Within the mind’s eye: Negative mental imagery activates different emotion regulation strategies in high versus low socially anxious individuals

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Abstract

Background and objectives: The link between social anxiety (SA) and maladaptive emotion regulation has been clearly established, but little is known about the spontaneous regulation strategies that may be activated during social stress by negative involuntary mental images and whether the nature of such strategies might distinguish individuals with high vs. low trait SA.

Methods: Participants with high (n = 33) or low (n = 33) trait SA performed an evaluative speech and reported whether they experienced an involuntary negative mental image during the task. They also rated their negative affect (NA) and positive affect (PA) and the extent to which they viewed their image as being controllable and malleable. Finally, they described the types of strategies they spontaneously used to try to control or change their image intrusions. Reported strategies were then subjected to a content analysis and categorized by blinded coders.

Results: Among high SA participants, image controllability was both diminished overall and positively correlated with PA. Whereas 90% of low SA individuals reported that they spontaneously self-regulated by altering the content or perceptual features of their images, only about half of the high SA participants used this strategy, with the other 50% reporting that they either suppressed their images or succumbed passively to them in whatever form they took.

Limitations and conclusions: Although these initial findings require replication in future experimental studies on clinical samples, they also help to enrich our understanding of the strategies that are commonly used by high and low SA individuals to manage their image intrusions during in-vivo stress and suggest potential avenues for future research on the role of imagery in adaptive and maladaptive emotion regulation.

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Most people, including both high and low trait socially anxious individuals, experience involuntary negative mental images in anxiety-provoking social situations (Chiupka, Moscovitch, & Bielak, 2012; Moscovitch, Gavric, Merrifield, Bielak, & Moscovitch, 2011). Such images are often derived from autobiographical memories of past negative events (see Brewin, Gregory, Lipton, & Burgess, 2010; Morgan, 2010) and may be experienced as highly symbolic visual scenes in which one “sees” oneself from an observer’s perspective behaving in an embarrassing or unacceptable manner (e.g., Hackmann, Clark, & McManus, 2000; Hackmann, Surawy, & Clark, 1998).

Although research has shown that the majority of people experience such images, studies also indicate that the impact of these images — across cognitive, emotional, and behavioral domains — may be considerably more toxic for those with higher levels of trait social anxiety (SA). Indeed, image intrusions in anxiety-provoking social situations have a much greater negative influence on high than low SA individuals’ views of themselves, others, and the world, even though the objective negative content of these images is virtually indistinguishable between the two groups (Moscovitch et al., 2011). Moreover, when high SA individuals or those with a clinical diagnosis of social anxiety disorder (SAD) are instructed to hold negative self-images in mind, they experience significant elevations in anxiety, increases in perceived visible symptoms of arousal, heightened self-critical appraisals, and greater social performance impairments compared to when they visualize control images (Hirsch, Clark, Matthews, & Williams, 2003; Hirsch, Meynen, & Clark, 2004; Stopa & Jenkins, 2007). In contrast, negative self-images may not impact low SA participants...
differently than control images (e.g., Vasilopoulos, 2005; but see also Makkar & Grisham, 2011).

What might account for the differential influence of negative images in high vs. low SA individuals? According to the combined cognitive biases hypothesis (Hirsch, Clark, & Mathews, 2006), one reason that high trait SA might exacerbate the impact of negative images is that imagery interacts with people’s existing cognitive biases to amplify their detrimental consequences. From this perspective, it is understandable that high SA individuals, who believe that they are socially awkward and undesirable across a number of different domains (Moscovitch, 2009; Moscovitch, Orr, Rowa, Gehring-Reimer, & Antony, 2009), would be negatively affected by mental image intrusions in which they appear socially incompetent or visibly anxious. In contrast, low SA individuals, who experience similar image intrusions, are likely more capable of recognizing them in the moment as being negatively biased self-representations that do not correspond to how they actually appear to others (or to themselves).

Thus, it seems that one critical difference between high and low SA individuals might be the extent to which they tend to appraise their images as being accurate self-representations that convey something meaningful about themselves and how they come across to others in social situations (see Clark & Wells, 1995). It is logical, therefore, that imagery rescripting (IR), a cognitive-behavioral intervention for SAD (Nilsson, Lundh, & Viborg, 2012; Wild & Clark, 2011; Wild, Hackmann, & Clark, 2007) and other psychological problems (see Arntz, 2012), is hypothesized to work by instilling a “meta-cognitive shift [in patients] towards seeing the distressing self as being the product of their own mind rather than mirroring reality” (Wild et al., 2007, p. 399). In essence, IR guides patients through an elaborate reappraisal process in which they are instructed to recount the earlier autobiographical memories upon which their images are based while adopting a “wiser” (i.e., a more balanced or realistic) and more self-compassionate present-day perspective. Through this process, patients are encouraged to gain greater objective distance from their negative images and to update their meaning (and that of the memories in which they are rooted) by actively transforming their content or features into a more benign form.

Although additional controlled studies are needed to conclude more definitively that IR is clearly efficacious in the treatment of SAD, the reappraisal processes which lie at the core of the intervention appear to be crucial for reducing the impact of negative autobiographical imagery in SAD. Following this premise, it is intriguing to ponder the types of self-regulatory strategies that individuals who have never received IR might use when their images intrude during social encounters. Because people both high and low in trait SA are generally quite motivated to make a positive impression on others in social situations, it is reasonable to assume that most, if not all, individuals would attempt to use some kind of compensatory strategy to cope with their image intrusions when they arise while they simultaneously try to stay engaged in the social encounter. Moreover, since people are generally motivated to experience positive emotions — and negative image intrusions have been shown in experimental studies to amplify and maintain negative affect and distress (see Holmes & Mathews, 2010) — it is likely that people who typically experience such intrusions have learned to use certain emotion regulation strategies to cope with them, even in the absence of any treatment. Cognitive reappraisal and expressive suppression are two such strategies that have received much attention in the literature (Gross, 1999). Research studies have consistently demonstrated that suppression, relative to reappraisal, is associated with greater negative affect, less positive affect, increased physiological arousal, poorer life satisfaction, higher levels of depression symptoms, and more interpersonal difficulties (Gross & John, 2003; Haga, Kraft, & Corby, 2009; Harris, 2001; Kashdan & Steger, 2006; Moore, Zoellner, & Mollenholt, 2008).

It is of interest, therefore, to investigate the nature and efficacy of these strategies in relation to negative imagery, and how they might distinguish high from low SA individuals. It is possible, for example, that low SA individuals might habitually initiate reappraisal processes to cope with their negative images that resemble those that characterize IR, whereas high SA individuals might be more likely to attempt to suppress or avoid their intrusive images when they arise, as they tend to do vis-à-vis their internal emotional responses within socially threatening contexts (see Werner, Goldin, Ball, Heimberg, & Gross, 2011), with deleterious consequences (Hofmann, Heering, Sawyer, & Asnaani, 2009).

Here, we present a preliminary study — to our knowledge, the first of its kind — which was designed to investigate: (a) the extent to which high and low SA individuals perceive their image intrusions as being controllable or malleable; (b) whether perceptions of image controllability are associated with experiences of positive and negative affect during social stress; and (c) the types of strategies participants report using in order to manage, control, or change spontaneous negative mental image intrusions when they arise during an in-vivo social task. Since socially anxious individuals are prone to perceiving social stress and their reactions to it as being relatively uncontrollable (see Hofmann, 2007), we hypothesized, first, that participants with high trait SA would also view their image intrusions as being less controllable or malleable than their low SA counterparts. Second, we predicted that across both groups of participants, increased image controllability would be associated with increased positive and decreased negative affect but that such associations would be particularly pronounced among high SA individuals. Third, we hypothesized that participants would report using a variety of self-regulatory strategies to manage their negative image intrusions that could be classified reliably into distinct categories, but that the nature of such strategies would distinguish high from low SA participants. Specifically, because high SA individuals habitually use maladaptive emotion regulation strategies to cope with social stress (see Hofmann, Sawyer, Fang, & Asnaani, 2012; Werner et al., 2011), we expected that they would be less likely than low SA participants to reappraise their images spontaneously and more likely to try to suppress or avoid them.

**Method**

**Participants**

Participants in the present study were among the 85 (39 high SA and 46 low SA) individuals who participated in a previously published study that investigated the retrieval properties of negative mental images and associated autobiographical memories accessed during an in vivo speech task (Chiupka et al., 2012). Sixteen of these participants (18.8%) were initially excluded from the current study, including 4 from the high SA group and 12 from the low SA group, because they did not report experiencing an image during the speech task. Of the remaining 69 participants who did endorse experiencing an image during the task, an additional 3 were excluded because they failed to answer (i.e., left blank) the questions about the nature of their spontaneous image coping strategies. Thus, our final sample for the present study consisted of 66 individuals (33 high and 33 low SA participants; comprising 77.6% of the original study sample).

Fifty (78.8%) of the participants in the present study were female, with a mean age of 19.18 (SD = 1.73; range = 17–27). Thirty (45.5%) participants identified their ethnic or racial background as Caucasian and 23 (34.8%) identified as Asian, with the remaining 13
(19.7%) reporting a mix of other backgrounds. Participants in the high and low SA groups did not significantly differ in gender, age, or ethnic/racial background, all p’s > .08. All participants provided informed consent and received partial course credit for their participation.

**Procedure and measures**

At the start of every semester, researchers in the Department of Psychology at the University of Waterloo administer several online screening measures, including the Social Phobia Inventory (SPIN; Connor et al., 2000), to students in the undergraduate psychology research pool. Respondents were invited to participate if they scored either above 30 (high SA) or below 12 (low SA) on the SPIN; however, the students themselves were unaware of these specific inclusion criteria. The SPIN was readministered at the time of the study (following the experiment) and individuals whose scores drifted from the required cutoffs were excluded, as described in Chiupka et al. (2012).

High and low SA participants were randomly assigned to one of two experimental conditions in which a trained experimenter who was blind to their SA status administered the Waterloo Images and Memories Interview (WIMI; Moscovitch et al., 2011) either right before they performed a three-minute videotaped speech (Anticipation condition) or immediately after they performed the speech (Post-Event Processing condition). The WIMI is a semi-structured interview recently developed to assess the presence and properties of mental images (and associated autobiographical memories) that individuals may experience during social situations. In the WIMI protocol, participants are initially instructed to recall whether or not they experienced a mental image within a particular context and, if an image was present, are then asked a number of specific probing questions about the nature of the recalled image (for complete details on WIMI administration and script, please see Moscovitch et al., 2011). Subsequently, participants are asked if they can identify a specific autobiographical memory associated with the existing image, and the recall and specific probe procedure is repeated with the memory. The original WIMI instructions include probes for images elicited within both anxiety-provoking and non-anxiety-provoking social contexts. In the present study, the experimental context was defined as the laboratory-based speech task and, as such, the WIMI instructions focused only on a single image (and associated memory) that each participant may have experienced specifically during anticipation or post-event processing of his or her speech. Following the standardized preamble in which the nature of a mental image was defined and relevant examples were provided, participants were asked directly: “Do you experience a mental image or picture of some sort when you think about the speech you will give/just gave?” The standard administration of the WIMI then continued for this image (and corresponding memory) in a manner consistent with the procedures described in Moscovitch et al. (2011).

The speech topic was why someone would want to become friends with me. To increase participants’ stress level and their motivation to make a good interpersonal impression during the task, participants were deceived to believe that other students would later watch the video of their speech and indicate whether they, indeed, wished to become friends with them.

Immediately following the retrieval of their image, participants completed self-report questions about its subjective properties. Whereas the original Chiupka et al. (2012) study investigated the extent to which participants experienced images during in-vivo social stress and how these images differed across time, experimental condition, and SA status, the focus of the current study was on the subjective controllability of participants’ images and the various strategies that high vs. low SA individuals might use to control or change them when they intrude. Participants who endorsed experiencing an involuntary image during speech anticipation or post-event processing were asked to rate each of the following image controllability questions on a 10-point Likert scale ranging from 1 (not at all) to 10 (extremely) with respect to that image: (a) While envisioning the mental image, I am able to change the mental picture I see; (b) While envisioning the mental image, I feel able to mentally change the details of the image itself; (c) I have control over when the mental image comes to mind; and (d) While envisioning the mental image, I can control how it impacts my mood (i.e., my emotional state). Following these questions, participants provided a written response to the open-ended question: In what ways are you able to control or change your image when it comes to mind?

Both immediately before and after the speech, participants completed the state version of the Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988). The PANAS instructs participants to rate their current feelings in correspondence with 10 positive mood adjectives and 10 negative mood adjectives on a 5-point Likert scale ranging from 0 (very slightly or not at all) to 4 (extremely). All study procedures were approved by the University of Waterloo’s Human Research Ethics Board. Participants were fully debriefed at the end of the study about the purpose and hypotheses of the experiment and were informed about the rationale for our use of deception. All participants provided renewed consent for our use of their data after learning that the video of their speech would not, in fact, be viewed by other students.

**Data preparation**

The four image controllability items were summed to create a single controllability composite score with values ranging from 4 to 40. This composite index demonstrated satisfactory reliability across the full sample (Cronbach’s alpha = .73) and in each of the groups separately (α’s = .69-.74).

Separate positive affect (PA) and negative affect (NA) composite scores were also created by summing the PANAS ratings provided before and after the speech. The reliability of these scores was satisfactory across the full sample (α’s = .90 and .91, respectively) and in each group separately (α’s = .74-.91).

Participants’ responses to the open-ended question were collated in random order, with identifying labels (i.e., about participants’ group status) removed. These responses were then subjected to directed content analysis (Hsieh & Shannon, 2005) by the study authors in order to determine an initial coding scheme. The content analysis revealed three distinct themes with respect to how participants generally reported attempting to control or change their images when they came to mind: (a) mentally altering the content or perceptual features of the image (e.g., “I can get rid of the audience, add people, change what I say, how I act, etc.” and “I can remove the audience and rotate the image to see myself at a different angle”); (b) mentally suppressing the image by concealing, pushing away, or ignoring aspects of it (e.g., “This image tends to stick in the back of my mind even when I try to ignore it,” and “I can try to get rid of it by closing my mind and focusing only on reality”); and (c) being unable to control or change anything about the image (e.g., “I don’t try to control the image when it comes to mind,” and “It is not something I feel I have much control over”).

All study procedures described in the experiment and were informed about the rationale for our use of deception. All participants provided renewed consent for our use of their data after learning that the video of their speech would not, in fact, be viewed by other students.
conform to any of the three categories (e.g., “This is the first time the image has come to mind”). Only 3 total responses (4.5%) were categorized as “Other” and these were removed from subsequent analyses, leaving 63 (31 high and 32 low SA) valid responses for analysis across the 3 categories. The two coders demonstrated excellent agreement (kappa = .802). All disagreements were resolved by a third coder, who was also blind to identifying information about the participants.

Results

An independent-samples t-test was conducted to examine differences between high and low SA participants in perceived controllability of negative imagery during the speech task, with the composite controllability score entered as the dependent variable. This dependent variable was normally distributed across the full sample of participants (Shapiro–Wilk Statistic = .973, df = 66, p = .16). Results indicated a significant group difference, t(64) = 2.21, p = .03, with high SA participants reporting lower subjective control over their images, M (SD) = 16.48 (7.35), than their low SA counterparts, M (SD) = 20.97 (9.02).1

Next, we wished to examine the relation between participants’ SA symptoms, image controllability, and their affective responses during the speech task. However, across the full sample of participants, the frequency distributions of the NA and PA composite scores were significantly skewed, thus violating the assumption of normally. Moreover, when examined within each group separately, the NA and PA composite scores remained significantly skewed in the low (but not high) SA group, while the image controllability index became significantly skewed in the high (but not low) SA group. Thus, we analyzed the associations between the image controllability index and each of the affective composite scores within each group separately using nonparametric correlations (Spearman’s rho, or rs). We expected that across both groups, image controllability would be positively correlated with PA and negatively correlated with NA, and that these associations would be particularly pronounced in high SA participants. Results of Spearman’s correlations in the low SA group revealed associations in the expected directions but no statistically significant effects, all rs values < .30, all p values > .09. Conversely, among high SA participants, there was a significant correlation between image controllability and PA, rs = .48, p = .004, but not between image controllability and NA, rs = –.19, p = .30.

Finally, to investigate whether and how SA symptoms impacted the types of coping strategies that participants used to manage their image intrusions during the social task, a chi-square analysis was conducted with the three coded categories and SA group status entered as the variables along the two axes. Consistent with hypotheses, the Group × Coping Responses effect was significant, \( \chi^2(4) = 10.78, p = .005 \). As displayed in Fig. 1, 90.3% of the 31 low SA participants reported attempting to mentally alter the content or perceptual features of their images, 6.5% reported trying to suppress or ignore them, and 3.2% reported being unable to change or control anything about them. In contrast, of the 32 total high SA participants, only 53.1% reported mentally altering their images, while 25.0% reported suppressing them and 21.9% reported being unable to change or control anything about them. Inspection of the adjusted standardized residuals revealed values above 1.96 for the high SA group across each of the three categories (alter = 3.3; suppress = 2.0; no change/control = 2.2), suggesting that the number of cases in each of the three cells was significantly different than expected if the null hypothesis were true (Agresti, 2002).1

Discussion

Previous studies have shown that appraising one’s negative mental images as being accurate self-representations is likely to fuel their detrimental impact. However, people who are prone to appraising their images in this way, such as those with higher levels of trait SA, can also learn to restructure the content and perceptual features of their images in order to reduce the negative cognitive, emotional, and behavioral consequences associated with holding them in mind. This is achieved, in part, by adopting a more distanced and self-compassionate perspective on the autobiographical memories upon which their images are based.

Based on this foundation of research, the present study provided a preliminary test of the hypothesis that non-treatment-seeking individuals who are high vs. low in trait SA might habitually differ not only in the ways they typically appraise their involuntary images, but also in the self-regulatory strategies they tend to use to cope with such images when they intrude during in-vivo social stress. Consistent with hypotheses, our results indicated that high SA participants experienced relatively low subjective control over their images and were much more likely than low SA individuals to report that they tended either to suppress their mental images or to succumb to them passively in whatever form they took. In contrast, the vast majority (90%) of low SA individuals reported that they tried to alter the content or perceptual features of their images, perhaps in order to make them less negatively valenced or emotionally impactful.

Moreover, we found that among high SA participants, perceived image controllability was positively correlated with PA during the speech task. Associations between higher levels of SA and diminished positive emotional experiences have been observed frequently in previous research (e.g., Kashdan, 2007; Moscovitch, Suvak, & Hofmann, 2010). In their recent review of the empirical literature on this topic, Kashdan, Weeks, and Savostyanova (2011) argued that “initial evidence suggests that the relationship between social anxiety and positive events might vary as a function of how people manage their emotions in everyday life” (p. 796), such that self-regulation strategies geared toward chronically concealing or suppressing internal experiences tend to drain resources that would normally promote positive affective experiences. Consistent with Kashdan et al.’s interpretation of the literature, the current results indicate that PA becomes increasingly diminished among
socially anxious individuals the more they view their intrusive images as being uncontrollable and nonmalleable (and also, presumably, the more they use suppression or avoidance strategies to cope with such intrusions). Conversely, although holding negative images in mind certainly promotes elevations in NA among socially anxious individuals (e.g., Chiu et al., 2012; Moscovitch et al., 2011), our results indicate that such increases in NA are not related to the extent to which they perceive their images as being controllable or malleable per se. Our previous research has shown that variations in NA among socially anxious individuals tend to be quite strongly related to the extent that negative beliefs about the self — specifically, concerns about appearing socially incompetent, visibly anxious, or physically unattractive — are activated within social contexts (Moscovitch et al., 2013).2 Thus, whereas NA might covary with the strength of high SA individuals’ negative self-beliefs (including those pertaining to self-representations in mental imagery), variations in PA may depend more on the extent to which they perceive such self-representations as being controllable or malleable and adopt image regulation strategies that are consistent with those perceptions. Despite these intriguing ideas about the meaning of our observed correlations between image controllability and affective experiences, it is crucial to remember that our study design precludes any definitive conclusions about the directionality of these associations. It is possible that socially anxious individuals’ perception of their images as being relatively uncontrollable does indeed erode their experience of PA, but it is also arguably conceivable that initial reductions in PA within the context of social threat subsequently lower the perceived controllability of their images. Future studies could use creative experimental manipulations to test which explanation is more viable.

To our knowledge, this is the first study to investigate the use of self-regulation strategies by anxious individuals in response to negative image intrusions. Our findings are consistent with numerous studies of both clinical and nonclinical participants, including those with high trait SA or SAD, which have concluded that the types of effortful strategies people tend to use in order to cope with the negative cognitions and feelings that arise in their daily lives have significant implications for their subsequent well-being (Kashdan & Steger, 2006; Neff, Kirkpatrick, & Rude, 2007; Turk, Heimberg, Luterek, Mennin, & Fresco, 2005; Werner et al., 2011). As mentioned above, previous research has demonstrated that people who experience problematic anxiety are likely to use suppression, avoidance, and other maladaptive strategies to cope with negative internal experiences and that these strategies serve to maintain or even enhance their anxiety difficulties, whereas nonanxious and psychologically healthy individuals are apt to respond more adaptively to emotionally distressing events by using strategies such as reappraisal or nonjudgmental/self-compassionate acceptance of their internal experiences as they unfold (Arch & Craske, 2010; Campbell-Sills, Barlow, Brown, & Hofmann, 2006; Hayes, Strosahl, & Wilson, 1999; Werner & Gross, 2009). As such, emotion regulation represents a crucial target for intervention of psychological disorders in vulnerable individuals (e.g., Fairholme, Boisseau, Ellard, Ehrenreich, & Barlow, 2010; Leahy, Tirch, & Napolitano, 2011).

Even though the total proportion of high SA participants who spontaneously reappraised their images in the present study was meager in comparison with the proportion of individuals who did so within the low SA group, it is important to note that over 50% of the high SA group did report attempting to alter their images in some way. What is unclear — and which well-designed future research can help to clarify — is the extent to which the specific nature and function of imagery reappraisal efforts and processes may differ between the two SA groups. To this end, it is now known that autobiographical memory is a constructive process, in which the ability to remember the past and imagine the future both rely on the same episodic memory system mediated by the hippocampus and related medial temporal lobe structures (see Schacter, 2012). Memory researchers believe that the adaptive function of a system that subserves both memory about the past and imagination about the future may be that it uses stored information about specific past autobiographical experiences in combination with semantic knowledge about the self to help people project themselves mentally forward in time in order to simulate a variety of anticipated future scenarios (Conway, Singer, & Tagini, 2004; D’Argembeau, Lardi, & Van der Linden, 2012; D’Argembeau & Van der Linden, 2006; Schacter, 2012). From this perspective, it may be the case that low SA individuals, who tend to view themselves quite favorably and whose images are discordant with that view, tend to reappraise their images and memories in a manner that completely changes their meaning, so that they could subsequently anticipate future scenarios with a more coherent and adaptive positive self-image in mind. In contrast, high SA individuals, whose negative images and memories tend to be consistent with their current negative perceptions of themselves, might only alter superficial aspects of their intrusions, perhaps even in a manner that serves to reinforce their own self-critical views and maintain the coherence of their autobiographical memory narratives; in turn, high SA individuals would be better prepared to avoid or escape the imagined “danger” of future evaluative encounters in which their perceived negative self-attributes would be on display for public consumption (see Moscovitch, 2009). Achieving a better understanding of the specific nature, efficacy, and function of high vs. low SA participants’ image and memory regulation strategies is a ripe topic for future research.

While actively reappraising negative images and memories during in-vivo stress may be a particularly useful strategy for reducing their emotional power, there may be other viable strategies for coping with such intrusions, including accessing positive self-images which could compete with and help to offset or inhibit the negative ones (Brewin, 2006; Craske et al., 2008). Recent research indicates that retrieval of positive imagery by high SA individuals in the aftermath of social exclusion improves their self-esteem and leads to healthier implicit self-evaluations (Hulme, Hirsch, & Stopa, 2012). Our own work has demonstrated, however, that high SA participants may have difficulty accessing positive images that contain a rich array of positive episodic details (Moscovitch et al., 2011). Another strategy for coping with negative imagery may be to increase the specificity with which the negative image or associated memory is imagined and processed. Interestingly, research has shown that high SA individuals experience reduced distress when imagining past stressful social events if they are instructed to recall more specific details of those experiences, but report greater distress if they are instructed to think about the events in a vague or overgeneralized way (Vrielynck & Phillipot, 2009; see also Williams et al., 2007 for a review of the overgeneral memory bias and emotional disorders). Thus, in addition to reappraisal, there may be other adaptive image control strategies

2 Exploratory post-hoc analyses with data from the present study also reveal this same pattern of results. Specifically, among both high and low SA participants, the composite measure of NA was strongly correlated with the extent to which participants reported that they appeared socially incompetent, visibly anxious, and physically unattractive within their images, all r or r, values > .38, all p values < .03, as measured on the image-specific version of the Negative Self-Portrayal Scale (the original measure is described in Moscovitch and Huyder, 2011; while the image-specific version is described in Chiu et al., 2012). Interestingly, image-specific concerns about the self in the current study were not correlated significantly with PA across any of the groups or image-specific NSPS subscales (all r or r, values < .17, all p values > .35).
which were not the focus of the current investigation but would be worthwhile to incorporate into future research examining the role of imagery in adaptive vs. maladaptive emotion regulation.

Finally, although high SA individuals in the current study were selected based on a screening measure for SAD and, as such, comprised a group that was only analogous to one with clinical symptoms, it is tempting to speculate whether the types of image control strategies that they reported using here — about half who mentally altered image content or features and half who either tried to suppress or ignore their images or used no strategies — are similarly represented among patients with a diagnosis of SAD. If they are, it would be of interest to examine the reliability of these strategies across time, contexts, and emotional stimuli for individual patients. Do they habitually use the same types of regulation strategies to cope with image intrusions during social situations across time and are similar strategies also recruited in response to emotionally-evocative stimuli other than negative imagery? Moreover, it would be important to examine whether the effects of interventions such as IR, which are specifically designed to improve patients’ self-regulatory responses to negative images, might also generalize to their strategic regulation of other negative internal experiences such as negative thoughts and bodily sensations. Similarly, although previous research has shown that the extent to which patients with SAD learn to re-appraise their negative thoughts during cognitive behavioral therapy from pre- to mid-treatment strongly predicts whether or not they ultimately will become treatment responders by the end of therapy (Moscovitch et al., 2012) and that increases in cognitive reappraisal self-efficacy during CBT mediates both the short- and long-term reduction of symptoms among such patients (Goldin et al., 2012), it is unknown whether such effects might also generalize to the regulation of negative intrusive images. Thus, future studies will be needed to identify the broader impact of these varying regulation strategies on patients with SAD (as well as those who struggle with other types of symptoms such as depression, which we did not examine in the present study). Such studies could ultimately help to inform clinicians engaged in evidence-based practice whether and how they ought to adjust their interventions to accommodate the imagery experiences and regulation strategies of individual patients.

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