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This is an Insta-vention! Exploring Cognitive Countermeasures to Reduce Negative Consequences of Social Comparisons on Instagram

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ABSTRACT

Social networking sites such as Instagram provide users with numerous social comparison cues, potentially leading to envy and lower self-esteem. We conducted two experiments, examining whether such negative consequences could be mitigated by brief cognitive interventions. In Experiment 1 (N = 391), we reminded users of the unrealistic nature of most Instagram posts in a 2 (intervention: disclaimer vs. control) × 2 (Instagram profile: upward vs. downward comparison standard) between-subjects design. Positive and negative affect, envy, self-esteem, and well-being served as dependent variables. Experiment 2 (N = 184) explored whether slightly longer cognitive interventions ("cognitive bias" vs. "growth mindset" vs. control) could improve participants' experience of upward comparisons, shielding them against envy or the loss of self-esteem. Both experiments included social comparison orientation (SCO) as a potential moderator. Results show that eliciting upward comparisons indeed evoked more envy, with SCO moderating the effect. We further observed indirect effects of the shown Instagram profiles on positive affect, envy, self-esteem, and well-being via participants' social comparison experience. Concerning the cognitive interventions, however, we report that neither an authoritative disclaimer, nor educating users about cognitive biases or mindsets significantly reduced the negative consequences of social comparisons.

Many users of social networking sites (SNS) tend to present themselves in an overly positive manner (Krämer & Winter, 2008; Yang & Brown, 2016), especially young adults who still experience high levels of self-doubt and emotional instability (Michikyan, Subrahmanyam, & Dennis, 2014). As a result, popular platforms such as *Facebook* and *Instagram* have turned into macrocosms of selective and often heavily edited content – making it easy for users to draw unfavorable comparisons to their own lives. Research shows that more often than not, this can lead to negative affect, lower self-esteem, body

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image disturbances, and envy (e.g., Appel, Gerlach, & Crusius, 2016; Saiphoo & Vahedi, 2019). Despite the strong societal implications of these findings, it remains mostly unclear how undesirable effects of SNS use could be prevented. The current project addresses this research question, focusing on the concept of brief cognitive interventions. In two experiments, we specifically examine whether (1) raising users' awareness about the fake nature of many social media posts or (2) providing users with information about cognitive biases and mindsets could counteract negative consequences of social comparisons on Instagram.

Social Comparison Behavior on SNS

Social comparison theory (Festinger, 1954; Wills, 1981) postulates that social comparisons may generally go in two directions. While *downward* comparisons targeting individuals of lower status usually affect people's well-being in a beneficial way, *upward* comparisons (to those who are deemed to be more successful or attractive) are often related to negative consequences (Suls & Wheeler, 2000). Broadly speaking, this principle also holds true in the context of SNS. Due to the usually euphemistic nature of most social media uploads (e.g., Vogel, Rose, Roberts, & Eckles, 2014), the respective platforms inherently contribute to negative comparison outcomes, including the loss of self-worth (Stapleton, Luiz, & Chatwin, 2017), lower body esteem (Tiggemann & Zaccardo, 2016), increased envy (Appel, Crusius, & Gerlach, 2015; Appel et al., 2016), and depressive thoughts (Lee & Kawachi, 2018). Arguably, recent research suggests that the underlying upward comparison processes could also be associated with positive effects such as inspiration (e.g., Liu, Wu, & Li, 2018; Meier, Gilbert, Börner, & Possler, 2020; Meier & Schäfer, 2018), which might be related to factors such as perceived similarity and attainability (e.g., Diel & Hofmann, 2019; Knobloch-Westerwick & Romero, 2011; Lockwood & Kunda, 1997). Still, considering the large number of scientific contributions that underscore the likely harm caused by virtual social comparisons, it remains crucial to discuss potential measures against the negative outcomes of this highly prevalent media practice.

However, to this day there is a notable lack of research on effective interventions to alleviate the negative consequences of comparison behavior on SNS. Whereas a few studies have tried to overcome this research gap by investigating specific user trends such as the "body positivity" movement on Instagram (e.g., Cohen, Fardouly, Newton-John, & Slater, 2019), others have discussed the idea of having beauty bloggers attach *transparency disclaimers* to their content in order to prevent negative effects among the audience (e.g., "I had acne here, this is a lot of makeup."; Fardouly & Holland, 2018). Yet, due to

the relative novelty of these ideas and the sparse empirical findings supporting them, there is still considerable need for further research on interventional approaches in the context of SNS.

This also concerns the individual vulnerability to negative outcomes of SNS comparisons. Research has shown that not all people are affected by viewing biased SNS content to the same extent. Instead, users' individual tendency to social comparisons (i.e., *social comparison orientation* or *SCO*; Gibbons & Buunk, 1999) exerts a meaningful influence on how SNS use translates into increased envy or lower well-being. Once people are more inclined to compare their accomplishments, living situations, or experiences with others, they also tend to suffer more strongly from upward comparisons in the online context. For instance, people high in SCO reported less positive affect after viewing unrealistically positive emotional expressions on social media (De Vries, Möller, Wieringa, Eigenraam, & Hamelink, 2018). Similarly, studies indicated that manipulated Instagram photos may affect the body image of young girls even more negatively if they have a stronger social comparison tendency (Kleemans, Daalmans, Carbaat, & Anschütz, 2018; see also Tiggemann, Brown, Zaccardo, & Thomas, 2017). Acknowledging the importance of this moderating variable, it appears as an easy solution to simply tell people to compare less. Yet, as SCO constitutes a rather stable trait, it may be quite difficult to change people's tendency to "think about the Joneses" (Weber & Hagmayer, 2018). Accordingly, the current research expands existing findings by undertaking new attempts to help viewers not to disregard, but to recognize, restructure, and reinterpret their social comparison tendencies on SNS. For this purpose, we introduced two potential cognitive interventions in two online experiments. In doing so, we also strived to explore how people's individual SCO affected the effectiveness of our suggested countermeasures. On the one hand, we considered it possible that a strong SCO could severely hinder the success of the designed interventions, as the inclination to focus on the provided comparison cues might simply be too strong. On the other hand, it also seemed likely to us that people with higher levels in this trait could benefit even more from the employed strategies.

Potential Counterstrategy: Changing Cognitive Biases

In order to design new interventions against the negative outcomes of SNS use, it is crucial to note the importance of cognitive processes for the experience of SNS (e.g., Meshi, Tamir, & Heekeren, 2015; Turel & Serenko, 2020). More specifically, previous research suggests that the negative outcomes of online social comparison behavior strongly depend on the fact that people assume the displayed content to reflect the reality of other users' lives (Chou & Edge, 2012; Lup, Trub, & Rosenthal, 2015). Based on this implicit assumption, frequent SNS users may come to believe that others are happier, smarter, and more

attractive than themselves, especially if they often browse through the content of strangers and popular influencers (Chou & Edge, 2012; De Vries et al., 2018; Kleemans et al., 2018). From a social psychological perspective, this suggests that the negative outcomes of SNS use may be facilitated by the *fundamental attribution error*, that is, the tendency to attribute the behavior of others to internal characteristics instead of possible external influences (Hooper, Erdogan, Keen, Lawton, & McHugh, 2015; Lup et al., 2015). Practically speaking, Instagram users may come to believe that famous influencers are flawless by nature, instead of considering situational circumstances such as the intense editing that might have occurred.

Following this argument, one might expect that users with an explicit awareness of the curation and manipulation of most SNS content (e.g., with filters) should be able to infer that the viewed photos do not mirror dispositional advantages or a wonderful life, and thus, suffer less from their potentially negative impact. As such, it emerges as a meaningful interventional strategy to prompt users to exchange an internal attribution pattern in favor of a stronger focus on external and situational preconditions. In fact, several studies in the field of body image research followed a similar line of thought, testing the effect of written disclaimers that were inserted into fashion magazines (e.g., Slater, Tiggemann, Firth, & Hawkins, 2012; Tiggemann et al., 2017; Tiggemann, Slater, Bury, Hawkins, & Firth, 2013), yet with mixed results. Whereas some of the according research revealed promising results (e.g., Arendt et al., 2016; Slater et al., 2012), a recent meta-analysis argued that the obtained beneficial effects are limited (Danthinne, Giorgianni, & Rodgers, 2020). A similarly ambiguous picture is painted by the first attempts to introduce intervention disclaimers to social media: Negative social comparison outcomes remained relatively unaffected by the disclaimer intervention (Fardouly & Holland, 2018; Livingston, Holland, & Fardouly, 2020).

However, we note two important shortcomings of the reviewed studies. First, they only focused on bodily-related content and mainly included magazine advertisements or fashion shoots, which picture professional models (for a review, see McComb & Mills, 2020). Despite the fact that body dissatisfaction presents one of the most discussed (and, undoubtedly, most worrisome) issues arising from social comparisons on SNS, this emphasis leaves out a substantial portion of the domains represented on SNS that people compare themselves in (e.g., travel posts, presentation of status symbols, leisure time activities). Further, disclaimers that are attached to professionally produced content such as magazine advertisements may evoke different reactions than disclaimers which warn about user generated SNS content (as examined in Fardouly & Holland, 2018). Second, the abovementioned research efforts on body-related SNS content (Fardouly & Holland, 2018; Livingston et al., 2020) only made use of *individual* disclaimers – that is, verbal statements that seemed to be written by the respective content creators themselves (e.g., "I posed

awkwardly to make my waist look smaller"). Arguably, this raises the question as to how users would react to a more *official* disclaimer, similar to the recently popularized *Twitter* fact check labels, which warn users about questionable content. Recent evidence supports the effectiveness of such platform-facilitated content warnings, albeit in the political context (e.g., Clayton et al., 2020; Mena, 2020).

For the topic addressed by the current project, we specifically expected three major advantages of official warning labels over the previously suggested individual disclaimer method. First, it stands to reason that a more general disclaimer provided by the respective SNS would elicit stronger impressions of objectivity, which has been shown to be particularly important for the success of fact-checking methods (e.g., Ecker, O'Reilly, Reid, & Chang, 2019). Second, it is possible that verbal statements added to the caption of an influencer's post are simply not read by the audience, as many users might merely look at the uploaded pictures without reading the attached texts. In contrast to this, we propose that an official disclaimer could be displayed prominently at the beginning of each user's feed or even on a starting screen when accessing the SNS (similar to the rating screens often presented before movies), making it impossible to ignore the respective message. Lastly, we believe that an authoritative disclaimer could ideally be designed to convey a stronger rooting in scientific evidence – thus appearing more worthy of consideration than the words of an individual SNS user.

Taken together, we suggest that a general disclaimer that explicitly informs participants about the unrealistic nature of Instagram content and, thus, prompts more external attributions may contribute to less negative consequences after viewing positively biased SNS content (Experiment 1).

Potential Counterstrategy: Changing Cognitive Mind-Sets

Another important cognitive characteristic that may impact the experience of using social media is the specific *mindset* with which users approach SNS. For instance, it was found that people who perceive SNS as a helpful tool (i.e., *tool mindset*) tend to experience positive effects, while users who regard social media as harmful (i.e., *addiction mindset*) report more negative outcomes (Lee & Hancock, 2020). For the topic of the current project, however, we decided to focus on cognitive mindsets that are more concerned with *self-related* perceptions. In particular, social psychological literature suggests two distinct ways of thinking about personal ability: A person with a *fixed mindset* believes that certain abilities are set and cannot be developed, while a person with a *growth mindset* believes that skills can be improved by effort (Dweck, 2006; Yeager & Dweck, 2012). In consequence, adopting a growth mindset can increase the willingness to take on challenges and lead to more enduring behavior (e.g., O'Rourke et al., 2014; Yeager et al., 2016). People with a fixed mindset regard

social comparison outcomes as less changeable and are therefore less likely to expect achieving the displayed attributes, status, or lifestyle. In contrast, people with a growth mindset focus on improving in the relevant dimension in social comparison situations. In our opinion, this could serve as a crucial explanatory factor as to why some people gain a sense of inspiration and *benign envy* from looking at upward comparison cues on SNS, whereas others are confined to negative effects and *malicious envy* (e.g., Meier et al., 2020; Meier & Schäfer, 2018). After all, the perceived attainability of a media ideal has already been proposed as a central predictor of social comparison outcomes (Diel & Hofmann, 2019; Knobloch-Westerwick & Romero, 2011) – and fixed vs. growth mindsets can be regarded as an overarching form of this perception. Growth mindset interventions have been shown to be effective in other contexts, for instance, to improve learning strategies and increase motivation (e.g., Lewis, Williams, & Dawson, 2020; Rhew, Piro, Goolkasian, Cosentino, & Palikara, 2018). Consequently, we suggest that fostering a growth mindset (by explicitly educating participants about the changeability of personal ability) may contribute to less negative consequences after viewing positively biased SNS content (Experiment 2).

The Current Research

In recent years, media scholars have started to investigate potential cognitive counterstrategies – such as written disclaimers – to increase people's resilience to negative SNS effects. Building upon these recent efforts by other researchers (e.g., Livingston et al., 2020) as well as new theoretical considerations, our first experiment examined whether providing participants with general disclaimers about the fake nature of Instagram content could reduce the detrimental effects of the evoked social comparisons. As an underlying psychological mechanism, we assumed that this interventional approach could help people to overcome the fundamental attribution error and to recognize the situational dependence (e.g., editing, selectivity) of the viewed content. We also advanced extant research by focusing on a more authoritative, platform-level disclaimer style. Finally, we included individuals' SCO as a potential moderator to explore whether a person's individual disposition to indulge in social comparisons would affect the effectiveness of the shown disclaimer.

In the second experiment, we expanded upon the theoretical foundation of the first study. As an advancement of our previous procedure, we implemented slightly longer cognitive interventions that educated participants about either the fundamental attribution error or the growth mindset concept. Based on its revealed importance in many SNS studies (e.g., De Vries et al., 2018; Kleemans et al., 2018), we again included SCO as a potential moderating variable. In the supplement, we provide an overview of all

variables and hypotheses of both experiments (see Tables S1 and S2). The reported research was conducted in Germany, adhering to local ethical guidelines and data protection policies.

Experiment 1

Experiment 1 was conducted in a 2 (intervention: disclaimer vs. control) × 2 (Instagram profile: upward vs. downward comparison standard) between-subjects design. Positive and negative affect, envy, self-esteem, and well-being served as dependent variables.

We hypothesized that presenting an Instagram profile filled with upward comparison cues would evoke more negative affect, less positive affect, more envy, lower self-esteem, and worse well-being than a profile filled with downward comparison cues (Hypothesis 1a–e). We further assumed social comparison to be the underlying mechanism and, thus, expected an indirect effect of the social comparison manipulation on the dependent variables via participants' individual social comparison experience (i.e., as how much better or worse do I perceive myself compared to the profile; Hypothesis 2). Next, we scrutinized the potential success of our intervention, expecting the effects of the shown profile to be mitigated by an authoritative disclaimer about the fake nature of Instagram (Hypothesis 3). Also, we hypothesized that SCO would moderate the effects of the shown profile (Hypothesis 4), as people who are high in SCO might be affected even more by upward and downward comparison cues. Finally, we strived to find out whether SCO would moderate the effects of the disclaimer; in our expectation, this could potentially go into both directions. Thus, we decided against a directional hypothesis and chose an explorative, open-ended research question instead (RQ1). For the full model, see Figure S2 in the supplement. Concluding our study design, participants' Instagram use and age were included as potential covariates.

Method

All study materials, including Instagram profiles, intervention, and measures, as well as the data and code can be found in the online supplement provided in the repository of the open science framework (OSF: https://osf.io/39qs5/).

Instagram profiles: Upward vs. downward comparison standard

Previous studies showed that health, traveling, and fitness are important topics for students and therefore dimensions that are likely to be used for social comparisons (Appel et al., 2015; Liu et al., 2018; Vogel et al., 2014). Based on previous research and the findings of a pilot study (see supplement S1 for details), we created two fictional Instagram profiles which were manipulated along two key dimensions: displayed lifestyle and social

feedback. Specifically, the pictures in the profile causing an upward comparison depicted a healthy, zestful, and active daily life. Comparable to the pilot study, the content included impressions of traveling, excercising, diligent studying, and a good, balanced diet, while the pictures in the profile triggering a downward comparison pictured the opposite (cf. Vogel et al., 2014). Further, posts in the upward condition had many "likes" and followers, whereas posts in the downward condition had few. Keeping the structure consistent, each profile entailed six pictures, representing different aspects of life, such as hobbies, food, and self-discipline (for examples see Figure S1 in the supplement). To prevent biases (e.g., based on attractiveness), no people were displayed. Profile gender was matched with the participants' gender by dynamically changing the names of the fictional profile owners. The stimulus material was pretested via short semi-structured interviews with a sample of students (n = 10) to ensure that the created profiles depicted a higher or lower comparison standard and, thus, increased the likelihood of upward or downward comparisons.

Intervention: Disclaimer vs. control

The short cognitive intervention (disclaimer vs. control) aimed at increasing participants' momentary awareness that many pictures on Instagram do not reflect reality. Participants received the following reminder before viewing the Instagram profile: "Important notice: Please note that research has shown that many Instagram users only present themselves in the best light on their profiles. Pictures are often heavily edited and reflect only a selective or skewed version of users' reality of life." It was prominently displayed in large letters on the same page as the Instagram profile. In contrast to previous studies, which included disclaimers as personal comments of the SNS user who posted the respective content, our disclaimer appeared as a more global statement regarding SNS content in general. Participants in the control group received no such disclaimer.

Measures

All instructions and measures were presented in German. If no validated measure was available in German, original items were translated by three independent translators who were fluent in both English and German (committee scale translation method; Van de Vijver & Leung, 1997). To test the assumed underlying structure of our measurements, we conducted confirmatory factor analyses (CFA) for our mediators, moderators, and dependent variables (see Table S3 in the supplement). Descriptive statistics, internal consistencies (Cronbach's α), and correlation coefficients are provided in Table 1.

Table 1. Experiment 1: internal consistencies, descriptive statistics, and zero-order correlations.

		Upward comparison		Downward comparison								
		Intervention (n = 95)	Control (n = 95)	Intervention (n = 106)	Control (n = 95)	2	3	4	5	6	7	8
	Cronbach's α	*M (SD)*	*M (SD)*	*M (SD)*	*M (SD)*	*r*	*r*	*r*	*r*	*r*	*r*	*r*
1. Individual social comparison experience	.84	5.91 (1.48)	5.43 (1.23)	7.11 (1.41)	6.92 (1.69)	.25***	−.03	−.38***	.29***	.35***	−.03	−.18**
2. Positive Affect	.88	2.80 (0.74)	2.75 (0.77)	2.94 (0.78)	2.75 (0.73)	–	.06	−.06	.28***	.40***	.01	−.15**
3. Negative Affect	.86	1.45 (0.46)	1.56 (0.64)	1.53 (0.61)	1.56 (0.58)		–	.11*	−.40***	−.36***	.09	.16**
4. Envy	.84	2.01 (0.86)	2.10 (0.70)	1.48 (0.51)	1.48 (0.43)			-	−.27***	−.24***	.16**	.33***
5. Self-Esteem	.89	3.26 (0.51)	3.19 (0.57)	3.21 (0.65)	3.27 (0.58)				-	.64***	−.08	−.35***
6. Well-being	.90	3.62 (0.57)	3.60 (0.65)	3.60 (0.57)	3.63 (0.59)					-	−.04	−.24***
7. Instagram Use	.84	3.24 (0.79)	3.37 (0.82)	3.20 (0.94)	3.30 (0.87)						-	.25***
8. Social Comparison Orientation	.83	3.22 (0.69)	3.38 (0.69)	3.23 (0.72)	3.31 (0.68)							-

*p < .05, **p < .01, ***p < .001. M, SD and correlations with Instagram use are based on n = 324 who reported that they use Instagram.

Individual social comparison experience (State). We adapted the *Social Comparison and Interest Scale* (SCIS; Thwaites & Dagnan, 2004) to assess individual social comparison experiences in the relevant dimensions (e.g., health behavior). It enquires about people's self-evaluation compared to the seen profile. The scale consists of six items, asking participants to rate themselves on a bipolar ten-point scale in relation to the previously seen profile (e.g., "In comparison . . . I feel less/more sporty.").

Affect. The *Positive and Negative Affect Schedule* (PANAS; Watson, Clark, & Tellegen, 1988; German version: Krohne, Egloff, Kohlmann, & Tausch, 1996) was used to assess the momentary affective state (short-term instruction: "How do you feel at this moment?"). Participants indicated on a five-point scale (1 = *not at all;* 5 = *extremely*) the extent to which they currently experienced ten positive (e.g., enthusiastic, active) and ten negative (e.g., distressed, hostile) mood states. A positive affect (PA) and a negative affect (NA) score were computed for each participant.

Envy. Envy was assessed with seven items taken from previous research (Appel et al., 2015). Items were answered on a seven-point scale (1 = *not at all;* 7 = *perfectly*).

Self-esteem. The *Rosenberg Self Esteem Scale* (German Version: Collani & Herzberg, 2003) was used to assess participants' self-esteem with ten items answered on a 4-point scale (1 = *strongly disagree;* 4 = *strongly agree*). Half of the statements reflect what persons with a high level of self-esteem would agree with (e.g., "I have a positive attitude towards myself."). The other half represents a rather low self-esteem (e.g., "I feel useless, from time to time."); these items were reversed.

Well-being. Participants' well-being was assessed with the *Warwick-Edinburgh Mental Wellbeing Scale* (Tennant et al., 2007). It consists of 14 items, addressing thoughts and feelings that occurred during the previous week (e.g., "I felt loved") and uses a five-point scale (1 = *never;* 5 = *always*).

Social comparison orientation. The *Iowa-Netherlands Comparison Orientation Measure* (INCOM; Gibbons & Buunk, 1999; German version: Schneider & Schupp, 2011) was used to measure the trait-like tendency to social comparison. The scale consists of eleven items (e.g., "I often compare myself to others in terms of what I have accomplished in my life.") which are assessed on a five-point scale (1 = *strongly disagree;* 5 = *strongly agree*).

Instagram use. Participants' Instagram use was assessed with the *Instagram Intensity Scale* (Stapleton et al., 2017), based on the level of agreement with six statements concerning the social network (e.g., "I feel I am part of the Instagram community.") rated on a five-point scale (1 = *strongly disagree;* 5 = *strongly agree).*

Participants and procedure

An a-priori sample size calculation (G*Power; Faul, Erdfelder, Lang, & Buchner, 2007) suggested a minimum sample size of 249 participants for small multivariate effects of $f^2 = .05$ (with $\alpha = .05$, $1\text{-}\beta = .95$). As we had expected significant dropout rates and incomplete data, we decided to oversample by 30%. Participants were recruited via SNS (i.e., posting the study link in different networks, e-mail lists, and groups; snowball sampling); $N = 391$ completed the study (age range: 14 to 59 years, $M = 27.50$ years, $SD = 8.55$; 70.6% female). The majority of the sample was highly educated ($n = 284$ had a high-school or college degree). The study was conducted online. Participation was voluntary and anonymous, with no payment. All ethical guidelines and data protection policies were met. Participants were informed that the study aimed at investigating people's perception of Instagram profiles. After giving their informed consent, they provided their demographic information (age, gender, and education) and indicated which SNS they used. Instagram users ($n = 324$) were subsequently asked to complete the Instagram Intensity Scale. Participants were then randomly assigned to one of the following four conditions. They either received the short disclaimer before viewing one of the Instagram profiles (upward comparison vs. downward comparison), or they did not receive any reminder before seeing one of the profiles. Participants were instructed to closely inspect the profile and to memorize as much as possible, since they would be asked to answer questions about it afterward. Next, the adapted SCIS and the DVs (i.e., affect, envy, self-esteem, and well-being) were presented in a random order. Finally, participants filled in the INCOM before being thanked, debriefed, and provided with contact information for questions.

Results

To test our hypotheses, we conducted path analyses using AMOS 26 for SPSS with a maximum likelihood estimation. The model fit was examined following the criteria for a good model fit, suggested by Hu and Bentler (1999): a root mean square error of approximation (RMSEA) of $\leq .06$, a comparative fit index (CFI) of $\geq .95$ and a standardized root mean square residual (SRMR) $< .08$. All models include the covariance between the dependent variables. See Tables S4–S6 in the

supplement for an exhaustive list of all direct effects of the path analyses. Additional analyses (i.e., MANOVA) are provided in the supplement S2. All results remained as reported when controlling for Instagram intensity and age.

Manipulation check: Individual social comparison experience

Participants in the downward comparison group rated themselves significantly better on the SCIS (ten-point scale) than participants in the upward comparison group, $F(1,387) = 82.16$, $p < .001$, $\eta_p^2 = .18$. As such, our manipulation of directional social comparison cues can be deemed successful. Notably, there was also a small main effect of the intervention, as participants in the disclaimer group rated themselves significantly better than those in the control group, $F(1,387) = 5.10$, $p = .024$, $\eta_p^2 = .01$. The interaction between comparison condition (upward vs. downward) and intervention (disclaimer vs. control) was not significant, $F(1,387) = 0.98$, $p = .323$, $\eta_p^2 = .00$. Pairwise comparisons revealed that people in the upward comparison group who received a disclaimer reported a more positive individual social comparison experience than those who did not receive a disclaimer, $p = .024$, 95%CI [.06; .90]. This difference was not significant among the participants in the downward comparison condition, $p = .364$, 95%CI [–.22; .59].

Main effects of comparison standard and intervention

Model 1 (Table S4) tested the effects of the shown Instagram profile (upward vs. downward comparison standard; dummy coded) and our intervention (disclaimer vs. control group; dummy coded) on PA, NA, envy, self-esteem, and well-being (all z-standardized). The experimental model shows excellent model fit: $\chi 2\ (1) = 0.29$, $p = .589$, CFI = 1.00, RMSEA = .00, SRMR = .01. However, this may be partially attributed to the structure of our hypotheses and the resulting low restrictiveness of the model. The direct path coefficients revealed that the effect of the upward vs. downward comparison standard was only significant for envy ($b = -.82$, $p < .001$). As hypothesized, participants in the downward comparison condition reported less envy than participants presented with an upward comparison standard. Thus, Hypothesis 1 could only be supported for envy, but not for affect, self-esteem, and well-being. The disclaimer intervention did not significantly predict the dependent variables. Hence, Hypothesis 3 was not supported.

Indirect effects via individual social comparison experiences

In Model 2 (Table S5), we also examined the indirect effect of the profile (upward vs. downward comparison standard; dummy coded) on the DVs (z-standardized) via participants' individual social comparison experiences (SCIS; z-standardized). The model fit decreased but remained good: $\chi 2$

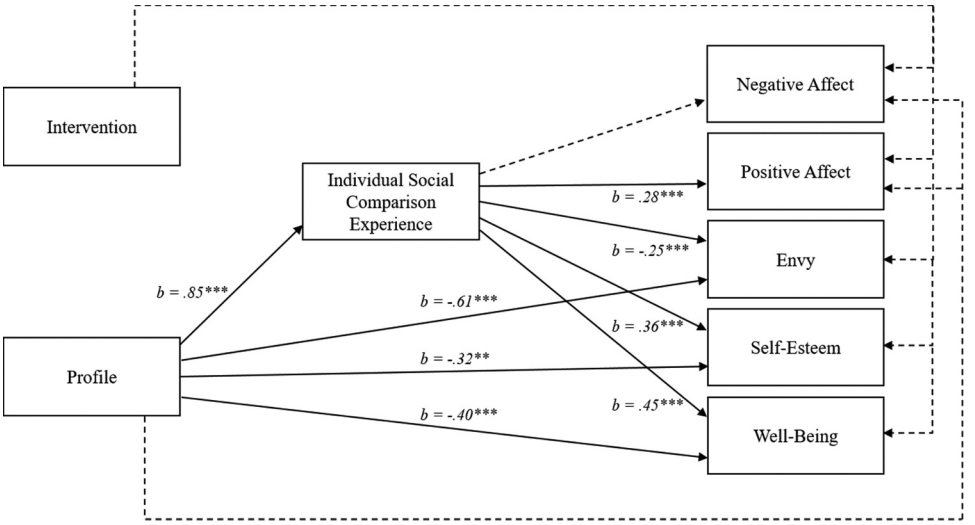

Figure 1. Experiment 1, Model 2: path analysis of mediation model.
Note. Intervention (0 = control group, 1 = experimental group), Profile (0 = upward comparison, 1 = downward comparison). Dotted lines display insignificant effects. Covariances between all DVs are considered in the model but not displayed. *p < .05, **p < .01, ***p < .001.

(2) = 5.27, p = .072, CFI = 1.00, RMSEA = .07, SRMR = .02. We examined the indirect effect of the shown profile using bootstrapped confidence intervals (5000 iterations; bias corrected). Providing support for Hypothesis 2, the indirect effect of the downward comparison standard via individual social comparison experience increased PA (b = .22, 95%CI [.13; .34]), decreased envy (b = −.21, 95%CI [−.34; −.11]), and led to both higher self-esteem (b = .29, 95%CI [.19; .43]) and well-being (b = .36, 95% CI [.24; .51]). All significant direct effects are displayed in Figure 1.

Moderating effect of social comparison orientation

In Model 3 (Table S6), SCO (z-standardized) was added as a potential moderator of the effects caused by the shown profile. Finally, we checked for possible interactions between the intervention and the profile or SCO. The model fit decreased to: $\chi 2$ (14) = 122.05, p < .001, CFI = .94, RMSEA = .14, SRMR = .08. Providing partial support for Hypothesis 4, there was a significant interaction of SCO and the upward vs. downward comparison standard on PA (b = −.25, p= .006) and envy (b = −.33, p< .001). Participants in the downward comparison group experienced more PA if they were low in SCO; in the upwards comparison group, people who were high in SCO reported more envy. Further, higher SCO significantly predicted lower self-esteem and more envy, independently of the comparison condition. Regarding our open

research question, SCO did not moderate the disclaimer intervention effect on any of the DVs. Finally, there was no significant interaction between the intervention and the shown profile.

Discussion of Experiment 1

The results of Experiment 1 provide evidence that upward comparison cues (compared to downward comparison cues) on SNS have negative consequences and are associated with lower self-esteem and lower well-being, as well as more envy. Overcoming the limitations of correlational research designs, we were able to demonstrate in an experimental design that it was indeed participants' self-evaluation compared to the seen profile and, thus, their experience of social comparisons that underpinned this effect. We observed that our comparison manipulation exerted an even stronger effect on PA and envy among people with a stronger trait-like tendency to socially compare. This extends our knowledge of how individual differences between SNS users shape their experience of the presented content.

The short intervention in the form of a general disclaimer, however, showed no effect on any of the dependent variables. Despite our expectations that the more authoritative nature of our added disclaimer would turn out more successful than individual disclaimers of particular social media users, we have to note that our method echoes previous efforts using individual disclaimers, which failed to mitigate social comparison processes (e.g., Danthinne et al., 2020; Livingston et al., 2020). Considering explanations for this finding, we would like to highlight that social comparison behavior is typically consolidated over a long period of time; as such, a brief intervention in the form of a three-line statement may simply be too weak to address this stable behavior. Maybe even more problematically, researchers have argued that in some instances disclaimers may even have negative consequences for viewers (cf. McComb & Mills, 2020), as they encourage a closer examination of the content and, paradoxically enough, increase the perceived realism or familiarity of an uploaded picture or message (e.g., Ecker et al., 2019; Tiggemann & Brown, 2018). Although this was luckily not the case in our study – the developed disclaimer intervention did not enhance the negative effects of the upward comparison profile – observations such as these certainly caution against the idea of using SNS disclaimers carelessly. At the same time, we still believe that supporting users in better coping with highly frequent upward social comparison cues remains the most promising approach to counteract negative well-being and health effects, since it is unlikely that distorted self-portrayals on SNS will disappear in the near future (Arendt et al., 2016).

Considering methodology, it needs to be noted that our study did not feature a manipulation check to make sure that participants had actually read the information. Thus, it is possible that participants only skimmed

over the disclaimer but did not cognitively process the information deeply enough, which could prevent a meaningful effect on the following social media content. Alternatively, participants may have been unsure how to process the information, as the disclaimer only told them that "pictures are often heavily edited (. . .)," but not that they therefore should be cautious when viewing such images. Thus, apart from the presumed ineffectiveness of the method in general, there are a few alternative explanations as to why our specific manipulation might not have worked. For our second experiment, we made sure that these observations informed the design of a potentially better intervention.

Finally, some operationalizations may have not been ideal. Regarding participants' individual social comparison experience, both sub-groups scored on, or above, the theoretical scale mean (i.e., 5.5 on a ten-point scale): On average, participants in the upward comparison group rated themselves as being similar to the displayed profile, while participants in the downward comparison group rated themselves as being better than the displayed profile. This indicates that the presented upward comparison stimulus material did not portray an overly optimized, but rather a realistic and attainable lifestyle for our participants. This may have limited the consequences that resulted from social comparisons. Moreover, the scales assessing well-being and self-esteem might not have been sensitive enough to assess momentary changes. In particular, we note that the timescale of the well-being measurement appears less-than-ideal, as it did not assess momentary well-being; instead, it asked for an evaluation of one's subjective well-being during the past week. Theoretically, we assumed that this type of measure would still be influenced by our intervention, as cognitive countermeasures should also affect the retrospective assessment of one's own life situation. Yet, this was not the case, so that we must deem the operationalization of well-being in Experiment 1 as suboptimal. Additionally, on the negative affect scale the low means and little variance indicated floor effects. Accordingly, we decided to run a second experiment with a more intense intervention and several other improvements (i.e., manipulation checks, state-sensitive DVs).

Experiment 2

The second experiment aimed at probing two longer and more intense interventions in the form of educating about cognitive biases and mindsets, using a one-factorial three-group between-subjects design (intervention: "fundamental attribution error" vs. "growth mindset" vs. control group). Although the content of the two cognitive interventions differed slightly, we ultimately expected them to work in a similar manner, as teaching participants about (a) the fact that behavior does not necessarily depend on dispositional factors, or (b) the idea that personal ability is a flexible construct that can be shaped, should both increase internal control beliefs and thus, foster resilience against

social comparisons. As we assumed that once the lifestyle or personal attributes portrayed in an Instagram post appeared more attainable to our participants – either because they better understood the importance of situational factors, or because they were reminded of the general changeability of personal ability – we expected a reduction of the negative outcomes that typically occur through upward comparisons.

Following our decision to streamline the explored model, only upward comparisons were triggered this time. Furthermore, we adjusted our DVs based on the findings and limitations of Experiment 1 (see previous Discussion chapter). We decided to focus only on envy, which was shown to be state-sensitive in Experiment 1, as well as a state-sensitive measure of self-esteem. In terms of hypotheses (see Figure S3 in the supplement for the full model), we expected both the *cognitive bias* and the *mindset* intervention to be associated with lower envy and higher state self-esteem compared to the control condition (Hypothesis 1). We further expected indirect effects of the intervention on the dependent variables via participants' individual social comparison experience, as well as their perceived chance of personal growth (Hypotheses 2a/b). Again, SCO was examined as a potential moderator (RQ1). Moreover, a measurement of the participants' control beliefs served as a manipulation check concerning our cognitive intervention. Completing our study design, trait self-esteem, Instagram use, age, and personal importance of the comparison dimensions were included as potential covariates.

Method

All study materials, including Instagram profiles, intervention, and measures, as well as the data and code can be found in the online supplement provided in the OSF. To test the assumed underlying structure of our measurements, we conducted CFAs for our mediators, moderators, and dependent variables (see Table S7 in the supplement).

Instagram profile: Upward comparison standard

To increase external validity, we created and pretested another Instagram profile based on the upward comparison profile used in Experiment 1. The pretest (n = 23, within-subject design) revealed that both profiles triggered comparable individual social comparison experiences (DV: SCIS; Profile 1: M = 5.04, SD = 1.62; Profile 2: M = 5.07, SD = 1.48). Participants were randomly assigned to see one of the two analogous profiles (i.e., the profile used in Experiment 1 or the new profile) triggering upward comparisons regarding a healthy and active lifestyle. As there were no statistical differences between the two profiles, they were combined into a single factor in the analyses. As in Experiment 1, participants viewed a gender-matched Instagram profile to avoid gender-effects.

Intervention: Fundamental attribution error vs. growth mind-set vs. control

The interventions consisted of two steps: education and consolidation. This combination has been shown to be effective in previous research (Stewart, Latu, Kawakami, & Myers, 2010). First, participants were presented a short informative text to increase knowledge and awareness about cognitive biases. Depending on the group, the text described either the fundamental attribution error or the controllability of personal abilities (fixed vs. growth mindset). The control group read a text about Instagram in general, which mostly included statistical information about the SNS. To consolidate the information and to apply it to Instagram user behavior, all groups were given a sentence completion task with four sentences based on the topic of their text (same sentences in both experimental groups, e.g., "If they wanted to, most people could present themselves in a positive light on Instagram, by … " vs. in the control condition, e.g., "Instagram offers many good functions, such as … "). Taken together, the two steps aimed at creating a deeper understanding that should change participants' point of view and thus, their attribution of positively biased SNS content (at least on a short-term basis).

Measures

Again, all instructions and measures were presented in German. If not available in German, scales were translated using the committee scale translation method (Van de Vijver & Leung, 1997). Descriptive statistics, internal consistencies (Cronbach's α), and correlation coefficients are reported in Table 2.

Internal control beliefs. Participants' internal control beliefs (indicating the success of our cognitive intervention) were assessed on the *internal-external control belief scale* (IE-4; Kovaleva, Beierlein, Kemper, & Rammstedt, 2014). All four items (e.g., "If I work hard, I will succeed.") were answered on a five-point scale (1 = *strongly disagree*; 5 = *strongly agree*).

Individual social comparison experience (state). To assess participants' social comparison experience with the shown profile, an extended version of the SCIS (Thwaites & Dagnan, 2004; see Experiment 1) was administered. Participants were asked for a self-evaluation in comparison with the previously seen profile based on six aspects (i.e., intelligence, sporty, emotionally stable, disciplined, health-conscious, social). They were also asked to indicate how likely they considered a personal change in the respective aspects (indicating an inspirational effect of the profile), as well as the personal importance of the different aspects. A bipolar ten-point scale was provided (1 = *very unlikely/not at all important*; 10 = *very likely/very important*).

Envy. The same scale as in Experiment 1 was used.

Table 2. Experiment 2: internal consistencies, descriptive statistics, and zero-order correlations.

		Fundamental attribution Error(n = 65)	Growth mind-Set (n = 64)	Control Group (n = 55)	2	3	4	5	6	7	8	9
	Cronbach's α	*M(SD)*	*M(SD)*	*M(SD)*	*r*	*r*	*r*	*r*	*r*	*r*	*r*	*r*
1. Internal control beliefs	.66	3.76 (0.56)	3.74 (0.67)	3.85 (0.65)	.29***	.00	.23**	−.31***	.52***	.58***	.08	−.12
2. Individual social comparison experience	.78	5.64 (1.65)	5.29 (1.35)	5.76 (1.30)	–	.07	.45***	−.15*	.42***	.39***	.11	−.01
3. Perceived chance of personal growth	.77	5.84 (1.57)	6.19 (1.51)	5.96 (1.48)		–	.29***	.23**	−.10	−.00	.14	.20**
4. Personal importance of comparison dimensions	.73	7.25 (1.43)	7.43 (1.02)	7.54 (1.38)			–	−.01	.19*	.24**	.18*	.13
5. Envy	.89	2.36 (0.89)	2.59 (1.07)	2.73 (1.23)				–	−.36***	−.33***	.25**	.32***
6. State Self-Esteem	.90	3.54 (0.63)	3.39 (0.64)	3.42 (0.60)					–	.80***	−.12	−.24**
7. Trait Self-Esteem	.91	3.10 (0.60)	2.95 (0.66)	3.03 (0.61)						–	.00	−.15*
8. Instagram Use	.90	3.18 (1.05)	3.16 (0.96)	3.28 (0.96)							–	.34***
9. Social comparison orientation	.72	3.12 (0.68)	3.26 (0.70)	3.32 (0.67)								–

*p < .05, **p < .01, ***p < .001.

Self-esteem (state). Current feelings of self-esteem (20 items; e.g., "I feel confident about my abilities"; "I feel frustrated or rattled about my performance.") were measured on the *State Self-Esteem Scale* (Heatherton & Polivy, 1991). A five-point scale (1 = *not at all*; 5 = *extremely*) was provided.

Self-esteem (trait). As a control variable, the *Rosenberg Self-Esteem Scale* was used to assess participants' trait self-esteem (see Experiment 1).

Social comparison orientation. SCO was assessed with a short form of the INCOM, consisting of six items (Schneider & Schupp, 2011).

Instagram use. The same scale as in Experiment 1 was used.

Participants and procedure

An a-priori sample size calculation (G*Power) suggested that for a small effect of $f^2 = .05$ (with $\alpha = .05$, $1\text{-}\beta = .95$), a sample size of 189 participants was needed. Basing our recruitment on the *Clickworker* participant panel, $N = 205$ participants completed the online study, receiving €1.50 for their participation. All ethical guidelines and data protection policies were met. To ensure good data quality, a total of $n = 21$ individuals were excluded because they failed the attention tests ($n = 8$), did not complete all assignments of the intervention ($n = 5$), and/or completed the study multiple times ($n = 13$). Thus, the final sample consisted of $n = 184$ SNS users aged 18 to 39 years ($M = 27.49$, $SD = 5.60$, 50.0% female). Again, the majority of the sample was highly educated ($n = 125$ had a high-school or college degree; $n = 40$ completed vocational training). After giving their informed consent, participants provided their demographic information (age, gender, education, SNS use) and completed the Instagram Intensity Scale. Then, they filled in the INCOM and the Rosenberg Self-Esteem Scale. Participants were randomly assigned to one of the three intervention conditions ("fundamental attribution error" vs. "growth mindset" vs. control group), including the informative text and the sentence completion task with four sentences which were to be completed in open text fields. The intervention was followed by the manipulation check (IE-4). Then, participants viewed one of the two analogous Instagram profiles that triggered an upward comparison. Afterward, people were asked to answer three questions about the profiles (attention check). Participants who failed to answer at least two questions correctly were excluded from the statistical analyses, indicating that they had not looked at the profiles properly and thus, not processed them deeply enough. Subsequently, the SCIS, the envy scale, and the state self-esteem scale were administered as dependent variables. Next, participants were provided with an open text field for comments, in

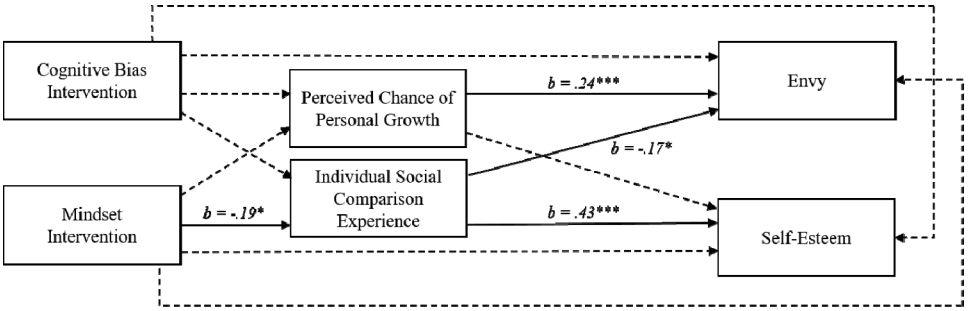

Figure 2. Experiment 2, Model 2: path analysis of mediation model. *Note*. Cognitive Bias Intervention: −1 = control group, 0 = growth mindset, 1 = fundamental attribution error. Mindset Intervention: −1 = control group, 0 = fundamental attribution error, 1 = growth mindset. Dotted lines display insignificant effects. Covariances between the DVs are considered in the model but not displayed. *$p < .05$, **$p < .01$, ***$p < .001$.

which they could indicate their thoughts on the study or request their data to be deleted. Finally, they were thanked, debriefed, and provided with contact information for questions.

Results

Again, we conducted path analyses using AMOS 26 for SPSS with a maximum likelihood estimation to test our hypotheses. The intervention was effect-coded, resulting in two dummy variables (I1: control = −1, fundamental attribution error = 1, growth mindset = 0; I2: control = −1, fundamental attribution error = 0, growth mindset = 1). All regression coefficients of the path analyses are displayed in Tables S8–S10 in the supplement. Additional analyses (i.e., MANOVA) are provided in the supplement S3.

Manipulation check: Internal-external control beliefs (IE-4)

Participants in the fundamental attribution error group and the growth mind set group did not differ significantly from the control group regarding the IE-4, $F(2, 181) = 0.44$, $p = .645$, $\eta_p^2 = .01$. As such, our cognitive intervention cannot be considered successful.

Direct and indirect intervention effect

Model 1 (Table S8) tested the effects of our intervention ("fundamental attribution error" vs. "growth mindset" vs. control group; effect coded) on envy and state self-esteem (all z-standardized). Participants in the fundamental attribution error group reported significantly less envy ($b = -.19$, $p = .042$). However, this effect did not recur in the following

extended models. The model revealed no other significant effect of the intervention on the DVs. Hence, Model 1 had no good fit: $\chi 2$ (1) = 43.09,p< .001, CFI = .38, RMSEA = .48, SRMR = .15.

In Model 2 (Table S9), the inclusion of participants' individual social comparison experiences and perceived chance of personal growth improved the model fit, yet it remained low: $\chi 2$ (2) = 44.45, p < .001, CFI = .62, RMSEA = .34, SRMR = .11. Surprisingly, participants in the growth mindset group rated themselves less positive on the SCIS than participants in the control condition (b= −.19, p= .038). People who rated themselves better on the SCIS reported less envy (b = −.17, p= .016) and higher state self-esteem (b = .43, p < .001). Further, people who reported a higher perceived chance of personal growth reported more envy (b = .24, p< .001) and a tendency to lower state self-esteem (b = −.13, p = .057). Bootstrapped confidence intervals (5000 iterations; bias corrected) revealed a small significant indirect effect of the growth mindset intervention on envy (b = .06, 95%CI [.00; .14]) and self-esteem (b = −.10, 95%CI [−.20; −.01]), although in the opposite direction as hypothesized. Thus, Hypotheses 1 and 2 were not supported. All significant direct effects are displayed in Figure 2.

Moderation effect of social comparison orientation

In Model 3 (Table S10), SCO (z-standardized) was added as a potential moderator. Still, the model fit did not meet the criteria of a good model: $\chi 2$ (13) = 100.88, p < .001, CFI = .49, RMSEA = .19, SRMR = .11. While higher SCO significantly predicted both higher envy (b = .27, p< .001) and lower state self-esteem (b = −.22, p < .001), there was no significant interaction of SCO and the intervention. The effect of SCO on envy disappeared when we controlled for age, trait self-esteem, Instagram use, and personal importance of the comparison dimensions.

Discussion of Experiment 2

In Experiment 2, we introduced a more extensive cognitive intervention which aimed at educating participants about either the fundamental attribution error or the concept of a growth mindset (vs. control). These cognitive counter-strategies aimed at supporting people to reframe social comparison information on SNS and thus, to mitigate its effects. Similar to Experiment 1, however, Experiment 2 revealed no significant intervention effect. Also consistent with Experiment 1, SCO significantly predicted envy and self-esteem – yet there was no significant moderation effect.

The null finding regarding our developed cognitive intervention seems surprising, as methodologically similar interventions in other contexts were able to reduce deeply internalized reactions such as automatic stereotyping

(Stewart et al., 2010). We would have expected that the negative consequences of social comparisons among our participants could also have been mitigated by the conducted intervention. However, some answers to the sentence completion task and the open-ended question at the end of our questionnaire suggest that participants may not have been able to relate the information of the informative texts to their personal social comparison experiences or the polished self-presentation behavior of people on Instagram. Instead, many of them expressed their anger toward people who present themselves in an overly positive manner on SNS. This suggests that future interventions might also need to target *emotional* responses among SNS users (and not only cognitive factors) in order to come into full effect. In a similar vein, we suggest that the small and surprisingly reversed effect of the growth mindset intervention could stem from a misinterpretation of the intervention: Participants may have thought that they do not achieve the presented lifestyle because they are not trying hard enough, yet others are – leading to frustration and, in turn, to even more negative outcomes. Thus, we recommend that future studies should focus on tasks that encourage recipients to explicitly call upon their own thoughts, feelings, and behavior in situations involving social comparisons. This could be done by asking them to write short statements about themselves or using think-aloud methods.

General Discussion

Previous studies suggest that virtual social comparison behavior may be accompanied by quite worrisome consequences, as viewing social media content affects people's self-perception on numerous levels. In an attempt to counteract these effects, we introduced two distinct counterstrategies. These took the form of either a general disclaimer (Experiment 1) or a more thorough intervention based on informing about cognitive biases and mindsets (Experiment 2). Going beyond previous research in this area, we did not restrict our focus merely to the body image of female participants. Instead of displaying beautified or overly thin women, our Instagram manipulation triggered upward comparisons regarding a healthy and active lifestyle. We believe that this adds to the generalizability of our findings.

In yet another shortcoming of previous research, we note that most extant studies on the effects of virtual social comparisons relied on correlational designs and cross-sectional survey data. This made it impossible to interpret the observed relations in a causal manner. Only recently, a growing number of studies have shifted their focus to experimental methods to reveal more concrete evidence for the proposed effects (e.g., De Vries et al., 2018; Engeln, Loach, Imundo, & Zola, 2020; Liu, Li, Carcioppolo, & North, 2016). Building upon these efforts,

we conducted two experiments to examine a) individual social comparison experiences as the underlying mechanism of negative consequences of viewing positively biased Instagram content and b) the effects of two cognitive interventions.

First, our results show (in line with earlier findings, e.g., Appel et al., 2016; Stapleton et al., 2017; Tiggemann & Zaccardo, 2016) that upward comparisons on SNS can have negative affective consequences for recipients. Across both experiments, this relationship was even more pronounced for people with a stronger trait-like tendency to social comparison (i.e., SCO). Further, users' individual social comparison experience (i.e., rating oneself better or worse than the comparison target) was identified as a significant mediator between the shown Instagram content (upward vs. downward comparison standard) and the dependent variables PA, envy, self-esteem, and well-being. As such, we present our findings as a notable confirmation of the relevance of social comparison theory in the context of SNS use.

Probably the most crucial finding was that none of our introduced interventions could reduce the detrimental effects of participants' upward comparisons with the displayed Instagram content. This provides new evidence that the effects of virtual social comparisons are indeed quite stable, possibly even immune against reflective, metacognitive thoughts. However, while single-exposure interventions such as the methods employed in the current research might not be overly effective in alleviating upward social comparison effects, longer and more intense interventions (e.g., based on cognitive restructuring) might emerge as a promising next step to counteract negative consequences of social comparisons on SNS. We think it could be particularly helpful to design new interventions around both cognitive and affective elements. Similarly, novel approaches could acknowledge recent research on the inspirational nature of Instagram (e.g., Meier et al., 2020; Meier & Schäfer, 2018). If SNS users could be nudged toward considering the shown content as motivational stimulation or to be happy about the already positive aspects of their own lives – both logical advancements of our "cognitive mindset" intervention – a successful counterstrategy against malicious envy or the loss of self-esteem could indeed be developed. Naturally, it is important to distinguish any future efforts in this regard from the so-called *thinspiration* and *fitspiration* movements on Instagram, which have garnered a lot of negative attention (both publicly and scientifically) in recent years (e.g., Griffiths et al., 2018). However, by focusing on the inspirational qualities of lifestyle, food, travel, and health content, we believe that considerably more positive outcomes might be fostered.

In any case, future intervention studies need to expend their best efforts to remain ecologically valid. At the current time, it seems highly improbable that social networking providers will be interested in including lengthy and tedious cognitive interventions into their platforms. As such, these kinds of countermeasures might be better suited for a different context, for instance, as compulsory trainings in schools. On the other hand, the fact that Instagram has recently started to remove public "like" counts from its service to counteract the platform's potential negative effects (Meisenzahl, 2019) clearly shows that the industry is well aware of the discussed issue – and might be willing to help alleviating it.

Limitations and Future Research Directions

Although we strived to conduct methodologically sound studies with ecologically valid materials, some limitations need to be noted. First, our participants only viewed fictional Instagram profiles that they had no personal association with. To us, it stands to reason that social media content by friends or other positively associated accounts might exert quite different effects, which might serve as the ignition point for new research (e.g., considering tie strength as an important mediator). Additionally, looking at only one Instagram profile in depth constitutes a rather artificial setting; users typically browse their timeline in a more extensive way, viewing the content of multiple people. This limits the generalizability and external validity of our findings. Second, our recruited samples reflect only a small part of the population of Instagram users, suggesting that further studies should address more diverse groups of participants. Especially in terms of age, participants may be more or less susceptible to the influence of both comparison cues and interventional approaches.

Finally, and maybe most importantly, we need to address potential limitations in our intervention strategies. Although we strove to base the developed cognitive techniques on both theoretical and empirical findings, it still needs to be noted that the employed strategies present only two relatively brief interventions out of a pool of potential options. Apart from the suggestions mentioned above (i.e., cognitive restructuring training that occurs over prolonged periods), researchers might also want to explore more positively framed approaches. Building on contemporary phenomena such as body positivity (e.g., Cohen et al., 2019) or inspirational effects of Instagram could be an example of this (i.e., differentiating between malicious envy and benign envy; Meier & Schäfer, 2018). Furthermore, as an alternative strategy, we suggest that self-affirmation interventions could be an effective method of protecting users' self-esteem if confronted with positively biased social media content. Lastly, we would like to point out that interventions presenting visual

material could be more appropriate for a visual platform like Instagram. Graphic disclaimers building upon the current "Instagram vs. Reality" trend might turn out as an entirely different success story.

Conclusion

Without a doubt, scientific efforts to mitigate the negative impact of the highly prevalent practice of social comparisons on SNS will be most valuable to shield young people from feeling imperfect in a seemingly perfect environment. While attempts to intervene against the "darker side" of SNS use are still in their early stages – and findings such as the ones reported in this paper raise doubts on the power of potential counterstrategies – there are still numerous possibilities to explore for both researchers and industry professionals in this regard. Ranging from graphic intervention methods and new strategies that underscore the inspirational nature of SNS, to educational training in different contexts, we urge researchers to scrutinize new ways of guiding SNS audiences toward a healthy and beneficial use of the respective platforms.

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Data Availability Statement

The data described in this article are openly available in the Open Science Framework at https://osf.io/39qs5/.

Open Scholarship

This article has earned the Center for Open Science badges for Open Data and Open Materials through Open Practices Disclosure. The data and materials are openly accessible at https://osf.io/39qs5/.

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