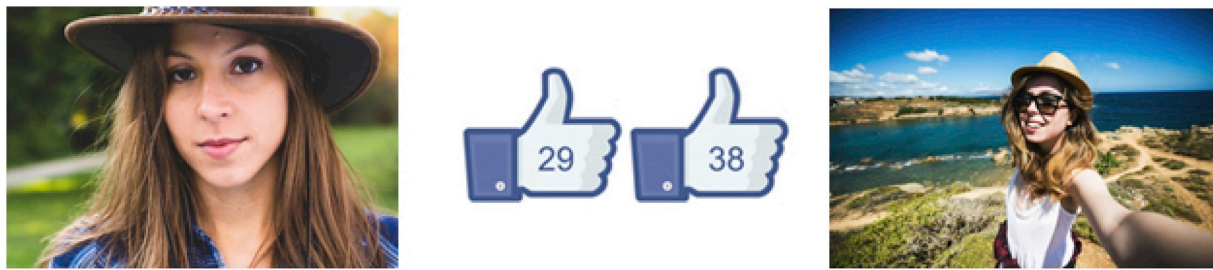
Fig. 3. Stimulus material example: Social comparison arrangements.

Table 2
Assignment of number of likes to self-selfies and other-selfies over the four categories of social comparison outcomes.

Absolute High Relative Loss		Absolute Low Relative Loss		Absolute High Relative Gain		Absolute Low Relative Gain	
Self-Selfie	Other-Selfie	Self-Selfie	Other-Selfie	Self-Selfie	Other-Selfie	Self-Selfie	Other-Selfie
42	50	8	9	42	38	8	4
42	46	8	11	42	35	8	5
42	44	8	13	42	30	8	7
39	50	12	13	39	38	12	4
39	46	12	18	39	35	12	5
39	44	12	26	39	30	12	7
29	38	16	18	29	26	16	9
29	35	16	26	29	18	16	11
29	30	16	30	29	12	16	13
28	38	20	26	28	26	20	11
28	35	20	30	28	18	20	13
28	30	20	35	28	13	20	18

et al., 2010; Brigham, Kelso, Jackson, & Smith, 1997). Participants stated to which degree (on a 6-point Likert scale) they currently experience joy, relief, happiness, superiority, schadenfreude, envy, resentment, sadness, inferiority, whether they feel less good when they compare themselves to the other, whether you are pleased by how things have turned out for the other participant, and whether they want to be in the other person's shoes.

In addition, participants filled in the Positive And Negative Affect Schedule Watson, Tellegen, and Clark (1988) with the two sub-scales positive and negative affect (10 items each, rated on a 5-point Likert scale) before the experimental tasks as well as after the first (upward/losing) and second (downward/winning) block of social comparisons.

3.5.3. Evaluation of social comparison - like decision

After each social comparison trial participants had to decide whether or not they want to give a Like to the other-selfie. At the very end of the experiment, participants had the opportunity in an open-ended question to elaborate on their reasons for giving a Like to the other-selfies during the study.

3.5.4. Evaluation of social comparison - ostracism

After both social comparison blocks (cf. section experimental tasks) participants filled in a modified version of the Basic Needs Questionnaire to measure ostracism (Williams, Cheung, & Choi, 2000) with the sub-scales belongingness (low belonging to others), self-esteem (low self-esteem), control (being in control over other's judgment), and meaningful existence (low meaningfulness of the own existence).

3.5.5. Moderating variables

The questionnaire battery included measurements to assess personality traits as well as parameters relevant to assess orientation for social reward and comparison. These include the German versions of the Social Comparison Orientation scale (Gibbons & Buunk, 1999, p. 11

items, 5-point Likert scale, Cronbach's $\alpha = 0.736$), the Rosenberg Self-Esteem Scale von Collani & Herzberg, 2003, p. 10 items, 5-point Likert scale, Cronbach's $\alpha = 0.868$), and social anxiety which was measured with the Brief Fear of Negative Evaluation Scale (Leary, 2016, p. 12 items, 5-point Likert scale, Cronbach's $\alpha = 0.691$).

We also asked participants about their general Facebook usage: how frequently participants use Facebook, how intensely they use Facebook (Facebook Intensity Scale; Ellison, Steinfield, & Lampe, 2007), how many friends they have on Facebook, how often they post pictures, status updates or other contents (e.g. links), and to what percentage they actually produce Facebook content (e.g. post a picture), interact with others (e.g. comment a post), or passively consume Facebook content (e.g. read posts without commenting).

Moreover, we wanted to explore how Likes on Facebook are perceived in general. Thus, we asked participants how relevant Likes are to them, how aware they are of received numbers of Likes, whether they feel happy when they receive Likes, whether they actively look up numbers of Likes received for a post and whether they receive messages on their smart-phones notifying them in case they received a Like for their content.

4. Results

4.1. Effects of a series of upward or downward social comparisons on ostracism and emotional affect

First, we analyzed whether participants feel worse after a series of upward social comparisons versus a series of downward social comparisons (H3) also in dependence of *gender* and *Likes reference frame*. We conducted a series of mixed-design repeated measures ANOVAs on the four sub-scales of the Basic Needs Questionnaire to measure ostracism (belongingness, control, self-esteem and meaningful existence; Williams et al., 2000). We measured after the first (upward/losing) and second set (downward/winning) of social comparisons as within factor and gender and Likes reference frame as between factors. Results revealed significant effects for repeated measures on the sub-scales belongingness and self-esteem. Participants showed less need to belong and less low self-esteem after winning versus losing (cf. Table 3). The sub-scales control and meaningful existence were not affected. There were no interaction effects of repeated measures with the between factors gender and Likes reference frame for belongingness, control and self-esteem (all $p > .05$). However, there was a significant interaction effect for the repeated measures with Likes reference frame for meaningful existence (higher ratings mean lower meaningful experience; $F(2,113) = 6.71$, $p = .011$, $\eta^2 = 0.056$) indicating that in the low reference frame participants improved in their ratings regarding meaningful existence from the losing ($M = 2.60$, $SD = 1.43$) to the winning set ($M = 2.42$, $SD = 1.02$), while the reverse effect took place in the high reference frame (losing set: $M = 2.14$, $SD = 1.11$; winning set: $M = 2.38$, $SD = 0.97$).

Moreover, we conducted mixed-design repeated measures ANOVAs on the two positive and negative affect sub-scales of the PANAS measured before the experimental tasks as well as after the first (upward/

Table 3
Repeated measures ANOVA for Ostracism Scales after winning set (T1) and losing (T2) set of social comparisons with main effect for within factor.

Ostracism Sub-scales	female				male				within subjects effect		
	low		high		low		high				
	M	SD	M	SD	M	SD	M	SD	F	p	η^2
Belongingness T1	4.24	1.42	3.62	0.94	4.01	0.97	4.06	1.05	19.51	< .001	.14
Belongingness T2	3.90	1.40	3.28	0.95	3.80	1.07	3.44	1.01			
Control T1	5.53	1.20	5.88	0.99	5.93	0.79	5.96	0.79	0.39	.533	.00
Control T2	5.87	0.98	5.76	1.12	5.90	0.73	5.96	0.62			
Self-Esteem T1	3.51	1.81	2.37	1.13	2.98	1.45	2.73	1.05	9.37	.003	.07
Self-Esteem T2	2.94	1.58	2.13	1.22	2.71	1.05	2.51	1.10			
Meaningful Existence T1	2.64	1.32	2.09	0.92	2.55	1.56	2.20	1.13	0.18	.671	.00
Meaningful Existence T2	2.44	1.10	2.27	1.00	2.40	1.14	2.49	0.95			

Table 4
Repeated measures ANOVA for Positive and Negative Affect after winning set (T2) and losing (T3) set of social comparisons compared to baseline (T1) with main effect for within factor.

PANAS	female				male				within subjects effect		
	low		high		low		high				
	M	SD	M	SD	M	SD	M	SD	F	p	η^2
Positive Affect T1	3.33	0.52	3.40	0.53	3.26	0.54	3.19	0.51	6.05	.003	.05
Positive Affect T2	3.08	0.66	3.54	0.62	2.93	0.68	3.12	0.58			
Positive Affect T3	3.01	0.68	3.44	0.66	2.95	0.75	3.16	0.70			
Negative Affect T1	1.58	0.59	1.47	0.61	1.80	0.58	1.75	0.57	7.42	.003	.06
Negative Affect T2	1.66	0.66	1.47	0.60	1.59	0.71	1.62	0.58			
Negative Affect T3	1.53	0.58	1.31	0.51	1.55	0.70	1.52	0.64			

losing) and second (downward/winning) set of social comparisons with gender and reference frame as between factors. Results showed that participants' positive affect significantly dropped after the first (losing) set and stayed lower afterwards, while negative affect was unaffected by the first (losing) set, but significantly improved after the second (winning set; cf. Table 4). There were no interaction effects of repeated measures with the between factors gender and Likes reference frame for negative affect (all $p > .05$). However, there was a significant interaction effect for the repeated measures with Likes reference frame for positive affect ($F(2,226) = 8.50, p < .001, \eta^2 = 0.070$) indicating that in the low reference frame participants dropped in positive affect over the course of the experiment (T1: $M = 3.30, SD = 0.52$; T2: $M = 3.00, SD = 0.66$; T3: $M = 2.98, SD = 0.71$), while participants in the high reference frame did not change in their positive affect (T1: $M = 3.30, SD = 0.52$; T2: $M = 3.32, SD = 0.63$; T3: $M = 3.30, SD = 0.69$).

4.2. Effects of social comparison category on emotional affect

We restructured the data in order to explore in more detail the effect of the social comparison category on participants' emotional state after the comparison. Data was now analyzed trial-wise (social comparison trials) to examine whether social comparison category and/or trial-wise rating differences with regard to, for instance, likability and justification between the two stimuli in one comparison trial predict participants' affective states and choice to give a Like or not. Emotional responses as well as choice data were analyzed using either ANOVAs or (logistic) regression analyses (Howell, op. 2010) with subject treated as a random factor ($n = 1416$ choices: 118 participants * 12 choices).

In order to test H1 assuming that social comparison outcome predicts emotional affect and RQ2 asking for the relationship between the absolute number of Likes and the relative number of Likes, we conducted a two factorial ANOVA with *social comparison outcome* and *absolute number of Likes* as independent factors and affective state as dependent variable revealing a significant main effect for social comparison outcome ($F(1,1409) = 55.28, p < .001, \eta^2 = 0.038$) and a main effect for absolute number of Likes ($F(1,1409) = 10.99, p = .001, \eta^2 = 0.008$), but no interaction effect. Hence, participants felt better after downward comparison than after upward comparison, and within these two comparison outcomes they felt better when they absolutely received higher rather than lower numbers of Likes.

For a more detailed picture, we repeated this analysis for the more precise assessment of participants' emotional state. For eleven items we found a main effect for social comparison outcome: after downward social comparison, participants were generally more joyful, experienced more schadenfreude, more superiority, more relief, felt better when they compared themselves to the other (in support for H1a), felt less envy, less sadness, less inferiority, less jealousy, wanted less to be in the other person's shoes, and were less pleased by how things have turned out for the other participant (in support for H1b).

There were significant main effects for absolute number of Likes showing that when people had a high number of absolute likes they were more happy, joyful, relieved and experienced more superiority and wanted less to be in the other person's shoes (RQ2). There were no interaction effects observable (cf. Table 5 for main effects, mean values, standard deviations).

Further, we hypothesized that the emotional affect caused by the social comparison outcome is moderated by the subjectively perceived difference in likability between the self-selfie and the other selfie. We calculated the relative difference in perceived likability (Δ likability) for each decision trial in each participant with respect to the other-selfie by subtracting the likability rating for the self-selfie from the rating given to the other-selfie during the rating trial. Positive Δ likability values are in favor for the other-selfie and negative ones for the self-selfie. We performed moderation analyses with the multi-categorical independent variable *social comparison category* (lose low, lose high, win low, win high, indicator coded) and the dependent variables for emotional affect (13 items, see above) with the moderator Δ likability using the PROCESS macro for SPSS (A. F. Hayes & Montoya, 2017). However, Δ likability did not moderate any of the above described effects.

Table 5
Participants' affective state after comparison trials with regard to the four social comparison categories.

	lose low		lose high		win low		win high		comparison outcome			absolute number of Likes		
	M	SD	M	SD	M	SD	M	SD	F	p	eta	F	p	η^2
emotion (neg-pos)	7.18	1.83	7.40	1.85	7.77	1.62	8.15	1.44	55.28	.000	.038	10.992	.001	.008
joyful	3.73	1.32	4.03	1.22	4.09	1.26	4.42	1.12	32.55	.000	.023	22.591	.000	.016
happy	3.88	1.31	4.06	1.29	3.99	1.36	4.19	1.30	3.20	.074	.002	7.593	.006	.005
relieved	2.53	1.38	2.77	1.50	2.78	1.51	2.95	1.55	7.83	**.005**	.006	6.756	.009	.005
pleased by outcome for other	3.19	1.41	3.56	1.49	3.05	1.46	3.38	1.50	4.03	.045	.003	19.616	.000	.014
superiority	1.58	1.07	1.78	1.22	1.89	1.28	2.09	1.37	22.10	.000	.015	8.982	.003	.006
schadenfreude	1.26	0.69	1.32	0.75	1.43	1.01	1.48	0.96	13.34	.000	.009	1.311	.252	.001
want to be in other's shoes	1.71	1.27	1.49	1.04	1.52	1.11	1.41	0.91	5.52	.019	.004	7.781	.005	.006
bad after comparison	1.75	1.20	1.88	1.27	1.57	1.06	1.52	1.03	20.21	.000	.014	0.473	.492	.000
inferiority	1.46	0.95	1.47	0.94	1.27	0.66	1.22	0.58	28.50	.000	.020	0.226	.635	.000
sadness	1.45	0.87	1.44	0.87	1.26	0.66	1.21	0.59	26.72	.000	.019	0.856	.355	.001
jealousy	1.49	0.90	1.62	0.99	1.30	0.74	1.26	0.67	37.82	.000	.026	1.209	.272	.001
resentment	1.39	0.85	1.46	0.89	1.25	0.64	1.23	0.59	21.33	.000	.015	0.392	.531	.000

4.3. Like decisions

Next, we wanted to know which factors influence whether participants give the other-selfie a Like after a social comparison trial (RQ3). There were four groups of variables that could be related to the liking decision:

1. The composition of the social comparison trial: loosing, winning, the actual number of Likes of the self-selfie and other-selfie and the difference in Likes (Delta number of Likes received) between the two pictures.
2. Participants' ratings of their respective self-selfie: likability of person, evaluation of picture, expected number of likes, justification with Likes received
3. Participants' ratings of the respective other-selfie: likability of person, evaluation of picture, expected number of likes, justification with Likes received
4. Participants' emotional experience directly after the social comparison

We first conducted correlation analyses. Regarding the composition of the comparison trial, we found that winning or loosing or having actual high or low Likes did not correlate with Like decisions, neither did the actual number of likes of the self-selfie, the actual number of likes of the other-selfie, or the difference in number of received likes for the self-selfie and other-selfie.

Regarding the evaluations of the two pictures, participants' ratings of their respective self-selfie did not correlate with Like decisions. However, participants' ratings of the respective other-selfie were strongly correlated with likability of person ($r = 0.473$, $p < .001$), evaluation of picture ($r = 0.494$, $p < .001$), and expected number of Likes ($r = 0.435$, $p < .001$) being positively correlated, and satisfaction with Likes received for the other-selfie being negatively correlated ($r = -0.114$, $p < .001$). In addition, we calculated differences between evaluations for both selfies implicated in one comparison trail as described above and found that all Delta variables were correlated with Like decisions: Δ likability ($r = 0.363$, $p < .001$), Δ PictureRating ($r = 0.374$, $p < .001$), Δ ExpectedLikes ($r = 0.350$, $p < .001$), and Δ SatisfactionWithLikes ($r = -0.082$, $p = .002$). Regarding emotional affect, participants decision to give a Like was correlated with the following emotional affect items: emotional affect (positive - negative; $r = 0.120$, $p < .001$), schadenfreude ($r = -0.109$, $p < .001$), superiority ($r = -0.077$, $p = .004$), resentment ($r = -0.095$, $p < .001$), want to be in the other person's shoes ($r = 0.187$, $p < .001$), pleased by how things turned out for other person ($r = 0.127$, $p < .001$).

The variables identified to be correlated with the Like decision were entered in a stepwise multiple regression analysis to evaluate whether all variables are necessary to predict Like decisions. At step 1 of the analysis, ratings of the other person's picture was entered into the regression equation and was significantly related to Like decision ($F(1,1403) = 451.81$, $p < .001$). The multiple correlation coefficient was 0.49, indicating approximately 24.4% of the variance of the Like decisions could be accounted for by ratings for the other person's picture. Ratings for likability of the other-selfie were entered in step 2 ($F(2,1402) = 274.98$, $p < .001$), ratings for wanting to be in the other person's shoes were entered in step 3 ($F(3,1401) = 195.09$, $p < .001$), and expected Likes for other-selfie in step 4 ($F(4,1400) = 154.25$, $p < .001$). Furthermore, ratings for resentment were entered in step 5 ($F(5,1399) = 126.73$, $p < .001$), ratings for emotional affect in step 6 ($F(6,1398) = 106.99$, $p < .001$), and ratings for schadenfreude in step 7 ($F(7,1397) = 92.68$, $p < .001$). Finally, in step 8 resentment was removed from the model ($F(8,1396) = 107.66$, $p < .001$). The final model accounted for 31.6% of the variance of the Like decisions (cf. Table 6). The following variables did not predict Like decisions: evaluation differences between self-selfie and other selfie (Δ likability, Δ PictureRating, Δ ExpectedLikes, Δ SatisfactionWithLikes), justification of received Likes for other-selfie, feelings of superiority, resentment, and how pleased participants are with how things turned out for the other person. In addition, we wanted to know whether Like decisions are influenced by participants' self-esteem, but linear regression analysis did not result in a valid regression model ($p = .465$).

5. Discussion

In this research, we experimentally addressed the question whether Facebook users' perceive Likes as indicators for social acceptance they themselves and other users receive for their posted content and whether they use this (un)flattering interaction information for social comparison. Participants in our study saw and evaluated their own (self-selfie) and other persons' selfies (other-selfie) with and without Likes. They

Table 6
Stepwise regression analysis summary for variables predicting like decisions (N = 1410.

	B	SE B	β	R2	Δ R2
Step 1: picture rating	0.18	0.01	0.49	.24	
Step 2: likability of other person	0.10	0.01	0.26	.28	.04**
Step 3: want to be in the other person's shoes	0.05	0.01	0.11	.29	.01**
Step 4: expected Likes for other-selfie	0.01	0.00	0.14	.31	.01**
Step 5: resentment	−0.05	0.02	−0.08	.31	.01**
Step 6: emotional affect (neg-pos)	0.02	0.01	0.06	.31	.00*
Step 7: schadenfreude	−0.03	0.01	−0.05	.32	.00*

**p < .001 * p < .05.

were made believe that all selfies were reviewed by students on a picture rating platform similar to Instagram and that those students had the chance to give or not to give a Like to each of the selfies. We varied the Like reference frame, i.e. the size of the audience on this platform (either 25 or 50 students). In addition to evaluating selfies, participants in our study repeatedly saw one of their self-selfies and other-selfies in direct (favorable or unfavorable) comparison with the respective number of Likes the selfies received by the fake audience. After viewing the selfies in comparison, participants indicated their emotional state and whether they want to give a Like to the other person's picture.

In line with our hypotheses, it seems that indeed participants used this "flattering interaction information" (Likes as sign for social acceptance by others) for social comparison indicated by the affective outcomes participants reported after winning (downward social comparison) or loosing (upward social comparison) the direct comparison in terms of Likes received. Trial-wise analysis of all comparison trials revealed that participants felt better after downward comparison than after upward comparison. Moreover, it made a difference to them how many Likes they absolutely received. Hence, they felt better when they absolutely received higher rather than lower numbers of Likes.

We explored the nature of emotional affect more fine-grained and found that after downward comparison participants reported to feel more schadenfreude and more superiority (*contrastive emotion*), however, they were also more joyful, happy, relieved and less pleased by how things turned out for the other (*assimilative emotion*; H1a). In contrast, after upward comparison, they wanted to be in the other person's shoes (*assimilative emotion*) and experienced more inferiority, sadness, jealousy and resentment and felt worse after the comparison (*contrastive emotion*, H1b). This is in line with literature on emotional affective outcomes of social comparison stating that the affective outcome of a comparison is not necessarily determined by its direction (upward vs. downward) (Smith, 2000; Suls et al., 2002). Instead, the more salient implication of this social comparison can determine the affective outcome. Our results show all four affective outcome types: positive and negative assimilative as well as contrastive emotions. Looking at the effect sizes it seems that upward social comparison might have a larger effect on contrastive negative emotions and a smaller effect on assimilative emotions. In contrast, downward social comparison might more strongly elicit assimilative emotions than contrastive emotions. This would also suggest different attribution foci - when winning, people or more self focused and when loosing, their attentional focus lays on the other person or they have a dual focus (Smith, 2000). A limitation of the measurement used (which was based on Dvash et al. (2010)) is, however, that the four types of emotional affect were not equally represented in the set of items. Hence, these results can only be interpreted as a hint into the direction that a positive comparison outcome elicits assimilative and a negative comparison outcome elicits contrastive emotion more strongly. Future studies should use more balanced sets of items in order to closer investigate whether this could be a persistent pattern.

In contrast to our expectations, it seems that participants only considered the "flattering interaction information", i.e. Likes, for social comparison, because the relative difference in perceived likability of oneself and the other person was not correlated with emotional affect and thereby also did not moderate the emotional affect caused by the social comparison outcome (no support for H2). If we take the delta of likability in favor of the other person as a measure for desirability for the other (the other person is more likable and therefore might deserve to win the comparison) the affective outcome of a social comparison was not influenced by the perceived deservingness for the other (Brickman & Bulman, 1977).

Moreover, we found that after a series of flattering social comparisons participants felt better, reported higher self-esteem and less ostracized, i.e. more accepted (H3) in contrast to a series of unflattering social comparisons. Comparing oneself to highly attractive comparison standards leads to worse mood (Haferkamp & Kramer, 2011) and

feelings of envy (Appel et al., 2015), but also the feedback of other people on SNS expressed by receiving less Likes can cause similar outcomes.

While experiencing such strong emotional affect after the comparison, emotional affect was not the strongest predictor for actually giving a Like to the other person. In our analysis in search for predictors for Like decisions we found that participants perceptions of and evaluations for the other-selfie predicted Like decisions as well as the emotional affect resulting from the social comparison. In detail, how participants rated the other person's picture, their rating for likability of the other person, how many Likes they expected for the other-selfie, and four emotional items (want to be in other person's shoes, schadenfreude and plain emotional affect (pos vs. neg)) were predictors with the other-related ratings (e.g. picture rating, likability) being stronger predictors than the emotional items.

Thus, the more likable the other person is judged by our participants the more likely they give a Like. This was also reflected in participants' answers to the open question asking for their reasons to give a Like or not. Almost all participants mentioned likability of the person to be a crucial factor for the decision to give a Like; i.e., 79 participants explicitly mentioned likability, others described the concept (e.g., smiling, authentic, nice person), and yet others negatively described the same concept (e.g., not arrogant). Other reasons were the quality of the picture (e.g., resolution, filters) or interestingness (e.g., exciting places or activities). Only four participants mentioned the social comparison situation: "Moreover, sometimes I gave a Like to people who "lost" in comparison to me, maybe because of some sort of pity."; "One time I decided against a Like because the person received already a lot of Likes for a picture, than the Likes for my picture."; "If a picture of another person received more Likes, this does not mean to me, that I would not like this picture"; "If someone is not likable, I evaluate this person negatively or neutrally, because to me it is somewhat not important who received how many Likes or how many Likes I received.". Within the regression model, admiration for the other person and positive affect also makes participants more likely to give a Like and this is diminished slightly by their feelings of Schadenfreude.

Although one can assume that people who just won might be more generous in giving a Like than people who lost, Like decisions were not based on the plain social comparison outcome (winning or loosing) or the perceived justification of the Likes already received. In contrast to prior work, there was no Bandwagon effect in that people liked pictures that already received high numbers of likes Sherman et al. (2016). Nor was the Like decision dependent on the perceived deservingness of the Likes already received for the other selfie (Smith, 2000) as might be assumed as an outcome of social comparison theory. It seems that, if at all, social comparisons had a rather indirect effect on Like decisions (RQ3). We observed that downward social comparison as well as receiving a high number of Likes (unrelated to winning or loosing) make participants feel better, and more positive emotional affect leads to a higher likability of giving a like. The perception of the other person, however, was a stronger predictor for Like decisions.

Participants answers to the open-ended question at the end of the experiment showed that giving Likes has many reasons. While the nature of the experimental setting eliminated a lot of variance regarding reasons to provide Likes, the interview answers reveal the diversity and complexity of Like decisions, thereby supporting the assumption that people follow either no or various communicative strategies when giving a Like (Carr et al., 2016).

Yet, our study was an experimental laboratory study in which users interacted within an unnatural environment, thereby limiting external validity of the study. Participants answers to the open-ended question hint at other factors that influence Like decisions (in general) that were not focused on in the current study and also were not salient mechanisms because they did not interact with content in a real or mocked SNS environment but rather saw the results that was generated in some (imagined) SNS environment. The relationship to the person posting a

picture that could potentially be given a Like by users plays a crucial role for whether participants are willing to give a Like (e.g., "I am more likely to give Likes to family and close friends, otherwise the picture has to be very fancy to receive a Like."). In our study, participants were in the rare situation that they were confronted with pictures of complete strangers, something that usually does not so often occur on Facebook or other SNS because your feeds would include predominantly pictures of friends or people one follows. Hence, an open question is how the relative perception of (un)flattering interaction information in comparison with real peers affects users, i.e. whether or not the effects will be stronger for peers as assumed by Appel et al. (2016).

Besides using no real SNS platform for our experimental study, we also used a within-subjects design because we aimed to explore individuals reactions to both a series of downward and upward social comparisons. While this situation is probably more ecologically valid since both situations can occur within on usage session of SNS, future work should include a study using a between design to see whether effects hold true.

In summary, driven by the assumption that negative effects of excessive Facebook use such as decreased subjective well-being and decreased life satisfaction (Kross et al., 2013; Verduyn et al., 2015) and depression (Nesi & Prinstein, 2015) are due to the tremendous opportunities for unflattering social comparison on Facebook, we investigated whether people use (un)flattering interaction information such as received Likes for social comparison processes. Indeed, our results demonstrate that users potentially base comparisons not only on other people's profile information (Appel et al., 2015; Fardouly et al., 2015; Haferkamp & Kramer, 2011; Verduyn et al., 2015; Vogel et al., 2015), but also on indicators for social support other people receive in relation to themselves. Hence, our results support the claim that one-click tools such as Likes on Facebook or Instagram are of social and affective relevance (Carr et al., 2016; R. A.; Hayes et al., 2016; Wohn et al., 2016) and work as another mechanism to compare oneself with others, because with Likes social support becomes quantifiable and thus easily accessible for social comparisons.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.chb.2018.10.017.

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