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Abstract

Mindset theory suggests that a deliberative mindset entails openness to information in one's environment, whereas an implemental mindset entails filtering of information. We hypothesized that this open- versus closed-mindedness influences individuals' breadth of visual attention. In Studies 1 and 2, we induced an implemental or deliberative mindset, and measured breadth of attention using participants' length estimates of x-winged Müller-Lyer figures. Both studies demonstrate a narrower breadth of attention in the implemental mindset than in the deliberative mindset. In Study 3, we manipulated participants' mindsets and measured the breadth of attention by tracking eye movements during scene perception. Implemental mindset participants focused on foreground objects, whereas deliberative mindset participants attended more evenly to the entire scene. Our findings imply that deliberative versus implemental mindsets already operate at the level of visual attention.

Keywords

motivation/goal setting, self-regulation, mindsets, visual attention, eye tracking

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Imagine you face the decision problem of whether to accept a job offer. In a situation like this, you are likely to deliberate and thoroughly weigh the pros and cons of the options. As the decision is important, you will avoid making it prematurely and will consider any available information with a broad focus. By contrast, once you have decided to accept the offer your mindset is likely to switch: You will adopt a narrow focus by looking solely for information that supports the implementation of your decision. Now imagine that you walk through a supermarket—either while still deliberating about the job offer or after having made the decision and while planning its implementation. The supermarket is full of visual stimuli, such as colorful products, promotional signs, and special offers. Will the mindset that has been evoked by the job offer also influence whether you direct your attention toward these distracting stimuli?

In the present research, we examine whether being in an implemental versus deliberative mindset influences individuals' breadth of visual attention. According to the mindset theory of action phases (summaries by Gollwitzer, 2012; Gollwitzer & Bayer, 1999), making a decision about which goal to pursue versus implementing a chosen goal are different action phases that trigger different mindsets. Each mindset provides a particular set of cognitive procedures that supports solving the task at hand (i.e., deciding vs. implementing). Individuals adopt a deliberative mindset when they face a decision on which goal they should pursue. To arrive at a good decision, they should attend to any new or stored information as a means by which to achieve certainty with regard to goal desirability and feasibility. Once individuals have made their decision, they switch to an implemental mindset, which supports them in acting upon their decision. Here, staying focused and not getting sidetracked when a decision has already been made can help in realizing one's decision.

An important aspect is that these mindsets may carry over to subsequent tasks. If a deliberative or implemental mindset is activated in one task, the mindset influences information processing in a subsequent task, even if this task is completely unrelated to the task by which the mindset has been activated (e.g., Bayer & Gollwitzer, 2005; Fujita, Gollwitzer, & Oettingen, 2007). Classic studies for examining mindset effects used these carry-over effects to examine the influence

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of mindsets on information processing (e.g., Gollwitzer, Heckhausen, & Steller, 1990; Gollwitzer & Kinney, 1989). To induce a deliberative mindset, participants are asked to name an unresolved personal decision problem and contemplate the pros and cons of making a change decision or retaining the status quo. To induce an implemental mindset, participants are asked to name an already chosen personal project and generate the five most important steps to implementing this project. Then, all participants work on a (presumably) unrelated task, which is actually designed to examine the expected differences in information processing between the two mindsets.[1]

Research on mindset has identified fundamental differences in information processing between deliberative and implemental mindsets. For instance, individuals in deliberative and implemental mindsets differ in terms of the information they attend to and the thoughts they produce. Individuals in a deliberative mindset focus on the desirability and feasibility of a broad set of alternatives, whereas individuals in an implemental mindset focus on planning when, where, and how to implement the decision made (Gollwitzer et al., 1990; Heckhausen & Gollwitzer, 1987). Furthermore, individuals in a deliberative mindset process information on desirability in a less biased and feasibility in a more objective manner than individuals in an implemental mindset (Gagné & Lydon, 2001; Gollwitzer & Kinney, 1989; Puca, 2001; Taylor & Gollwitzer, 1995).

The differences that mindset research has identified so far address how information is encoded, processed, and retrieved. However, mindset theory posits that deliberative and implemental mindsets differ already at the level of visual attention (Fujita et al., 2007; Gollwitzer, 2012). In particular, deliberative and implemental mindsets are supposed to differ in their openness to information due to the different task demands of making a goal decision versus implementing a chosen goal. When making a decision about which goal to pursue, individuals will arrive at better decisions if they consider many different aspects of the alternatives, and if they are able to detect information that is useful for the decision. Thus, individuals in a deliberative mindset are supposed to be more open-minded and receptive to various types of information. When implementing a goal, however, individuals will be more successful if they manage to ignore goal-irrelevant stimuli and concentrate on the accomplishment of the chosen goal instead. This implies that individuals in an implemental mindset should be more selective during information processing.

In support of the increased open-mindedness of a deliberative mindset assumption, Fujita et al. (2007) found that individuals in a deliberative mindset process incidental (i.e., task-irrelevant) information in a more open-minded manner than individuals in an implemental mindset. In one of Fujita et al.'s studies (Study 2), participants with a deliberative or implemental mindset worked on a computer performance task, where they responded to critical stimuli that were presented in the center of the computer screen. These stimuli were preceded by briefly presented incidental words. A subsequent recognition test for the incidental words revealed that individuals who were in a deliberative mindset recognized significantly more of the incidental words than individuals in an implemental mindset did. These findings support the general notion that a deliberative mindset leads to higher openness toward incidental stimuli. However, it remains unclear whether the effect is caused by differences in visual attention, because the higher recognition for incidental words in the deliberative mindset may also be caused by differences in memory processes (i.e., during storage or retrieval).

Our central hypothesis is that deliberative and implemental mindsets already have an impact at the basic level of visual attention, and that the mindsets entail differences in relation to breadth of attention. Task demands and goals influence the automatic allocation of visual attention (e.g., Pieters & Wedel, 2007; Vogt, De Houwer, Moors, Van Damme, & Crombez, 2010); this suggests that visual attention will be aligned according to the task demands of deliberating about goals versus implementing a goal. Attention acts as a filter influencing which stimuli will be detected and processed (Orquin & Mueller Loose, 2013). The wider the breadth of attention, the higher the likelihood that peripheral stimuli will also be detected. Thus, a deliberative mindset should go along with a wide breadth of attention, because this supports detecting new stimuli that might be useful for the goal decision. An implemental mindset, in contrast, should be linked to a narrow breadth of attention, because this supports the individual to concentrate on the goal at hand while ignoring distracting stimuli.

We propose that attentional breadth is an essential part of deliberative and implemental mindsets, and is thus strongly associated with the cognitive procedures that constitute the mindset. A recent study demonstrated that individuals learn to associate a particular attentional set with a context (Cosman & Vecera, 2013). Whenever the context is activated, they apply the corresponding attentional set. In the same way, repeatedly applying a wide (vs. narrow) attentional focus during a goal decision (vs. implementation) should lead to strong associations between breadth of attention and other cognitive features of a mindset. As such, the change in breadth of visual attention should be activated automatically whenever task instructions activate a deliberative (vs. implemental) mindset—together with the other differences in information processing that constitute the mindset. This has two core implications. First, the attentional breadth should be subject to the carry-over effects that mindset research has identified (e.g., Bayer & Gollwitzer, 2005): Once a deliberative or implemental mindset has been activated in a task, the corresponding breadth of visual attention should carry over to a subsequent task. Second, as the attentional set is strongly associated with the other cognitive procedures of a mindset, the differences in breadth of attention

should also be activated when the first task is not of a primarily visual nature (e.g., thinking about options or plans). If a subsequent task contains visual elements, the breadth of visual attention should influence the way in which the stimuli are perceived.

The present research examines the influence of mindsets on breadth of attention, and contributes to the literature in two ways. First, it demonstrates that differences between implemental and deliberative mindsets occur already in visual attention at initial exposure to stimuli. Second, it shows that the open- versus closed-mindedness of deliberative versus implemental mindsets also entails a wide versus a narrow breadth of visual attention. Extending mindset research to the level of visual attention is important because individuals' environments are rich in terms of visual cues that can trigger new, or even conflicting, goals (e.g., pop-ups with incoming email, advertisements, products in stores, etc.). Establishing a link between mindsets and breadth of attention would indicate that action-related mindsets also influence individuals' susceptibility to such peripheral visual cues.

The Present Research

In the present research, we examined whether mindsets affect the focus of individuals' visual attention during initial exposure to stimuli. In line with the assumption that an implemental mindset entails more closed-minded information processing than a deliberative mindset (Fujita et al., 2007; Gollwitzer, 2012), we hypothesized that an implemental mindset entails a narrower breadth of visual attention than a deliberative mindset.

In all studies, we first induced either an implemental or a deliberative mindset, and then examined the breadth of attention in an ostensibly unrelated second study. Because a central feature of mindsets is that they carry over from the task that induces the mindset to unrelated tasks, we were able to test the effects of mindsets on breadth of attention in the same tasks for individuals in implemental, and for those in deliberative, mindsets. The breadth of attention was measured with an optical illusion task in Studies 1 and 2, and with a scene perception task in Study 3.

The breadth of attention tasks applied in Studies 1 and 2 used x-winged figures based on the classic Müller-Lyer illusion (see Figure 1). In this task, participants estimated the length of a critical line relative to a control line. The breadth of attention is reflected in the direction of the experienced illusion and length estimates (e.g., Predebon, 2004). A narrow breadth of attention is reflected in attending more to the inward-directed wings (i.e., inner wings) while ignoring the outward-directed wings (outer wings). Thus, a narrow breadth of attention produces shorter illusion experiences (i.e., underestimation). By contrast, a wider breadth of attention is reflected in attending to inner as well as outer wings, and reduces the likelihood of underestimations (i.e., less underestimation, more correct estimates). We expected individuals in a deliberative mindset to attend to whole x-winged figures, and participants in an implemental mindset to attend more to the critical line and the inner wings while ignoring the outer wings. Individuals in an implemental mindset should thus underestimate the length of the critical line of the x-winged figures more often than individuals in a deliberative mindset, indicating a relatively narrow breadth of attention.

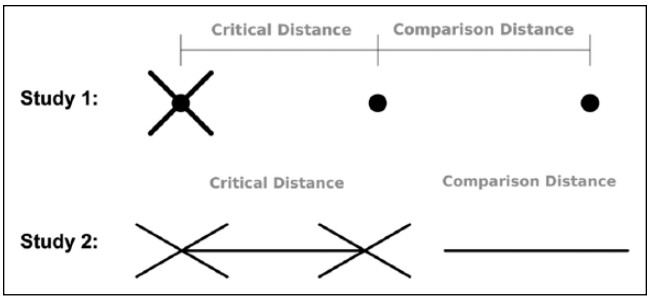

Figure 1. Examples of the single x-winged Müller-Lyer figures used in Study 1 (above) and the double x-winged Müller-Lyer figures used in Study 2 (below).
Note. The length of the critical and the control distance is the same in each of the Müller-Lyer figures.

In Study 3, we used an eye-tracking paradigm adapted from Chua, Boland, and Nisbett (2005) to measure mindset effects on attention more directly, and to use more naturalistic stimuli. Participants viewed pictures of naturalistic scenes—each of which depicted a focal foreground object (e.g., an animal) on a complex background (e.g., a nature scene). We studied whether individuals in deliberative mindsets differ from individuals in implemental mindsets in the way they explore the scenes. We expected that individuals in a deliberative mindset would evenly explore the whole scene, and thus gather more information compared with individuals in an implemental mindset, who were expected to focus more on the foreground object embedded within the scene. Individuals in an implemental mindset should thus have spent more time looking at the foreground objects compared with individuals in a deliberative mindset, indicating a relatively narrow breadth of attention.

Study 1: Mindset Effects on Single X-Winged Müller-Lyer Figures

Building on the classic Müller-Lyer illusion, which depicts only inner wings or outer wings, x-winged figures (see Figure 1) were developed as a breadth-of-attention measure (e.g., Goryo, Robinson, & Wilson, 1984). In the x-winged figures, inner as well as outer wings were added simultaneously at the end of the critical line. Previous research has found that attention instructions affect the illusion experience in x-winged figures: Instructions to ignore the outer wings of the x-winged figure (i.e., narrow breadth of

attention) lead to an underestimation of the critical line when compared with the outcome based on neutral attention instructions (Predebon, 2004). In Study 1, we induced either a deliberative or an implemental mindset, and then measured participants' breadth of attention by asking whether, compared with a same-length comparison distance, the critical distance of the single x-winged figures was either shorter (i.e., underestimation) or longer (i.e., overestimation).

We expected that participants in an implemental mindset would underestimate the length of the critical distance more often because they would focus on the inner wings while ignoring the outer wings. By contrast, participants in a deliberative mindset were expected to underestimate the length of the critical distance less often, because they would be attending to both the inner wings and the outer wings. Thus, we predicted more underestimations for participants in an implemental mindset than for participants in a deliberative mindset.

Method

Participants and design. Twenty students from a German university participated in this study (M_{age} = 24.00, SD = 2.72). A 2 within (Mindset: deliberative vs. implemental) × 2 between (Order: deliberative-implemental mindset vs. implemental-deliberative mindset) mixed factorial design was used. The number of shorter and longer illusion experiences served as the dependent variable.

Materials and procedure. The participants were informed that they would work on two independent tasks, a motivation and a perception task. The experimenter stated that both tasks included two parts, and that the two parts were separated by a certain time interval in which the respective other task had to be completed. The motivation task was described as investigating processes in goal pursuit; it was designed to induce either a deliberative or an implemental mindset. Participants were randomly assigned to one of two different orders of mindset induction. They either received a booklet containing the deliberative mindset instructions before they received a booklet containing the implemental mindset instructions, or the other way around. To induce the respective mindsets, we used a standard experimental manipulation from mindset research: In the deliberative mindset condition, we asked participants to name an unresolved personal decision problem and to extensively reflect on it, whereas we asked participants in the implemental mindset condition to name a chosen personal project and to plan its implementation (for details, see Bayer & Gollwitzer, 2005; Gollwitzer & Kinney, 1989, Study 2).

When participants had finished the first mindset task, we asked them to work on an ostensibly unrelated perception task. We presented 15 single x-winged Müller-Lyer figures (see Figure 1). For each of the figures, participants had to say aloud whether the distance between the point located on the left and the point in the middle (critical distance) was shorter or longer compared with the distance between the point located in the middle and the point on the right (comparison distance). In fact, the critical and comparison distances were of the same length in all trials, namely either 6, 7.5, or 9 cm. Each of the two x-wings was 6-cm long, and was arranged at angles of 45°, 65°, or 80° to the imaginary critical and comparison distance line. Each trial started by presenting a fixation cross in the middle of the screen for 3 s to focus participants' attention. This fixation cross was followed by a 5-s presentation of a modified Müller-Lyer figure; the point that separated the critical distance from the comparison distance was placed exactly where the preceding fixation cross had been shown.

Following this first part of the Müller-Lyer task (i.e., a first set of 15 figures), participants received instructions that induced the respective other mindset (i.e., the implemental or deliberative mindset, depending on which mindset had been induced previously). Next, participants worked on the second part of the Müller-Lyer task, which consisted of judging a second set of 15 modified Müller-Lyer figures. Finally, participants were debriefed and compensated with 5 Euros.

Results

To test our hypothesis that the implemental mindset induces a narrower breadth of attention compared with the deliberative mindset, we computed a Mindset × Order repeated-measures ANOVA using the number of underestimation judgments as the dependent variable. Note that only two response options were offered in this first study: either under- or overestimation. As expected, this analysis revealed no main effect of order and no Mindset × Order interaction effect, both Fs < 1, but a significant main effect of mindset, $F(1, 18)$, p = .02, η_p^2 = .259, 95% confidence interval (CI) for difference = [0.154, 1.746], observed power with alpha = .05 (two-tailed) = .66. In support of our hypothesis, compared with participants in a deliberative mindset (M = 10.15, SD = 3.64), participants in an implemental mindset judged more of the 15 figures (M = 11.10, SD = 3.13) as depicting shorter critical distances.

Discussion

Study 1 provides initial evidence that deliberative and implemental mindsets differ in relation to selective attention during initial exposure to stimuli (i.e., in terms of a wide vs. narrow breadth of attention). In the optical illusion task, participants in an implemental mindset reported more underestimations than participants in a deliberative mindset. This indicates a narrower breadth of attention in the implemental versus the deliberative mindset.

However, Study 1 leaves some important questions unanswered. Our participants in Study 1 were faced with a forced choice: Their task was to decide whether the critical line was

either shorter or longer than the comparison line. They could not choose the third and correct answer; that is, that the two lines were of the same length. Consequently, we were unable to test a third possible option: If participants in a deliberative mindset look at both the inner and outer wings, then they might be better at correctly judging the critical line as being of the same length as the comparison line. However, if they focus relatively more on the outward wings, their performance in correctly judging the line should be equally as poor as that of participants in an implemental mindset. Thus, in Study 2, we added the response option "The lines are of the same length."

Moreover, mood has been shown to affect the breadth of visual attention (e.g., Gable & Harmon-Jones, 2008, 2010), and could therefore account for differences in visual attention as reflected by the reported shorter and longer illusions. Some mindset studies (Brandstätter & Frank, 2002, Study 2; Taylor & Gollwitzer, 1995) have shown that the mindset manipulations may cause differences in mood (though others did not find mood differences, for example, Brandstätter & Frank, 2002, Studies 1 and 3; Fujita et al., 2007). Furthermore, extensively thinking about an important personal problem might be tiring, whereas planning steps to reach a desired goal could be energizing—in other words, the mindset manipulation could affect psychological states such as arousal or fatigue, and therefore account for differences in visual attention. Finally, any differences in how participants perceive and cope with the mindset manipulation could possibly influence commitment to perform well on the Müller-Lyer task, and therefore account for our results. We address these issues in Study 2.

Study 2: Mindset Effects on Double X-Winged Müller-Lyer Figures

In Study 2, we used a double x-winged variant of the Müller-Lyer figures. Study 2 sought to replicate and extend the findings from Study 1 in a number of ways. First, Study 2 included a control group (no mindset condition) to examine whether deliberative and implemental mindsets both affect attention by inducing a wider (narrower) breadth of attention. Second, Study 2 did not force participants into either underestimating or overestimating the critical distance, but included a same-length response category. Third, Study 2 controlled for mood, arousal, and task commitment as possible confounding factors of the effect. And fourth, Study 2 applied a between-subjects design, rather than a within-subjects design.

Method

Participants and design. A total of 148 students (111 female) from German high schools participated in this study (M_{age} = 16.51, SD = 3.31). A between factorial design with three conditions (Mindset: deliberative vs. implemental vs. control) was used. As the dependent variable, we computed a breadth-of-attention index by coding underestimations (= −1), correct judgments (= 0), and overestimations (= 1) for each of the two double x-winged figures, and then aggregating the scores across the two trials. The resulting breadth-of-attention index comprises a 5-point scale ranging from −2 (*two underestimations*) to +2 (*two overestimations*).

Materials and procedure. The participants were informed that they would work on several independent tasks: an action control training task, an unrelated pretest for a perception task, and some general questionnaires. The action control task was described as consisting of training in cognitive procedures that are relevant for successful goal pursuit; in reality, it was designed to induce participants' deliberative versus implemental versus control mindsets. Participants were randomly assigned to either the deliberative, implemental, or control mindset by receiving a booklet containing the respective mindset instructions. To induce deliberative versus implemental mindsets, we used the standard experimental manipulation from Study 1; to induce a control mindset, participants worked on a concentration performance task (Konzentrations-Leistungs-Test [KLT]; Düker, 1953), which was described as working memory training. The KLT consisted of 80 arithmetic tasks that required two sums to be calculated (i.e., adding up three positive/negative numbers), and the answers to be retained in the participant's short-term memory; the smaller of the two sums then had to be subtracted from the larger sum, and the resulting difference had to be entered into a box.

After the first task (the mindset induction), we asked participants to work on a perception task that was introduced as an unrelated pretest. We presented two Müller-Lyer double x-winged figures (see Figure 1). One of these figures depicted critical and comparison lines that both measured 5 cm, and the other figure depicted critical and comparison lines that both measured 7 cm. For each of these figures, participants had to decide whether the critical winged line was shorter, longer, or of the same length as the non-winged comparison line.

Following the Müller-Lyer trials, we assessed participants' mood by applying the following items: happy, downhearted, upbeat, contented, upset, sad, satisfied, lonely, and distressed (Cronbach's α = .84); these were drawn from the Multiple Affect Adjective Checklist (MAACL; Zuckerman & Lubin, 1965), which was used in a previous mindset study by Taylor and Gollwitzer (1995). The participants responded using 7-point answer scales ranging from 1 (*not at all*) to 7 (*very much so*). Using the same approach as Taylor and Gollwitzer, we derived a composite measure of mood by subtracting the totaled self-ratings of the items assessing negative mood (i.e., downhearted, upset, sad, lonely, and distressed) from the totaled self-ratings of the items assessing positive mood (i.e., happy, upbeat, contented, and satisfied). Moreover, participants filled in Self-Assessment-Manikin

(SAM) scales (Lang, 1980), in which they were asked to select one out of the nine figures that best depicted valence, arousal, and dominance, respectively. Last, four items assessed participants' commitment ("How important was it to you to respond in the action control and perception tasks, and the questionnaires, in the best and most appropriate manner? How seriously did you take the action control and perception tasks, and the questionnaires? How much effort did you exert on performing well on the action control and perception task and the questionnaires? How easy were the action control and perception task and the questionnaires for you?"). Responses ranged from 1 (*not at all*) to 7 (*very much*). Reliability was high (Cronbach's α = .83). Finally, participants were debriefed and compensated via the opportunity to participate in a 50 Euro lottery.

Results

As a breadth-of-attention index, we coded underestimations (= −1), correct judgments (= 0), and overestimations (= 1) for each of the two double x-winged figures, and then aggregated the scores across the two trials, thereby creating a 5-point scale ranging from −2 (*two underestimations*) to +2 (*two overestimations*). To test our hypothesis that the implemental mindset induces a narrower breadth of attention, whereas the deliberative mindset induces a relatively wide breath of attention, we entered this breadth-of-attention index into a univariate ANOVA. As expected, this analysis revealed a significant main effect of mindset, $F(2, 145) = 3.71$, $p = .02$, $\eta_p^2 = .049$, observed power = .686.

In support of our hypothesis, participants in an implemental mindset judged more of the two double x-winged figures ($M = -0.67$, $SD = 0.72$) as depicting shorter critical distances, compared with participants in a deliberative mindset ($M = -0.35$, $SD = 0.48$), $F(1, 145) = 6.64$, $p = .01$, $\eta_p^2 = .044$, 95% CI for difference = [0.075, 0.565], observed power = .726, and control-group participants ($M = -0.41$, $SD = 0.61$), $F(1, 145) = 4.30$, $p = .04$, $\eta_p^2 = .029$, 95% CI for difference = [−0.498, −0.012], observed power = .540. Although in the right direction, the differences between the deliberative mindset and control-group participants were not significant, $F(1, 145) = .28$, $p = .60$, $\eta_p^2 = .002$, 95% CI for difference = [−0.177, 0.306], observed power = .082.

Control variables. An ANOVA with the composite score of the MAACL scale as the dependent variable yielded no differences between the deliberative mindset ($M = 8.04$, $SD = 7.59$), control ($M = 8.94$, $SD = 4.81$), and the implemental mindset conditions ($M = 7.60$, $SD = 10.07$), $F(2, 145) < 1$, $p = .68$, $\eta_p^2 < .005$. Similarly, separate ANOVAs with the scale means of the three SAM scale items as dependent measures yielded no differences between mindset conditions regarding their reported mood, arousal, and dominance, all Fs$(2, 145) < 1.65$, $p > .19$, $\eta_p^2 < .03$. Participants in the deliberative mindset, control, and implemental mindset conditions indicated that they were generally happy (Ms = 6.71, 6.63, and 6.40, respectively), calm (Ms = 3.12, 3.39, and 3.83, respectively), and in control (Ms = 6.94, 6.47, and 6.33, respectively). The composite score of the MAACL scale and the scores of the positive affect SAM scale were positively correlated, $r > .68$, $p < .001$, indicating a high convergent validity between the two mood measures. Regarding commitment, participants in the deliberative mindset, control, and implemental mindset indicated that they were highly committed to performing well on the tasks (Ms = 4.78, 5.12, and 5.19, respectively), with no difference between mindset conditions, $F(2, 145) = 1.65$, $p = .20$, $\eta_p^2 = .022$.

Discussion

Study 2 provides further evidence that deliberative and implemental mindsets affect the breadth of attention. Participants in an implemental mindset underestimated the length of the double x-winged figures twice as often compared with participants in a deliberative mindset, and also correctly estimated the length of the double x-winged figures less often compared with participants in a deliberative mindset. These findings suggest that participants in a deliberative mindset attended to the inner as well as the outer wings, whereas participants in an implemental mindset attended more to the inner wings, while ignoring the outer wings.

It is important to note that effects of the mindset induction on mood, arousal, and task commitment cannot explain the reported results. We did not find any influence of the experimental conditions on these variables. While some mindset studies (Taylor & Gollwitzer, 1995; Brandstätter & Frank, 2002, Study 2) have observed that mindset manipulations may cause differences in mood, our results are in line with a set of other studies that did not find mood differences between deliberative and implemental mindsets (e.g., Brandstätter & Frank, 2002, Studies 1 and 3; Fujita et al., 2007).

One question Study 2 cannot answer definitively is whether both mindsets exert equal effects on attention. Although only implemental mindsets (but not deliberative mindsets) have been found to significantly differ from the control mindset condition, this does not mean that deliberative mindsets cannot widen the breadth of visual attention. The narrowing or widening effects of mindsets may be more pronounced, for example, depending on the control condition applied. In Study 2, the control mindset participants worked on arithmetic tasks. Although this control task should have successfully prevented participants from engaging in deliberative or implemental thought, it may also have mentally fatigued them, and thereby shifted their attention from goal-directed top-down to a more stimulus-driven bottom-up attention (e.g., Boksem, Meijman, & Lorist, 2005). This depleting influence may have masked differences between the deliberative mindset and the control mindset that might have been visible if a less effortful control condition had

been used (e.g., watching a neutral movie clip). Future research might explore this possibility.

In sum, these findings systematically extend previous research (Fujita et al., 2007; Heckhausen & Gollwitzer, 1987) by showing that the difference in open-mindedness between implemental and deliberative mindsets exists already at the level of visual attention. However, as a limitation of Studies 1 and 2, the length estimates regarding single and double x-winged Müller-Lyer illusion figures still reflect an indirect measure of visual attention that only allows limited access to process variables. Study 3 addressed this issue with eye tracking as a more direct measure of visual attention.

Study 3: Mindset Effects on Breadth of Attention in an Eye-Tracking Paradigm

In Study 3, we applied an eye-tracking paradigm and directly measured visual attention. We asked participants to evaluate 36 pictures of nature and urban scenes depicting single foreground objects, while we recorded their eye movements. Thus, the material we used in Study 3 was more naturalistic than the Müller-Lyer figures from Studies 1 and 2. In addition, the eye-tracking paradigm allowed us to distinguish between attention directed to the foreground object versus attention directed to the background of the scenes. We expected that individuals in a deliberative mindset would attend evenly to the whole scene, thus showing a relatively wide breadth of attention. In contrast, we expected individuals in an implementation mindset to primarily focus on the foreground objects, while ignoring the background of the scenes.

Method

Participants and design. Forty male psychology students from an Austrian university participated in exchange for course credit. We excluded two participants from data analysis because they had participated in a course in which one of the authors had explained the mindset manipulations used in this study. The final sample therefore comprised 38 students (M_{age} = 25.39, SD = 7.18). A 2 between (Mindset: deliberative vs. implemental) × 2 within (Attentional Focus: object vs. background) mixed factorial design was used. The average amount of dwell time on foreground objects and on the background of the scenes across trials served as the dependent variable.

Materials and procedure. Participants were tested individually, and were randomly assigned to one of two experimental conditions (deliberative vs. implemental mindset). Again, we applied the standard experimental manipulation from mindset research: In the deliberative mindset condition, participants reflected on an unresolved personal decision problem, whereas in the implemental mindset condition, they planned the implementation of a chosen personal project (for details, see Bayer & Gollwitzer, 2005; Gollwitzer & Kinney, 1989, Study 2). As manipulation check, we included three items from Gollwitzer and Kinney (1989, Study 2) to measure action tendency (Cronbach's α = 68). Participants answered the following items on a 7-point scale ranging from 1 (*not at all*) to 7 (*very much so*): (a) "How determined do you feel with respect to your decision?" (b) "How committed to a certain course of action do you feel?" (c) "How well prepared do you feel to act on your decision?"

In addition, we assessed mood by applying the four-item subscales valence (e.g., "happy"; Cronbach's α = .87), awareness (e.g., "tired"; Cronbach's α = .92), and calmness (e.g., "relaxed"; Cronbach's α = .80) from the Multidimensional Mood State Questionnaire (short version A; Steyer, Schwenkmezger, Notz, & Eid, 1997). Participants responded using 7-point scales ranging from 1 (*not at all*) to 7 (*very much so*).

Next, participants worked on an ostensibly unrelated picture evaluation task. We used the procedure and graphical material from a study by Chua et al. (2005). The material consisted of 36 pictures containing a single focal foreground object displayed against a complex background. The foreground object was either an animal or an object such as a train, airplane, or boat. We told participants that they would view pictures of both urban and nature scenes, and that their task would be to evaluate these pictures. Each trial started with a fixation cross in the middle of the screen. A picture then appeared on the screen for 3 s. After each presentation, participants indicated the degree to which they liked the picture by verbalizing a number between 1 (*don't like it at all*) and 7 (*like it very much*), with 4 being labeled as neutral.

During the presentation of the pictures, eye-tracking data were collected using a remote eye tracker (SMI RED 500) with a sampling rate of 120 Hz. The pictures were presented on a 22-inch monitor with a screen resolution of 1,680 × 1,015 pixels. Participants sat at a distance of 70 cm from the monitor. Before stimulus presentation, eye tracking was calibrated and validated for each participant.

After participants had completed the picture evaluation task, we used single items ranging from 1 (*I don't agree at all*) to 7 (*I totally agree*) to assess the following control variables: task enjoyment ("The task to evaluate the pictures was fun"), task engagement ("I was keen to evaluate each of the pictures accurately"), and concentration during the task ("I think that I concentrated over the entire period"). Thereafter, participants were probed for suspicions regarding the experimental manipulation, and then debriefed.

Results

Manipulation check. The measure of action tendency indicated that the experimental manipulation was successful: Implemental mindset participants (M = 5.39, SD = 0.82) showed a significantly higher action tendency compared with deliberative mindset participants (M = 4.18, SD = 1.12),

Table 1. Descriptive Statistics for the Average Dwell Time (ms) on Foreground Object and Background.

	Mindset condition			
	Deliberative (n = 19)		Implemental (n = 19)	
Focus of attention	*M*	*SD*	*M*	*SD*
Foreground object	1,503	178	1,672	183
Background	1,461	176	1,267	180

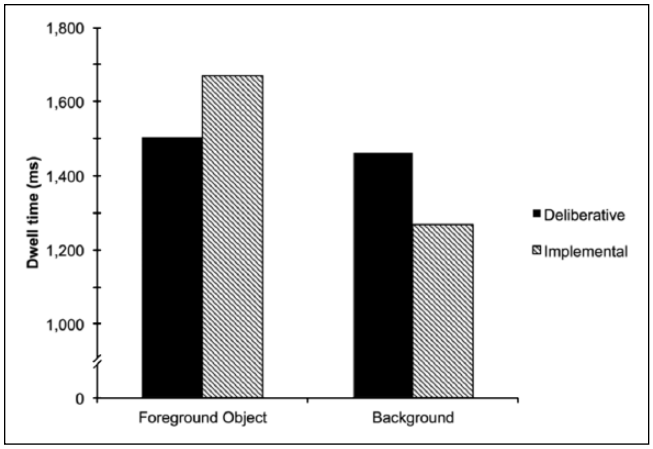

Figure 2. Study 3: Dwell time as a function of attentional focus (foreground vs. background) and mindset (deliberative vs. implemental).

$t(36) = 3.79$, $p = .001$. Importantly, the mindset manipulation did not influence participants' liking ratings of the pictures ($M_{del} = 4.01$ vs. $M_{impl} = 3.82$), $t < 1$, $p > .38$. Furthermore, during probing, none of the participants mentioned a suspicion that the mindset manipulation was used to influence the picture evaluation task.

Eye movements. To test the hypothesis that, relative to participants in a deliberative mindset, participants in an implemental mindset attend more to the foreground object and less to the background, the foreground object and the background were defined as two separate areas of interest (AOIs). The average amount of dwell time on foreground objects and dwell time on backgrounds across trials (see Table 1) were used as measures of visual attention.

The dwell times on foreground objects and background were submitted to a 2 between (Mindset: deliberative vs. implemental) × 2 within (Attentional Focus: object vs. background) mixed-model ANOVA (see Figure 2). The main effect of mindset was not significant, $F(1, 36) = 2.30$, $p = .14$, $\eta_p^2 = .060$, observed power = .314. Overall, participants spent more time looking at the foreground objects ($M = 1,587$ ms, $SD = 198$ ms) than looking at the backgrounds of the scenes ($M = 1,364$ ms, $SD = 201$ ms), $F(1, 36) = 15.06$, $p < .001$, $\eta_p^2 = .295$, 95% CI for difference = [93 ms, 353 ms], observed power = .965. In line with our hypothesis, this effect was qualified by a significant Mindset × Attentional Focus interaction effect, $F(1, 36) = 9.95$, $p = .003$, $\eta_p^2 = .217$, observed power = .866. Simple effects analyses tested the effect of mindset on dwell time at each level of attentional focus (object vs. background). As predicted, participants in an implemental mindset looked at the foreground objects for a longer time ($M = 1,672$ ms, $SD = 183$ ms) than participants in a deliberative mindset ($M = 1,503$ ms, $SD = 178$ ms), $F(1, 36) = 8.29$, $p = .007$, $\eta_p^2 = .187$, 95% CI for difference = [50 ms, 288 ms], observed power = .800. Concurrently, participants in an implemental mindset spent less time looking at the backgrounds ($M = 1,267$ ms, $SD = 180$ ms) than participants in a deliberative mindset ($M = 1,461$ ms, $SD = 176$ ms), $F(1, 36) = 11.34$, $p = .002$, $\eta_p^2 = .239$, 95% CI for difference = [77 ms, 312 ms], observed power = .906. The results support our hypothesis that individuals in an implemental mindset primarily attend to the foreground objects (which, on average, comprised only 13.75% of the total area of the pictures), thus showing a narrow breadth of attention, whereas individuals in a deliberative mindset attend more evenly to the whole scene, thereby showing a wider breadth of attention.

Time course of eye movements. We tested whether the difference between participants in deliberative and implemental mindsets persisted over the whole duration of stimulus presentation, or changed over time. We calculated the dwell times on foreground object versus background over the first 1,000 ms (0-1,000 ms), the second 1,000 ms (1,001-2,000 ms), and the third 1,000 ms (2,001-3,000 ms) of stimulus presentation. The dwell times were subjected to a 2 between (Mindset: deliberative vs. implemental) × 3 within (Time: first 1,000 ms vs. second 1,000 ms vs. third 1,000 ms) × 2 within (Attentional Focus: object vs. background) mixed-model ANOVA. In line with the previous analysis, the Mindset × Attentional Focus interaction was significant, $F(1, 36) = 9.90$, $p = .003$, $\eta_p^2 = .216$, observed power = .865. Importantly, this effect was not moderated by time: The Mindset × Attentional Focus × Time interaction was not significant, $F(2, 36) = 1.41$, $p = .25$, $\eta_p^2 = .038$, observed power = .292. These results show that the difference between participants in deliberative and implemental mindsets persisted over the whole duration of stimulus presentation, and did not change over time.

Moreover, the results of the mood measure (Steyer et al., 1997) provide further evidence that our findings cannot be explained by mood effects: There was no significant difference between the experimental conditions for any of the mood dimensions (i.e., valence, awareness, calmness), all ts < 1, ps > .67. In addition, neither dwell time on the foreground object nor dwell time on the background was correlated with any of the mood dimensions, with all rs < .12, ps > .50.

To account for further alternate explanations, we checked whether the experimental conditions differed in terms of task

enjoyment, task engagement, or concentration during the task. None of these variables differed significantly between the experimental conditions, all ts < 1.6, ps > .12. In addition, none of these variables correlated significantly with dwell time on the foreground object or dwell time on the background, all rs < .11, ps > .52.

Discussion

The present results demonstrate that deliberating on an unresolved decision problem and planning the implementation of an already-made decision profoundly changes how individuals attend to visual scenes. In our eye-tracking study, we found that participants in a deliberative and implemental mindset are initially tuned to attend to different aspects of visual scenes. In a picture evaluation task, deliberating participants attended more evenly to the whole scene, whereas planning participants primarily attended to the single foreground object within the scene. This difference in selective attention persisted over the whole trial duration, and thus did not change over time. Furthermore, we ruled out the possibility that mood, task enjoyment, engagement, or concentration were responsible for the differences in attention.

General Discussion

The present findings provide further evidence for the notion of a more open-minded processing style in a deliberative mindset than in an implemental mindset. In three studies, differences between deliberative and implemental mindsets already emerged at the level of visual attention. These results extend previous findings, which have shown that a deliberative mindset leads to more open-minded processing in terms of a superior recognition memory for incidental information (Fujita et al., 2007); however, these previous results did not shed light on the question of whether these differences already emerge during earlier (i.e., attention) or at later stages of information processing (i.e., encoding or retrieval).

We found that compared with a deliberative mindset, an implemental mindset induces a narrow breadth of attention. Participants in an implemental mindset attended less to the periphery of the x-winged Müller-Lyer figures, compared with participants in a deliberative mindset, as indicated by more underestimation errors (Studies 1 and 2) and fewer correct length estimates (Study 2). In Study 3, we further showed that participants in deliberative and implemental mindsets significantly differ in terms of the way they look at complex scenes (i.e., attending more equally to the whole scene in a deliberative mindset vs. focusing on the foreground object in an implemental mindset). These findings support the notion that individuals in a deliberative mindset are open to processing more information that is available in their environment, compared with individuals with an implemental mindset.

It has to be noted that we did not distinguish between goal-relevant and goal-irrelevant information in our studies. In Study 3, neither attending to the foreground object nor attending to the background was explicitly more goal-relevant than the other, as participants simply had to judge how much they liked each picture. The same holds for the Müller-Lyer optical illusion task used in Studies 1 and 2. With respect to attending to the inner versus the outer wings of the Müller-Lyer figures, neither can be seen as more goal-relevant in judging the lengths of an ambiguous line. Thus, our results support the notion of a general automatic change in individuals' breadth of attention as a function of mindset, which occurs despite the lack of goal-relevance of the stimuli.

Implications for Future Mindset Research

Building on these findings, a promising avenue for future research could be to examine possible ways in which to modulate the observed mindset effects on attention. As the distinction between goal-directed top-down and stimulus-driven bottom-up processing regarding attention is well established (for a review on two partially segregated networks of brain areas in attention, see Corbetta & Shulman, 2002, and Dijksterhuis & Aarts, 2010), we would expect that setting goals would be a possible means by which to modulate mindset effects on attention. However, given that people in a deliberative mindset attend more to goal-irrelevant information, compared with people in an implemental mindset, attention to goal-irrelevant information may at times interfere with an individual's focal goal (e.g., Anderson, Laurent, & Yantis, 2011). For instance, when a person browses through a supermarket with the focal goal of buying certain healthy foods, but also with a wide breadth of attention triggered by certain unrelated deliberation (e.g., Should I accept a job offer?), this may drive the person's attention toward distracting options (Büttner et al., 2014), and may even reduce the effectiveness of previous planning (Wieber, Sezer, & Gollwitzer, 2014). Thus, the question arises as to how people can shield their ongoing focal goal pursuits from the unwanted interference of incongruent mindsets. Would thinking about an unresolved issue or its implementation succeed in strategically aligning one's mindset with an upcoming focal goal pursuit? Future research might also want to more closely study the impact of reduced cognitive resources or distracting environments on mindset effects on attention. On one hand, factors such as high time pressure, multi-tasking, being tired, or the presence of attention-capturing stimuli like noise or moving objects could possibly affect the establishment of the mindset itself; on the other hand, these factors might even accentuate the detrimental effects of the deliberative mindset-induced attention to goal-irrelevant stimuli on goal pursuit. In any case, testing the consequence of such personal and contextual limitations for

the effects of mindsets on attention allocation would provide insights into the extent to which automatic, relative to effortful, processes are involved in mindset effects on attention.

Global/Local Processing and Construal Level

One may wonder whether the present research relates to the distinction between global and local processing as reflected in GLOMOsys theory (Förster & Dannenberg, 2010). The global/local account proposes two different processing styles: a local level, at which individuals focus on the details of a given stimulus (e.g., on small letters H composing a large letter E; Navon, 1977); and a global level, at which individuals focus on the holistic aspects of a given stimuli (e.g., on the large letter E consisting of small letters H). A core proposition of GLOMOsys is that processing information at a global versus local level may carry over from perceptual tasks to conceptual tasks (e.g., categorization)—and vice versa (Förster, 2012; Förster & Dannenberg, 2010). Förster and Dannenberg (2010) also linked the distinction between global and local processing to construal level theory (Trope & Liberman, 2010). According to construal level theory, far psychological distance triggers global (high-level construal) processing, whereas near psychological distance triggers local (low-level construal) processing. In support of this link between global versus local processing and construal level, participants who were asked to write about their future life one year later (far future) versus tomorrow (near future) did process the Navon stimuli at a global level versus local level, respectively (Liberman & Förster, 2009, Study 1). Based on these findings, one might assume that the results of our studies reflect differences in global versus local processing, or in construal level. We caution against such a conclusion for three reasons.

First, we argue that deliberative and implemental mindsets cannot be equated with global versus local processing, or with high versus low level of construal (see also Freitas, Gollwitzer, & Trope, 2004; Tsai & McGill, 2011). The differences in information processing between deliberative and implemental mindsets do not depend on experiencing objects and events holistically versus detailed. Rather, they depend on using information for different purposes: either making a goal decision or implementing a chosen goal (Gollwitzer, 1990, 2012). Global as well as local processing (high- as well as low-level construal) is necessary for both purposes (i.e., deliberating and implementing). When making a goal decision, the cognitive procedures activated in the deliberative mindset are assumed to facilitate goal choice by considering both the desirability and the feasibility of attaining a potential goal. According to findings from research on construal level theory, however, desirability is linked to high-level construal, and feasibility to low-level construal (Liberman & Trope, 1998). This implies that individuals in a deliberative mindset use both high- and low-level construal. Moreover, both global and local processing (high- and low-level construal) may occur when planning the implementation of a chosen goal (i.e., in the implemental mindset): Local processing may be the standard mode, but individuals may switch to global processing when they encounter obstacles during goal pursuit (Marguc, Förster, & van Kleef, 2011). In sum, both global and local processing (high- and low-level construal) may occur in a deliberative as well as in an implemental mindset.

Second, we argue that deliberative and implemental mindsets are not systematically linked to triggers that activate global versus local processing (high- vs. low-level construal). In construal level theory, psychological distance is the crucial trigger that influences information processing (Trope & Liberman, 2010), but mindsets are not systematically linked to either far or near psychological distance. The cognitive procedures activated in the deliberative mindset pertain to processing both short-term as well as the long-term consequences of attaining a potential goal (Gollwitzer, 1990, 2012). Furthermore, planning when and how to act also requires both considering the far and the near future. With respect to GLOMOsys theory, novelty versus familiarity has been specified as the trigger of global versus local processing (Förster, 2012). However, deliberating about a goal is not necessarily a more novel situation than thinking about its implementation (or vice versa). In sum, then, the presumed triggers (far vs. near psychological distance, novelty vs. familiarity) that activate global versus local processing (high- vs. low-level construal) seem independent from the determinants of deliberative versus implemental mindsets (i.e., intensively engaging in the deliberation of potential goals vs. planning the implementation of chosen goals). Further research might want to explore how novelty versus familiarity and far versus near psychological distance affect the degree of engagement in deliberation and planning.

Third, our concept of wide versus narrow breadth of attention addresses a different aspect of visual attention than global versus local processing. Our concept of breadth of attention focuses on the amount of information that individuals can process: A wide breadth of attention supports the goal decision because it increases the likelihood of detecting all of the relevant information. A narrow breadth of attention supports the implementation of a chosen goal by shielding the individual from distractors. However, global processing means that an individual focuses on the gestalt of a stimulus, whereas local processing focuses on the stimulus' details (Förster & Dannenberg, 2010; Trope & Liberman, 2010). Still, breadth of attention has also been used as an operationalization of global versus local processing (Marguc et al., 2011, Study 3A), but this link is not unambiguous: A wide breadth of attention does not necessarily imply that individuals focus on the gestalt—it may also lead to more local processing of stimuli in the periphery of the visual field (Hollingworth & Henderson, 2002). Thus, further research should systematically analyze the relationship between breadth of attention and global versus local processing. Such

research might also want to take into account that research on global and local processing has identified hemispheric activation asymmetries related to global versus local processing (e.g., Fink et al., 1996; Proverbio, Minniti, & Zani, 1998; Yamaguchi, Yamagata, & Kobayashi, 2000).

Conclusion

Taken together, the present findings extend our knowledge on the role of mindset in the control of action. Under the assumption that the course of goal pursuit presents itself to the individual as a series of consecutive tasks that need to be solved to promote goal attainment, mindset theory of action phases (Gollwitzer, 1990, 2012) argues that becoming involved in these various tasks activates relevant cognitive procedures in support of solving these tasks. It was found that the deliberative mindset is characterized by cognitive tuning toward desirability- and feasibility-related thoughts and information, by an accurate analysis of feasibility-related information and an impartial analysis of desirability-related information, and, finally, by a heightened general receptivity to available information. The implemental mindset, in contrast, is characterized by cognitive tuning toward implemental thoughts and information, by an overly optimistic analysis of feasibility-related information and a partial analysis of desirability-related information, and, finally, by a comparatively reduced receptivity (closed-mindedness) to available information. The present line of research provides further evidence for the open-/closed-mindedness difference between deliberative and implemental mindsets. Whereas prior research has demonstrated respective differences by using memory tasks (e.g., Fujita et al., 2007), the present research demonstrates that this difference already evinces at the level of visual attention as indicated by wider versus narrower breadth of attention in the deliberative as compared with the implemental mindset. In our view, these findings illustrate how effectively people's efforts in choosing and implementing goals manage to recruit instrumental cognitive procedures.

Declaration of Conflicting Interests

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Note

1. We used this approach in the present research because letting participants name unresolved personal problems or chosen projects, respectively, helps to establish high personal task relevance. A disadvantage of this approach might be that the deliberative and the implemental mindset conditions differ in terms of the content participants think about. However, mindset manipulations that keep the content identical across both conditions, such as buying a car (Büttner, Florack, & Göritz, 2013), or taking part in a scavenger hunt (Armor & Taylor, 2003) also produced results that are in line with mindset theory. Moreover, using content-fixed manipulations or the personal decision/project manipulation yielded the same results regarding information processing (Gollwitzer, Heckhausen, & Steller, 1990), optimism (Armor & Taylor, 2003; Taylor & Gollwitzer, 1995), and recognition of incidental words (Fujita, Gollwitzer, & Oettingen, 2007). For instance, similar mindset effects on the recognition of incidental words were observed irrespective of whether mindsets were manipulated by either deliberating about, or having made, a decision about preference for verbal versus spatial tasks, or by using the personal decision/project task paradigm (Fujita, Gollwitzer, & Oettingen, 2007).

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