

# Does Evaluative Pressure Make You Less or More Distractible? Role of Top-Down Attentional Control Over Response Selection

Alice Normand, Cédric A. Bouquet, and Jean-Claude Croizet  
Université de Poitiers and CNRS

People's ability to resist cognitive distraction is crucial in many situations. The present research examines individuals' resistance to attentional distraction under conditions of evaluative pressure. In a series of 4 studies, participants had to complete various attentional tasks while believing their intelligence was or was not under the scrutiny of an experimenter. Using a spatial cuing paradigm, Studies 1 through 3 demonstrated that feeling evaluated led participants to implement stronger feature-based attentional control, which resulted in more (or less) distraction when irrelevant information matched (did not match) the searched-for target. Study 4 ruled out the possibility that the above effects were due to voluntary shifts of attention and demonstrated that the control settings implemented under evaluative pressure resulted in stronger goal-contingent response priming. Thus, the way individuals relate to the task—the performance context in which they are—induces strong attentional selection biases. Altogether, the present findings highlight an overlooked form of top-down modulation of attention based on performance self-relevance. Implications for both the current models of attentional control and the current hypotheses on the impact of evaluative pressure on cognition, as well as the consequences for more complex performances, are discussed.

**Keywords:** evaluative pressure, attentional set, selective attention, self-threat, response priming

The ability to attend to one source of information while ignoring or excluding other aspects of the environment is crucial to people's daily activities, be it at work or in their social life. Indeed individuals often get distracted from their ongoing activity by task-irrelevant stimuli. The consequences can be minor if the entrance of a colleague in your office breaks the reading flow of this article or more serious if you engage your vehicle onto a crossroad because the wrong crossroad light turned green. Understanding the conditions under which irrelevant stimulus events involuntarily disrupt the observer's goals fulfillment (i.e., attentional distractibility) is therefore an important issue.

The reasons why task-irrelevant stimuli can disrupt task performance are multiple. Irrelevant stimuli can involuntarily draw our attention—a phenomenon referred to as *attentional capture*—away from task-relevant information. As you drive, your attention

may shift in response to an unexpected event like a flashing light on the side of the road. Furthermore, studies measuring distractibility in interference tasks (e.g., flanker task) show that task-irrelevant stimuli can disrupt task performance by priming an inappropriate response that competes with the appropriate response (e.g., Verbruggen, Liefooghe, & Vandierendonck, 2004). While driving and waiting at a crossroad, you may automatically press the gas pedal when the wrong green light turns. In other words, distractors can disrupt cognitive control at different levels: At the perceptual level, they can involuntarily capture attention, and, at the level of response selection, they can involuntarily trigger an inappropriate behavior.

Though much effort has been devoted to understanding how the features of irrelevant stimuli and their interaction with the activity at hand create cognitive distraction, research has only begun to investigate how the self-relevance of performance situations modulates cognitive control. There are indeed many situations in which individuals want to avoid cognitive distraction from the focus task. Evaluative settings are certainly some of them. During an exam, an interview, or when giving an important speech, people strive for their best performance and usually want to devote all their attentional resources to the task at hand.

Research on social cognition has well established that evaluative settings often create an uncomfortable psychological state that actually alters cognitive functioning. Evaluative situations can lead to underachievement through disruption of working memory (Austin & Croizet, 2012; Crouzevialle & Butera, 2013; Schmader, Johns, & Forbes, 2008), self-control (Baumeister, Heatherton, & Tice, 1994), and vigilance (Seibt & Förster, 2004). In evaluative situations, people also pay more attention to details (Förster & Dannenberg, 2010; Higgins, 1997), and they concentrate more on skill processes (DeCaro, Thomas, Albert, & Beilock, 2011). In short, when they are being evaluated, people are in a state of

---

This article was published Online First November 11, 2013.

Alice Normand, Cédric A. Bouquet, and Jean-Claude Croizet, Centre de Recherche sur la Cognition et l'Apprentissage (CERCA UMR 7295), Université de Poitiers, Poitiers, France, and Centre National de la Recherche Scientifique, Paris, France.

The research was supported by grants from the Contrat Projet Etat Région (13e CPER programme 11-Contexte), a Fulbright scholarship, and a bourse de mobilité from the Région Poitou Charentes, awarded to Jean-Claude Croizet. Parts of this work were presented in Alice Normand's doctoral dissertation at the University of Poitiers under the supervision of Jean-Claude Croizet. We thank the members of the Intersideral Group and Dominique Muller for their feedback about this research and Frédérique Autin for helping with data collection.

Correspondence concerning this article should be addressed to Alice Normand or Jean-Claude Croizet, CeRCA UMR CNRS 7295, Université de Poitiers, 5 rue Théodore Lefebvre, Poitiers, 86000 France. E-mail: alice.normand@univ-poitiers.fr or jean-claude.croizet@univ-poitiers.fr

attentional alert. In the present article, our goal was to investigate whether this psychological state of attentional alertness makes people less prone to distractibility. Understanding this issue is fundamental, as being distracted from the focus task in a high-stake evaluative situation can have serious personal and practical consequences, from not passing an exam to failing a particularly demanding safety maneuver in an emergency situation. Here we report four studies in which we examine how being under evaluative scrutiny modulates attentional distractibility from nonrelevant information.

### Evaluative Pressure and Attention

In evaluative situations, individuals are particularly concerned with their performance. The mere presence of others, the fear of failing, or not reaching the standard of success is often enough to trigger self-worries (DeCaro et al., 2011). Inspired by previous work on the impact of social presence on performance (Baron, 1986; Easterbrook, 1959; Zajonc, 1965), two hypotheses have recently emerged to account for the attentional effects of evaluative pressure.

On the one hand for the self-evaluative threat hypothesis (Muller & Butera, 2007), evaluative pressure narrows the focus of attention (Baron, 1986; Huguet, Galvaing, Monteil, & Dumas, 1999; Muller & Butera, 2007). The discrepancy between one's performance and a given standard (other's performance, minimal threshold) triggers concerns about one's self-image that highjack attention from the task at hand. As a result, evaluative pressure reduces the amount of information that can be processed (Crouzevialle & Butera, 2013). Attention is then prioritized to the most relevant information for the task at the expense of less relevant information, thereby generating attentional focusing. Evidence reveals that evaluative pressure reduces visual distraction: Pressured individuals show less Stroop interference (Huguet et al., 1999), make less illusory conjunctions (Muller, Atzeni, & Butera, 2004), and show reduced sensitivity to a nonrelevant abrupt onset (Muller & Butera, 2007; Normand & Croizet, 2013).

On the other hand for the mere effort hypothesis (McFall, Jamieson, & Harkins, 2009), evaluative pressure affects attention through increased motivation to do well. Potential evaluation indeed motivates individuals to strive for their best performance and to put more effort into the task. As a result, evaluative pressure increases the emission of the "prepotent" response that is the response that is dominant for a given task (i.e., the most accessible, automatized, or learned response). In accordance with this account, research indicates that individuals under evaluative pressure are more prone to attentional automatisms, for example, they show higher propensity to reflexive saccades in the antisaccade task (McFall et al., 2009).

These two lines of research indicate that evaluative pressure impacts attentional processes. However, they offer opposing views as to how evaluative situations modulate attentional distractibility from nonrelevant information. The self-evaluative threat framework predicts that distraction induced by nonrelevant information will depend on whether the nonrelevant stimulus matches the current behavioral goal. Instead, the mere effort framework predicts that distraction induced by nonrelevant information will depend on whether or not the nonrelevant stimuli trigger a prepotent automatic response. One ambition of the present research is to

disentangle this issue. Despite this fundamental divergence, these hypotheses nevertheless concur with the idea that evaluative pressure exerts an involuntary top-down influence on attentional processes.

### Top-Down Modulation of Attentional Distractibility

Task goals can impact cognition at an early stage of perceptual processing by impacting how incoming information is filtered out (i.e., attentional capture) or a later stage by influencing how responses are elaborated (i.e., response selection).

Attentional capture has first been conceptualized as a strictly bottom-up process driven by the relative distinctiveness of stimuli (Theeuwes, 1991, 1992, 1994). According to this perspective, people are distracted by a stimulus that presents certain unique stimulus properties (i.e., a singleton), for example, an abrupt visual onset (Yantis, 1993; Yantis & Hillstrom, 1994; Yantis & Jonides, 1990). Others have shown that attentional capture is not solely a function of the distinctiveness of a given stimulus but that it is also contingent on current behavioral goals (Becker, Folk, & Remington, 2010; Folk & Annett, 1994; Folk, Remington, & Johnston, 1992; Folk, Remington, & Wright, 1994). According to this latter perspective, goals result in the implementation of filters that prioritize attention. Thus, an irrelevant stimulus will be more distracting when it shares a feature property that is critical to the focus task. As a result, an irrelevant singleton defined by a specific feature (e.g., red) will less likely capture attention when individuals are searching for a singleton target defined by a different feature value (e.g., green; Folk & Remington, 1998). For example, while driving and searching for a green sign indicating a highway direction, your attention may be more captured by the abrupt onset of a green flashy billboard. Different stimuli properties can be set to attentional filtering systems, such as color (Folk & Remington, 1998), motion (Folk et al., 1994), shape, whether the stimulus is a singleton or not (Bacon & Egeth, 1994), its conditions of appearance (onset, nononset; Folk et al., 1994; Yantis & Jonides, 1990), and even a combination of different properties (Adamo, Pun, Pratt, & Ferber, 2008). The properties identified as relevant for task resolution constitutes a form of attention engagement, more commonly referred to as an *attentional or task set*. The attentional set can thus be defined as a top-down function that prioritizes certain stimuli for selection, thereby preorienting processing toward the selection of a particular response (i.e., selection for action; Allport, 1989).

If the current behavioral goals defined by the nature of the task set the attentional filtering of incoming information, they also set later cognitive stages like response selection processes (i.e., how particular stimulus information is translated into a corresponding response). Response selection, particularly inhibition, has traditionally been conceptualized as being under voluntary control (Logan, 1983; Logan & Cowan, 1984). There is also strong evidence of automatic stimulus-response translation (Hommel, 2000). Echoing work on attentional capture, current work indicates that automatic stimulus-response translation is contingent on the top-down goals (Anderson & Folk, 2012a; Hommel, 1993). For example, the inhibition of a motor response (e.g., no-go response) can involuntarily be triggered by a goal-relevant distractor (Anderson & Folk, 2012a). When a feature-defined target is associated with a specific response, the observer adopts an attentional and

response set in order to produce the response when a stimulus shares this feature (e.g., while driving and waiting at a crossroad, you prepare to press on the accelerator when the light turns green) (Anderson & Folk, 2012b). An irrelevant stimulus (e.g., the traffic light for the other street) can therefore activate a wrong response because it shares with the target a response-associated feature (i.e., the color green).

There is thus substantial evidence that the distraction induced by an irrelevant stimulus is influenced by top-down processes. Indeed, task goals translate in the implementation of attentional control settings. As a consequence, irrelevant stimuli that match the attentional set can, at the perceptual level, involuntarily capture attention and, at the level of response selection, involuntarily trigger behavioral response. Cognitive control is adjusted to task requirements; it can also be affected by social factors such as the evaluative nature of performance settings. However, it remains unclear how situations in which individuals want to perform their best and therefore avoid cognitive distraction impact attentional distractibility.

### Overview of the Present Research

In this article, our goal was to investigate the effect of evaluative pressure on attentional distractibility. Previous research has shown that when confronted with a task, individuals voluntarily set up control settings to fulfill the task goals (i.e., an attentional set). These parameters are defined by the goals of the task and act as cognitive filters that prepare individuals to attend and more efficiently process the features that are critical for goal fulfillment. Building on the self-evaluation threat hypothesis (Muller & Butera, 2007) and the research on the contingency of involuntary attention to top-down goals (Anderson & Folk, 2012a; Folk & Remington, 1998), we make the following prediction: When individuals are under evaluative scrutiny, they implement a stronger attentional set (i.e., their visual control for action becomes more selective; Allport, 1989). Whether or not people under evaluative pressure will be distracted by irrelevant information therefore depends on the matching between the distractor properties and the participants' attentional set. We hypothesized that evaluative pressure will render people more prone to exogenous distractors when the distractors match the attentional set but less sensitive when distractors do not match.

We report four studies in the present article. The goal of the first study was to show that an irrelevant abrupt onset influences response to a visual target to a lesser extent when individuals are under evaluative pressure. The aim of the second and third studies was to demonstrate the contingent nature of this influence: When individuals are under pressure, they are more (less) distracted by an abrupt onset if it matches (does not match) the attentional set implemented for task requirement. Finally, a fourth study revealed whether the moderation role of evaluative pressure on attentional distractibility operates strictly at the perceptual level (i.e., involuntary shift in spatial attention) or at the level of response selection (i.e., involuntary response selection).

### Study 1

In the first study, we sought to examine whether attentional distractibility could be reduced by evaluative pressure. Participants

had to perform an attentional task in either one of two experimental conditions. In the pressure condition, participants were told that the task was diagnostic of their cognitive ability, and the experimenter remained in the experimental room throughout the task. In the nonpressure condition, participants were told the task was not diagnostic of cognitive ability, and the experimenter left the room during the task.<sup>1</sup> To assess how evaluative pressure modulates attention, we used a spatial cuing paradigm in which participants had to search for a target after a brief irrelevant abrupt onset cued one location on the computer screen (Muller & Butera, 2007). Participants had to indicate as quickly and accurately as possible the location of a letter *O* presented among three letters *Qs* displayed in a rectangle (see Figure 1, Panel A). The spatial cue (a black dot) was presented before the target display to trigger attentional capture (Jonides, 1981). This cue was irrelevant to task resolution: For one half of the trials, the cue primed the location where the *O* was about to appear (i.e., *valid cue*), and for the other half, it primed an incorrect location (i.e., *invalid cue*). Invalid cues thus result in longer response time (as invalid cues capture attention away from the target at first) than valid cues, and the response time difference between invalid and valid trials reflects the magnitude of the cuing effect. Our goal was to examine whether being under evaluative scrutiny modulates the distracting effect of the abrupt onset of the spatial cue (i.e., cuing effect). We expected that evaluative pressure would exert a top-down modulation of attention through the implementation of a stronger attentional set. We hypothesized that stimuli whose features are different from those critical to task resolution are filtered out and elicit less attentional capture (Folk & Remington, 1998). Because the cue (an abrupt onset of a black dot) did not match task demands (identifying the letter *O* among *Qs* on the target display), we predicted that under evaluative pressure, the spatial cue would be less distracting, which should translate into a reduced cuing effect.

### Method

**Participants and design.** Participants included 38 undergraduates from the University of Poitiers, Poitiers, France, who participated for course credit. They all had normal or corrected-to-normal vision. They were randomly assigned to a 2 (evaluative pressure: evaluative, nonevaluative)  $\times$  2 (cue validity: valid, invalid) mixed design, with the first factor varying between participants and the second factor varying within them. Two participants were excluded from the analysis due to abnormal reaction times (high studentized-deleted residuals and Cook's distances).

**Material.** The visual cuing task was borrowed from Muller and Butera (2007, Experiment 5). Participants had to locate as quickly as possible a target, the letter *O*, among three *Qs*, subtended 2.16° by 2.41° and displayed in a rectangle (see Figure 1, Panel A). They were instructed to press the 1, 3, 4, or 6 keys on the numerical pad to indicate whether the letter *O* was located at the bottom-left, bottom-right, top-left, or top-right corners, respec-

<sup>1</sup> In this research, our goal was not to assess whether the presence of the experimenter or the diagnosticity separately trigger evaluative pressure, as it is well established in the literature (e.g., McFall et al., 2009; Schmader et al., 2008). We combined these two factors to maximize evaluative pressure and to reproduce usual high-stakes evaluative situations in which people perform in presence of an evaluator.

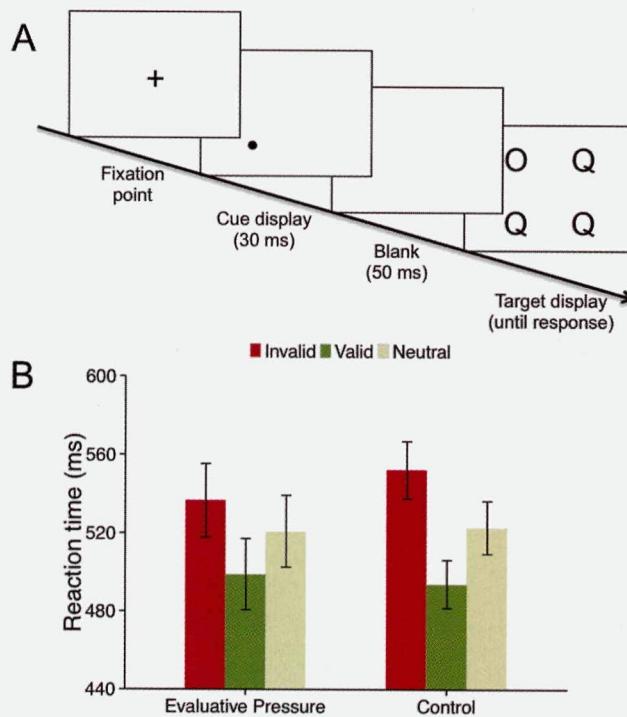


Figure 1. Study 1: Sequence of events for an invalid trial (Panel A) and mean reaction time as a function of evaluative pressure and cue validity (Panel B). Error bars represent standard error.

tively. In each trial, participants were first presented with a fixation cross ("+") in the center of the screen for a random duration (850, 1,000, 1,250, 1,500 ms). Each letter was presented at an angular distance of 6.78° from the fixation point. Angular distances were controlled through the use of chinrest. A spatial cue (i.e., a simple black dot subtended 0.44° by 0.44°) was presented before the target display for 30 ms. For one third of the trials, the cue appeared at the subsequent target's location and was therefore expected to facilitate the correct answer (i.e., *valid* cue). For another third of the trials, the cue was presented randomly at the location of one of the three subsequent *Qs* and was expected to slow down reaction times (i.e., *invalid* cue). For the last third of the trials (control), four cues appeared at the four locations on the screen. Following 15 practice trials, participants completed two blocks of 72 trials. Stimuli were displayed using E-Prime.

**Procedure.** On arrival, participants were informed that they were about to take an attentional task. In the evaluative condition, the experimenter introduced the task as "an evaluation of attentional capacity that is linked to intellectual ability." Participants were also told that they would get a score at the end, and the experimenter sat next to them throughout the experiment (Harkins, 2001, 2006). Participants, however, received no score. In the control condition, the experimenter introduced the task as a device to study "the effect of training on perception," and insisted on the fact that individual performance would automatically be merged with the others' performance and finally left the experimental room so that the participant completed the task alone. After the attentional task, manipulation checks were administered, and participants were then thoroughly debriefed and thanked.

**Manipulation checks.** Participants were asked to evaluate to what extent the test measured intellectual capacities and whether they felt being evaluated during the task on a Likert scale anchored from 1 (*not at all*) to 7 (*very much*).

## Results

**Manipulation checks.** Participants in the evaluative condition reported the task measured intellectual capacities to a greater extent ( $M = 6.06$ ;  $SD = 2.58$ ) than control participants ( $M = 2.06$ ;  $SD = 1.63$ ),  $F(1, 34) = 31.01$ ,  $p < .001$ ,  $\eta_p^2 = .48$ . They also reported feeling more evaluated ( $M = 3.33$ ;  $SD = 1.88$ ) than control participants ( $M = 1.22$ ;  $SD = 0.43$ ),  $F(1, 34) = 21.61$ ,  $p < .001$ ,  $\eta_p^2 = .39$ .

**Reaction time.** Reaction times (RTs) less or greater than three standard deviations from the individual mean RT were excluded from the analyses; this trimming eliminated less than 3% of the data.<sup>2</sup> Correct RTs were subject to a 2 (evaluative pressure: evaluative, nonevaluative)  $\times$  2 (cue validity: valid, invalid) mixed analysis of variance (ANOVA). Analysis revealed no effect of evaluative pressure on mean RTs,  $F(1, 34) = 0.06$ ,  $p = .81$ ,  $\eta_p^2 = .002$ . A main effect of cue validity was observed, indicating that the abrupt onset of the cue captured attention,  $F(1, 34) = 128.57$ ,  $p < .001$ ,  $\eta_p^2 = .79$ . RTs were longer for invalid trials ( $M = 544$ ;  $SD = 71$ ) than for valid trials ( $M = 496$ ;  $SD = 65$ ). As predicted, the two-way interaction of evaluative pressure and cue validity was significant,  $F(1, 34) = 5.91$ ,  $p = .02$ ,  $\eta_p^2 = .15$ . Though

<sup>2</sup> Mean error rate was very low (.006); therefore, errors were not further analyzed.

significant in both conditions, the cuing effect was reduced in the evaluative pressure condition (38 ms) relative to the control condition (58 ms). This pattern indicated, as predicted, that the spatial cue was less distractive when participants were under evaluative pressure (see Figure 1, Panel B).

## Discussion

Previous literature has indicated that stimuli whose features are different from those critical to task resolution tend to be filtered out and elicit less attentional capture (Folk & Remington, 1998) or less response activation (Anderson & Folk, 2012a). We expected this phenomenon to be reinforced under evaluative pressure. Because the spatial cue (an abrupt onset of a black dot) did not match task demands (identifying the letter *O* among *Qs* on the target display), we predicted that under evaluative pressure, the cue would be less distracting, which would translate into a reduced cuing effect.

The findings from Study 1 are congruent with our claim that evaluative pressure exerts a top-down modulation of attention. Being under evaluative scrutiny leads individuals to implement a stronger attentional set by which stimuli that present features different from those critical to task resolution are filtered out. The results showed that being under evaluative scrutiny made participants' reaction time less influenced by an irrelevant distracting stimulus. The modulation of attentional distractibility by the situational context observed in the present study replicates previous findings by Muller and Butera (2007), who found that individuals confronted with a better-off peer (i.e., under upward social comparison) showed a reduced spatial cuing effect. The present results extend this previous literature by showing that evaluative pressure can generate the same behavioral outcome. Though congruent with our filtering hypothesis, the present finding, however, remains only suggestive. If evaluative pressure translates into a stronger attentional set, we should expect it to increase attentional distractibility by stimuli that present features similar to those critical for task fulfillment. The second study was designed to address this issue.

## Study 2

Study 2 involved a manipulation of the physical similarity between the irrelevant cue and the searched-for target. For that purpose, the paradigm used in Study 1 was modified according to Folk and Remington (1998; see also Ansorge & Heumann, 2003; Fayant, 2011). Participants had to detect a target defined on a specific dimension of color, all other dimensions being equal (shape, conditions of appearance). In our modified paradigm, the target, a red letter *O*, was presented among two letters *Qs* in black and one *O* in green. The target was then distinctive on the color dimension. Before the presentation of the target display, the correct or incorrect location of the target was primed by a spatial cue that either shared (red color) or not (green color) the feature defining the uniqueness of the target. The contingent attentional capture hypothesis (Folk & Remington, 1998) predicted that the spatial cue would capture attention to a larger extent when it shared the target-distinctive feature. In this study, we hypothesized that the contingent impact of task goals on attentional distractibility would be heightened by evaluative pressure. Under evaluative

pressure, individuals implement a stronger attentional set. As a result, stimuli, whose features match the content of the set (i.e., here the color red) receive more attention and prime more the associated response, whereas those that do not match it are filtered out. We predicted that under evaluative pressure, the distractibility induced by a spatial distractor (i.e., the cuing effect) is exacerbated when the distractor matches the attentional set implemented for the task (i.e., it is red like the target). We also predicted that this distractibility would be diminished when the distracting stimulus does not match the attentional set (i.e., it is not red).

## Method

**Participants and design.** Participants included 42 undergraduates at the University of Poitiers who participated for course credit. They all had normal or corrected-to-normal vision. They were randomly assigned to a 2 (evaluative pressure: evaluative, nonevaluative)  $\times$  2 (cue color: red, green)  $\times$  2 (cue validity: valid, invalid) mixed design, with the first factor varying between participants and the other two within them. Two participants were excluded from the analysis due to abnormal reaction times or high error rate (high studentized-deleted residuals and Cook's distances).

**Material and procedure.** The procedure was identical to the one used in Study 1 except for the following changes in the cuing task. First, the to-be-detected target was a red letter *O* presented among two letter *Qs* and one green letter *O*. Because we needed the target to be a singleton like in the original version of the task, that is, a stimulus that differs from the others on one sole dimension, we introduced a green letter *O*. The target thereby only differed from the other letters in the display by its color (i.e., red). Second, in order to have equivalent conditions of appearance between the cue and the target, the target display appeared abruptly for 60 ms immediately followed by a 1,440-ms mask. Finally, we modified the cue display. Not one dot (see Study 1), but four dots at the four locations of the screen were displayed. One of them was the spatial cue and was colored, making it salient enough to capture attention (see Figure 2, Panel A). The spatial colored cue was equally red (i.e., the same color as the target) or green (i.e., a different color). In one third of the trials, the cue (both colors) was valid, and in another third of the trials, invalid. The last third of the trials were control trials, and the cue display consisted of four black dots. Following 15 practice trials, participants completed two blocks of 144 trials. Stimuli were displayed using E-Prime (Psychology Software Tools, Inc., Pittsburgh, PA).

## Results

**Manipulation checks.** Participants in the evaluative condition reported the task measured intellectual capacity to a greater extent ( $M = 4.74$ ;  $SD = 2.53$ ) than control participants ( $M = 1.86$ ;  $SD = 1.42$ ),  $F(1, 38) = 20.12$ ,  $p < .001$ ,  $\eta^2 = .35$ . They also reported feeling more evaluated ( $M = 3.89$ ;  $SD = 1.88$ ) than control participants ( $M = 2.00$ ;  $SD = 1.67$ ),  $F(1, 38) = 21.62$ ,  $p = .002$ ,  $\eta^2 = .36$ .

**RT.** RTs less than or greater than three standard deviations from the individual mean RT were excluded from the analyses;

this trimming eliminated less than 0.2% of the data.<sup>3</sup> Correct RTs were subject to a 2 (evaluative pressure: evaluative, non-evaluative)  $\times$  2 (cue color: red, green)  $\times$  2 (cue validity: valid, invalid) mixed ANOVA. Analyses revealed no effect of evaluative pressure on mean RTs,  $F(1, 38) = 1.55, p = .22, \eta_p^2 = .04$ . The analysis revealed the classical cuing effect (main effect of cue validity),  $F(1, 38) = 474.40, p < .001, \eta^2 = .93$ . RTs on invalid trials were longer ( $M = 379; SD = 34$ ) than RTs on valid trials ( $M = 340; SD = 38$ ). Cue color had a significant effect on RTs,  $F(1, 38) = 7.72, p = .008, \eta_p^2 = .17$ . RTs on green-cued trials were longer ( $M = 362; SD = 34$ ) than RTs on red-cued trials ( $M = 357; SD = 38$ ). The two-way interaction between cue validity and cue color was also significant,  $F(1, 38) = 145.21, p < .001, \eta_p^2 = .79$ . Following Folk and Remington (1998), the cuing effect was stronger when the cue shared the distinctive feature of the target (i.e., it was also red) ( $M = 66$  ms) than when it did not (i.e., it was green) ( $M = 12$  ms). As hypothesized, the analysis yielded a significant three-way interaction of evaluative pressure, cue color, and cue validity,  $F(1, 38) = 8.70, p < .005, \eta_p^2 = .19$ . As shown in Figure 2, Panel B, the cuing effect was stronger for participants in the evaluative condition when the cue shared the distinctive feature of the target (i.e., it was also red) ( $M = 75$  ms) than in the control condition ( $M = 58$  ms),  $F(1, 38) = 6.67, p < .01, \eta_p^2 = .15$ . This pattern suggests that when the cue was the same color as the target, it became more distracting for participants in the evaluative condition than for participants in the control condition. Moreover, the cuing effect was smaller for participants in the evaluative condition when the cue did not share the distinctive feature of the target ( $M = 7$  ms) than for participants in the control condition ( $M = 16$  ms),  $F(1, 38) = 4.29, p < .04, \eta_p^2 = .10$ . In accordance with our hypothesis, when the cue was a different color than the target, it became less distracting for participants in the evaluative condition than for participants in the control condition (see Figure 2, Panel B).

## Discussion

The results of Study 2 provide the first direct support for our hypothesis that evaluative pressure influences how cognitive control settings involuntarily influence attentional distractibility. Participants had to detect the location of a colored target (i.e., a red  $O$ ) that was swiftly preceded by a spatial cue that was either red or green and that was equally valid or invalid. In accordance with Folk and Remington's (1998) contingent attentional capture hypothesis, results showed that the spatial cue was more distracting when it shared the distinctive feature of the target: The cuing effect was more pronounced when the distractor, like the target, was red. On the contrary, the spatial cue was less distracting when it did not share the distinctive feature of the target: The cuing effect was diminished when the distractor, unlike the target, was green. More importantly, the findings confirmed our hypothesis of modulation of attentional distractibility by evaluative pressure. Contingent attentional distractibility was more pronounced when participants were under evaluative pressure. Altogether, the results strongly advocate for the existence of top-down control of attentional distractibility. The attentional system outweighs the importance of the relevant physical features that are central to the task (e.g.,

the red color), resulting in less distraction from irrelevant physical features. Most of all, this top-down modulation appears to be stronger for participants in the evaluative pressure condition. Participants in this condition indeed showed stronger distraction by the similar-to-target spatial cue and weaker distraction by the dissimilar-to-target cue than their peers in the control condition. Though consistent with our stronger attentional set account, results from Study 2 are opened to an alternative interpretation. The higher impact of the red spatial cue relative to the green one under evaluative pressure could result from the specific meaning of the red color regarding human behavior. In daily life, the color red signals potential danger (e.g., warning signals, traffic lights) and activates an avoidance motivation that enhances a detail-oriented processing style (Elliot, Maier, Binser, Friedman, & Pekrun, 2009; Mehta & Zhu, 2009). Thus, it remains possible that participants under an evaluative threat were biased toward any red cue in their environment. To address this shortcoming, we designed a third study in which the shared dimension between the target and the spatial cue was counterbalanced. To extend the generalizability of our finding, we manipulated the shape rather than the color of the visual features.

## Study 3

In Study 3, participants performed the same task as in Study 2 except for the stimuli appearing on the screen. The target display contained one circle, one cross, and two signs, that is, “=”. The to-be-detected target was either the circle or the cross and varied between participants. The spatial cue was either a cross or a circle that appeared abruptly on the screen. We predicted that the similar-to-target cue would interfere with the localization of the target to a greater extent than the dissimilarto-target cue and that this phenomenon would be exacerbated for participants in the evaluative pressure condition.

## Method

**Participants and design.** Participants included 38 undergraduates at the University of Poitiers who participated for course credit. They all had normal or corrected-to-normal vision. They were randomly assigned to a 2 (evaluative pressure: evaluative, nonevaluative)  $\times$  2 (target: circle, cross)  $\times$  2 (cue similarity: similar, dissimilar)  $\times$  2 (cue validity: valid, invalid) mixed design, with the first two factors varying between participants and the other two within them. Two participants were excluded from the analysis due to abnormal reaction times or high error rate (high studentized-deleted residuals and Cook's distances).

**Material and procedure.** The procedure and the cuing task replicated the one used in Study 2 except for some critical changes in the stimuli presented on the screen. First, the target display was composed of one circle, one cross, and two signs, that is, “=”, which appeared randomly in the four quadrants of the screen (see Figure 3, Panel A). Unlike Study 2, the distinctive feature of the target was counterbalanced. For a given participant, it was either a

<sup>3</sup> Mean error rate was very low (.005); therefore, errors were not further analyzed.

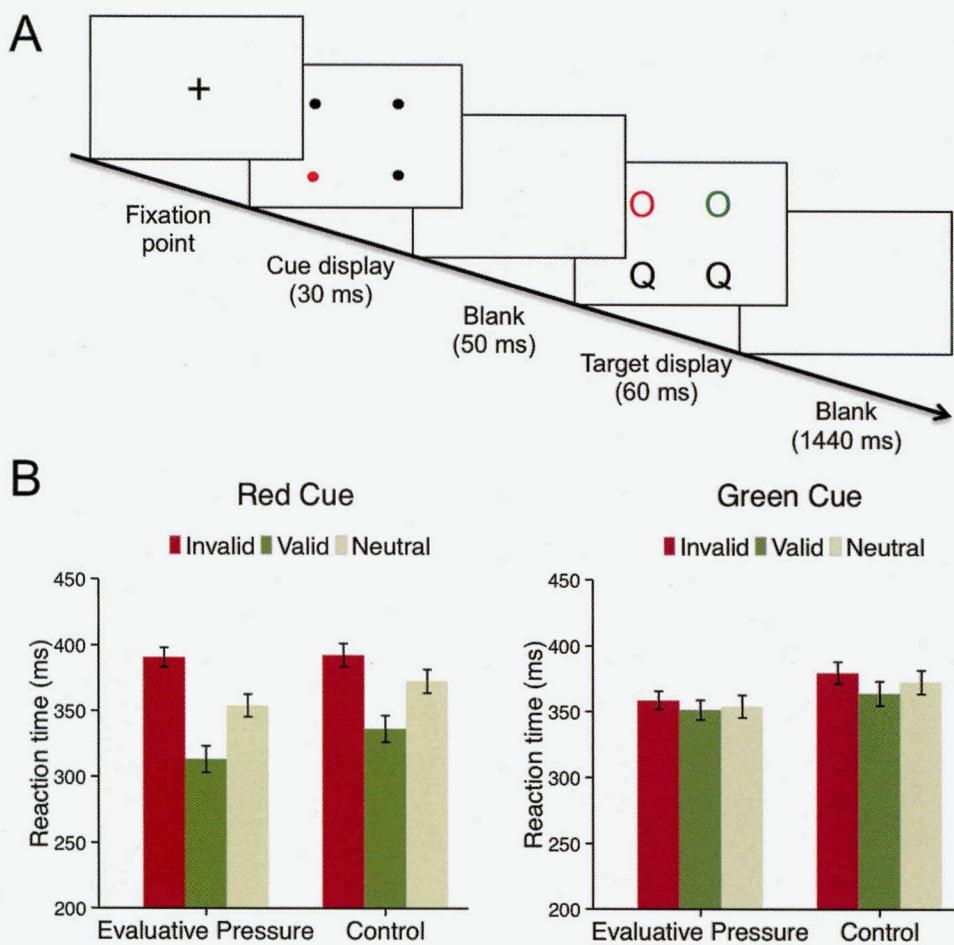


Figure 2. Study 2: Sequence of events for an invalid trial in which the cue is the same color as the target (Panel A) and mean reaction time as a function of evaluative pressure, cue validity, and cue color (Panel B). Error bars represent standard error.

cross or a circle. The target display was preceded by the abrupt onset of a spatial cue that was similar or dissimilar to the target across trials. The spatial cue primed a location that was equally valid or invalid. A control cue display made up of four circles or four crosses in the four quadrants was presented for one third of the trials as in Studies 1 and 2. Following 15 practice trials, participants completed two blocks of 144 trials. Stimuli were displayed using E-Prime (Psychology Software Tools, Inc., Pittsburgh, PA).

## Results

**Manipulation checks.** Participants in the evaluative condition reported the task measured intellectual capacities to a greater extent ( $M = 6.22$ ;  $SD = 2.39$ ) than control participants ( $M = 1.94$ ;  $SD = 1.62$ ),  $F(1, 34) = 39.44$ ,  $p < .001$ ,  $\eta^2_p = .54$ . They also reported feeling more evaluated ( $M = 3.44$ ;  $SD = 1.92$ ) than control participants ( $M = 1.28$ ;  $SD = 0.46$ ),  $F(1, 34) = 21.72$ ,  $p < .001$ ,  $\eta^2_p = .39$ .

**RT.** RTs less than or greater than three standard deviations from the individual mean RT were excluded from the analyses; this trimming eliminated less than 0.2% of the data.<sup>4</sup> Correct RTs

were subject to a 2 (evaluative pressure: evaluative, nonevaluative)  $\times$  2 (cue similarity: similar, dissimilar)  $\times$  2 (cue validity: valid, invalid) mixed ANOVA. Analyses revealed no effect of evaluative pressure on mean RTs,  $F(1, 34) = 0.15$ ,  $p = .70$ ,  $\eta^2_p = .004$ . The standard cuing effect again was found,  $F(1, 34) = 105.52$ ,  $p < .001$ ,  $\eta^2_p = .76$ . RTs on invalid trials were longer ( $M = 391$ ;  $SD = 47$ ) than RTs on valid trials ( $M = 359$ ;  $SD = 52$ ). Cue similarity had a significant effect on RTs,  $F(1, 34) = 8.87$ ,  $p = .005$ ,  $\eta^2_p = .21$ . RTs on trials preceded by a dissimilar cue were longer ( $M = 378$ ;  $SD = 50$ ) than RTs on trials preceded by a similar cue ( $M = 372$ ;  $SD = 49$ ). The two-way interaction between cue validity and cue similarity was also significant,  $F(1, 34) = 97.79$ ,  $p < .001$ ,  $\eta^2_p = .74$ . Congruent with Folk and Remington (1998), the cuing effect was stronger when the cue shared the distinctive feature of the target (i.e., same shape) ( $M = 50$  ms) than when it did not (i.e., different shape) ( $M = 15$  ms). The analysis yielded the predicted significant three-way interaction of evaluative pressure, cue similarity, and cue validity,  $F(1, 34) = 21.37$ ,

<sup>4</sup> Again, no ANOVA was conducted on error rate, as errors were very low (.003).

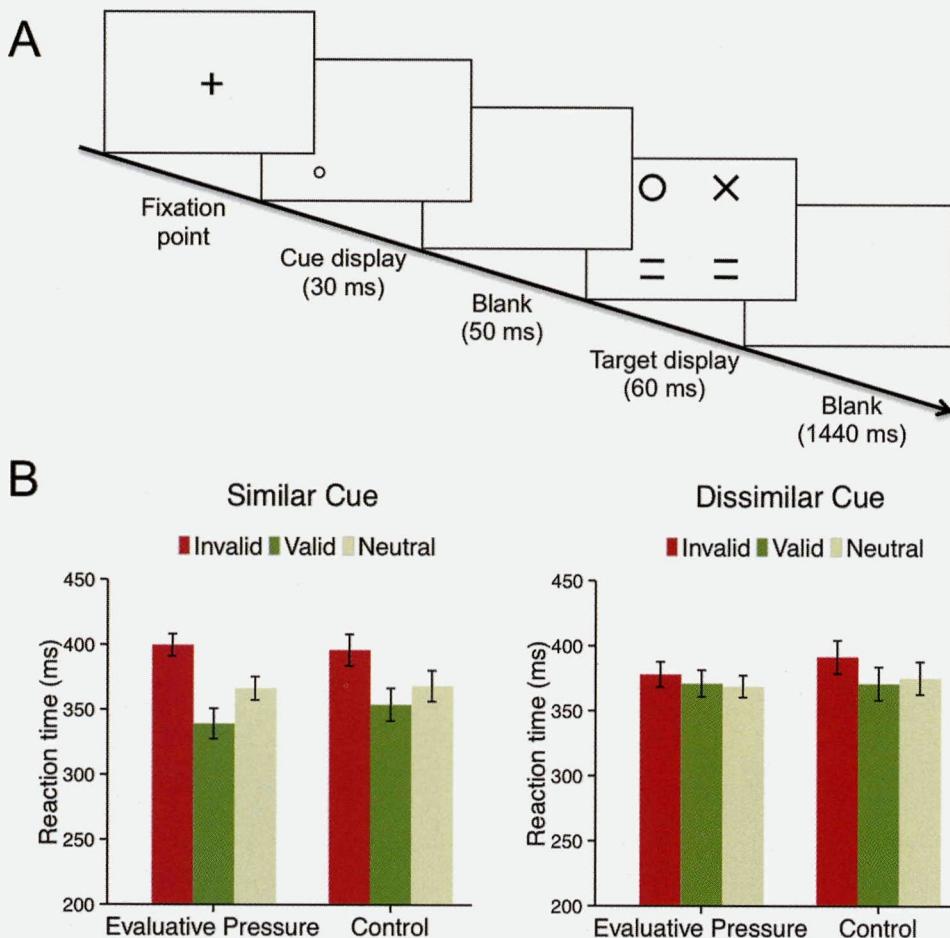


Figure 3. Study 3: Sequence of events for an invalid trial, in which the cue was considered as "similar" to the target for participants who had to locate the circle and "dissimilar" to the target for those who had to locate the cross (Panel A). Also displayed is the mean reaction time as a function of evaluative pressure, cue validity, and cue similarity (Panel B). Error bars represent standard error.

$p < .001$ ,  $\eta_p^2 = .39$ . As shown in Figure 3 (Panel B), the cuing effect of the similar-to-target cue was bigger for participants in the evaluative condition ( $M = 58$  ms) than for participants in the control condition ( $M = 42$  ms),  $F(1, 34) = 4.08$ ,  $p = .05$ ,  $\eta_p^2 = .11$ . Thus, evaluative pressure increased the distracting effect of similar-to-target irrelevant cues. Moreover, the cuing effect of the dissimilar-to-target cue was smaller for participants in the evaluative condition ( $M = 7$  ms) than for those in the control condition ( $M = 23$  ms),  $F(1, 34) = 6.66$ ,  $p < .02$ ,  $\eta_p^2 = .16$ . In accordance with our hypothesis, the findings indicated that evaluative pressure diminished the attentional distractibility by dissimilar-to-target irrelevant cues (cf. Figure 3, Panel B).

## Discussion

Study 3 replicated results from Study 2 and provided additional support for our hypothesis that being under evaluative pressure translates into top-down modulation of attention through the implementation of a stronger attentional set. Participants, who believed that their intelligence was under the scrutiny of the experimenter, gave higher attentional weight to the central elements of

the task. Under evaluative pressure, their detection latencies were more influenced by the abrupt onset of an irrelevant spatial cue when it shared the distinctive feature of the to-be-detected target. On the contrary, evaluative pressure reduced the influence of the irrelevant cue when it did not share this distinctive feature.

These findings confirm that attentional distractibility is contingent on task requirements. When confronted with a task, individuals prioritize their attention on the features they perceived as central for its resolution (i.e., identifying an *O* among *Qs*; a red symbol among nonred distractors a cross or a circle among other shapes). As a result, they filter out the incoming information that does not match these priorities. Our results confirm the idea that distraction induced by an abrupt onset is modulated by task goals (Folk & Remington, 1998). More importantly, the present results extend this literature by demonstrating that top-down modulation of attention distractibility can be profoundly affected by social situations.

Evaluative situations are particularly relevant to study sensitivity to distraction because in these settings, individuals strive to achieve at their best and to avoid distraction by irrelevant stimu-

lation. Our findings indicate that being under evaluative scrutiny leads people to set stronger attentional filters that influence their sensitivity to distracting information. During an exam or an interview, individuals will show less distractibility by irrelevant stimulation if it does not resemble the information prioritized to complete the task. The higher selectivity of attention under evaluative pressure still implies that people will be more easily lured by irrelevant stimuli if they somehow resemble the relevant information for the task.

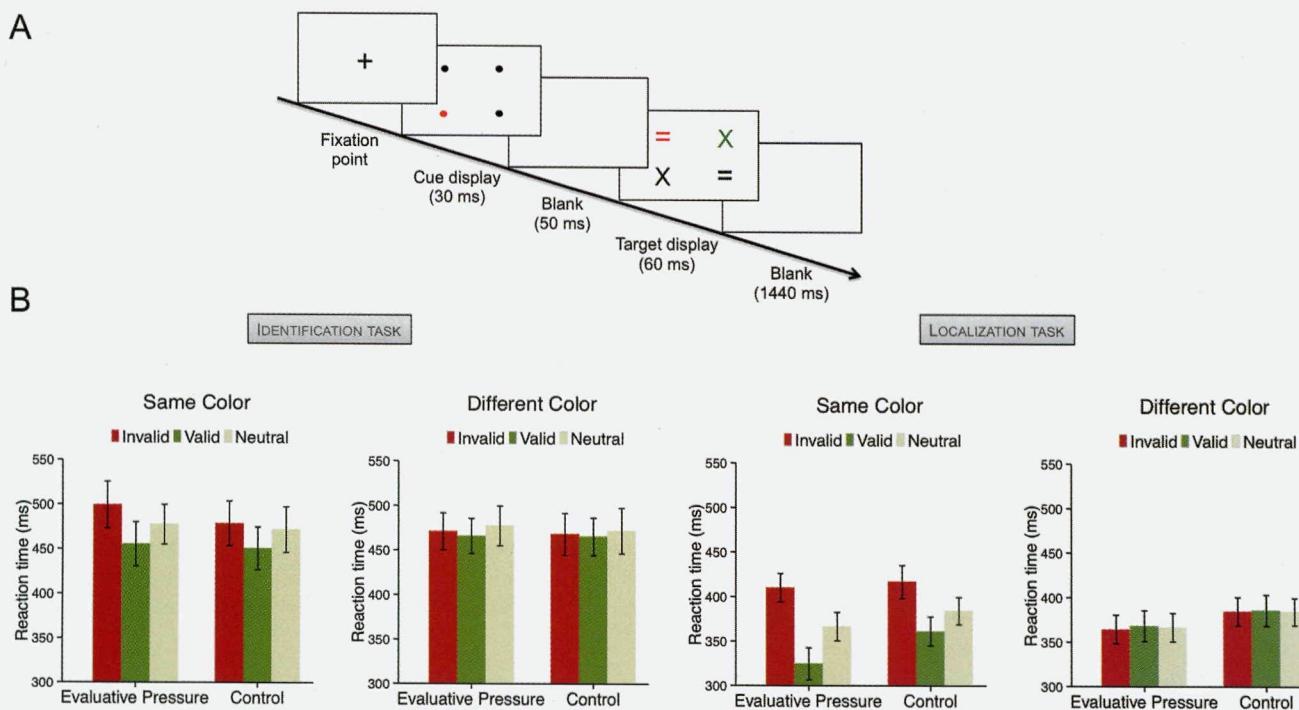
Though the three previous studies showed that evaluative pressure exacerbates the goal contingent cuing effect, the experimental procedure used across these studies leaves open several interpretations of the findings. Two issues can be identified. First, because there were four possible locations for the target and the cues were valid 50% of the time, the cues were actually informative with respect to predicting the target location. Indeed, to be completely uninformative, the cue and target locations should have matched at chance level (i.e., 25% of the time). It is therefore possible that the cuing effect we observed reflects voluntary instead of involuntary shifts in attention (e.g., attentional capture). Second, because the task is to report the location of the target by pressing a spatially corresponding button, the cue shares the response feature of the target. Consequently, a spatial cue may thus create a bias for one particular response (i.e., visuomotor priming) such as a cue appearing, for example, in the bottom-right corner that may prime a bottom-right button press (Rosenbaum & Kornblum, 1982). It is therefore possible that the obtained effect reflects the influence of evaluative pressure on response selection rather than involuntary

attentional shifts in attention. To address these alternative interpretations, we designed a fourth experiment.

### Study 4

The goal of this study was to specify the cognitive processes behind the moderation of the cuing effects by evaluative pressure observed in previous studies. Our purpose was to disentangle three possible accounts of the findings: (a) Under evaluative pressure, individuals are more efficient at voluntarily orienting their attention toward the stimuli that match the control settings implemented for achieving the task goal; (b) under evaluative pressure, individuals implement a stronger control set that makes them more (less) prone to the involuntary attentional capture of distractors that match (mismatch) their *perceptual attentional set*; (c) under evaluative pressure, individuals implement a stronger control set that makes them more (less) prone to the involuntary selection of the motor response primed by distractors that match (mismatch) their *attentional set*.

We adapted the procedure used in Studies 1–3 in Study 4 to address these issues. Participants had to perform a spatial cuing task in which a target display (two Xs and two “=” signs) was preceded by irrelevant spatial cues (dots) that shared or not the color feature defining the target (red vs. green) (see Figure 4, Panel A). First, to discard the possibility that participants were able to implement a voluntary strategy, the cue was rendered completely uninformative as to the location of the target; it primed the correct location on 25% of the trials (i.e., at chance level). Second, to examine



**Figure 4.** Study 4: Sequence of event for an invalid trial, in which the cue was considered as “similar” to the target for participants who had to locate the red “=” and “dissimilar” to the target for those who had to locate the green X (Panel A). Mean reaction time as a function of evaluative pressure, cue validity, and cue similarity for both the identification and the localization task are also illustrated (Panel B). Error bars represent standard error.

whether the impact of evaluative pressure results from moderation of attentional capture versus moderation of response selection, participants were exposed to the same sequences of stimuli but were required to perform two distinct tasks, administered one after the other. The target identification task modeled after Folk and Remington (1998) was always administered first. On the target display, two Xs and two “=” were presented. Two of the items were black, one was red, the other was green. Participants had to search for a color-defined target (red or green) and to report its identity (i.e., X or “=”). In this target identification task, the distractor (a spatial cue) did not share the response feature with the target (i.e., reporting its identity). Thus, this task prevented the cue from matching the response set adopted by participants.

To replicate the procedure used in the previous studies, a target localization task was last administered. Participants were exposed to the same sequence of stimuli as the identification task but were instructed to report the location instead of the identity of the feature-defined target. In this localization task and contrary to the identification one, the cue shared the response feature with the target (i.e., location).

We reasoned that if the top-down modulation of attention under evaluative pressure affects attentional capture, then we should replicate findings of Studies 1–3 for both the identification and the localization tasks. However, if the top-down modulation of attention under evaluative pressure disrupts cognitive performance at the level of response selection through visuomotor priming, then we should replicate findings from Studies 1 to 3, but only when participants were required to report the location of the target.

## Method

**Participants and design.** Participants included 36 undergraduates at the University of Poitiers who participated for course credit. They all had normal or corrected-to-normal vision. They were randomly assigned to a 2 (evaluative pressure: evaluative, nonevaluative)  $\times$  2 (target color: red, green)  $\times$  2 (cue color: same as the target, different from the target)  $\times$  2 (cue validity: valid, invalid) mixed design, with the first two factors varying between participants and the other two within them. Five participants were excluded from the analysis: three due to abnormal reaction times or high error rate (high studentized-deleted residuals and Cook's distances), one in reason of suspicion about the manipulation of evaluative pressure, and one due to a misunderstanding of instructions.

**Material and procedure.** The procedure (timing and stimuli sizes) was based on that used in Study 2, except for some critical changes in the stimuli of the target display and in the instructions. Specifically, the letters O and Q were replaced by two Xs and two “=”, among which one was red, one was green, and the others were black. The target was feature-defined by either the red or green color and varied between participants. Four blocks of 72 trials were created (two per type of tasks: identification and localization). On each trial, the target display was swiftly preceded by a cue display composed of four dots at the four locations on the screen (like in Study 2). Within one block, one third of the trials (24 trials) were neutral trials in which the four dots of the cue display were all black. For the other two thirds of the trials, one of the four dots (i.e., the spatial cue) of the cue display was equally colored in green (24 trials) or in red (24 trials), thereby being

salient enough to capture attention (see Figure 4, Panel A). In the previous version of the cuing task, the spatial cue was valid on half of the trials and invalid on the other half. However, given the four possible locations and in order to be completely uninformative, the cue and the target location should correspond no more than 25% of time. This issue was addressed in the present version of the task: Within one block of trials, the colored spatial cue was invalid for 75% of the trials (18 trials) and valid for 25% of the trials (six trials). Following 15 practice trials, participants first completed two blocks of trials in a counterbalanced order with the instruction to report the identity of the red (one half of participants) or the green (one half of participants) target as quickly and as accurately as possible by pressing a left key labeled with an X or a right key labeled with an “=”. Participants then read the instructions for the localization task made of the last two blocks: They were instructed to report the location of the colored-defined target.<sup>5</sup> After 15 practice trials, they completed two blocks with the localization instruction. The order of these two “localization blocks” was also counterbalanced, and the response keys were the same as in Studies 1–3. Stimuli were displayed using E-Prime (Psychology Software Tools, Inc., Pittsburgh, PA).

## Results

**Manipulation checks.** Participants in the evaluative condition reported the task measured intellectual capacities to a greater extent ( $M = 5.71$ ;  $SD = 3.12$ ) than control participants ( $M = 2.71$ ;  $SD = 1.16$ ),  $F(1, 29) = 11.41$ ,  $p = .001$ ,  $\eta^2_p = .32$ . They also reported feeling more evaluated ( $M = 3.71$ ;  $SD = 2.05$ ) than control participants ( $M = 1.59$ ;  $SD = 0.79$ ),  $F(1, 29) = 15.49$ ,  $p < .001$ ,  $\eta^2_p = .35$ .

### RTs.

**Identification task.** RTs less than or greater than three standard deviations from the individual mean RT in each category of trials were excluded from the analyses; this trimming eliminated less than 0.2% of the data.<sup>6</sup> Correct RTs were subject to a 2 (evaluative pressure: evaluative, nonevaluative)  $\times$  2 (cue color: same as the target, different from the target)  $\times$  2 (cue spatial validity: valid, invalid) mixed ANOVA. Analyses revealed no effect of evaluative pressure on mean RTs,  $F(1, 29) = 0.05$ ,  $p = .82$ ,  $\eta^2_p = .002$ . The analysis revealed the classical main effect of cue spatial validity,  $F(1, 29) = 16.79$ ,  $p < .001$ ,  $\eta^2_p = .36$ . RTs on invalid trials were longer ( $M = 479$ ;  $SD = 91$ ) than RTs on valid trials ( $M = 460$ ;  $SD = 86$ ). Cue color had no significant effect on RTs,  $F(1, 29) = 0.53$ ,  $p = .47$ ,  $\eta^2_p = .02$ . The two-way interaction of cue color and cue spatial validity was significant,  $F(1, 29) = 10.79$ ,  $p = .003$ ,  $\eta^2_p = .26$ . Replicating Folk and Remington (1998), the cuing effect was stronger when the cue shared the distinctive feature of the target (i.e., it was the same color) ( $M = 35$  ms) than when it did not (i.e., it was from a different color) ( $M = 4$  ms). The two-way interaction of evaluative pressure and

<sup>5</sup> The identification task was always administered before the localization task. Two reasons motivated this choice: First, the goal of Study 4 was to test whether the findings extend to an identification task (the localization task was just added as replication of previous studies), and second, there was a risk that starting with a localization task would lead participants to implement a control response set that could contaminate responses in the upcoming identification task.

<sup>6</sup> Mean error rate was low (.01), and errors were not further analyzed.

cue color did not reach significance,  $F(1, 29) = 1.46, p = .24, \eta_p^2 = .05$ , and neither did the interaction of evaluative pressure and cue validity,  $F(1, 29) = 0.90, p = .35, \eta_p^2 = .03$ . Finally, the three-way interaction observed in the three previous studies was not significant,  $F(1, 29) = 0.50, p = .49, \eta_p^2 = .02$ . The evaluative pressure thus did not moderate the interaction of cue color and cue validity when participants were asked to report the identity of the target. This finding indicates that evaluative pressure does not influence attentional capture.<sup>7</sup>

**Localization task.** RTs less than or greater than three standard deviations from the individual mean for each category of trials were excluded from the analyses, and this trimming eliminated less than 0.3% of the data.<sup>8</sup> Correct RTs were subject to a 2 (evaluative pressure: evaluative, nonevaluative)  $\times$  2 (cue color: same as the target, different from the target)  $\times$  2 (cue spatial validity: valid, invalid) mixed ANOVA. Evaluative pressure did not have any effect on mean RTs,  $F(1, 29) = 0.79, p = .38, \eta_p^2 = .03$ . Again, RTs on invalid trials were longer ( $M = 394; SD = 64$ ) than RTs on valid trials ( $M = 360; SD = 67$ ),  $F(1, 29) = 68.98, p < .001, \eta_p^2 = .70$ . Cue color had no significant effect on RTs,  $F(1, 29) = 0.60, p = .50, \eta_p^2 = .02$ , but did interact with cue validity,  $F(1, 29) = 112.27, p < .001, \eta_p^2 = .79$ . The cuing effect on RTs was greater when the cue was the same color as the target (71 ms) than when it was of a different color (-2 ms). Confirming the findings from Studies 1–3, this interaction was further qualified by the significant three-way interaction with evaluative pressure,  $F(1, 29) = 5.60, p = .02, \eta_p^2 = .16$ . When the cue was the same color as the target, it had a greater effect on RTs for participants under evaluative pressure (85 ms) than for control participants (56 ms),  $F(1, 29) = 6.70, p = .01, \eta_p^2 = .19$ . However, when the cue was of a different color from the target, there was no difference in cuing effect between participants under evaluative pressure (-4 ms) and control participants (-1 ms),  $F(1, 29) = 0.08, p = .78, \eta_p^2 < .01$ . This result indicates that evaluative pressure involuntarily influences the control settings that participants adopted for response selection.

## Discussion

The goal of Study 4 was to clarify the processes driving the effects of evaluative pressure observed in the previous studies. First, the changes introduced in the attention paradigm allowed discarding the alternative account that the previous effects may have been due to voluntary shifts in attention (i.e., a strategic artifact). Second, by manipulating the task goals (identification vs. localization of the target), our intention was to determine whether evaluative pressure affected cognitive control settings at the perceptual stage (attentional capture) or at the level of response selection. Our findings indicate that being under evaluative scrutiny does not modulate the width of the incoming information that may draw attention. Indeed, evaluative pressure did not affect the degree of top-down control over attentional capture (see Folk & Remington, 1998). However, evaluative pressure does modulate the degree of top-down cognitive control over response selection. Under evaluative pressure, individuals implement stronger task control settings that make them more (less) prone to the priming of response by the distractor when it matches (mismatches) their attentional set.

## General Discussion

Our ability to focus on some aspects of our environment while neglecting others is fundamental to any human activity. Concentrating on the task-relevant information and filtering out irrelevant information can also become a priority. This is especially the case in evaluative situations in which people are being evaluated and strive to perform at their best. In the present article, our goal was to examine how evaluative pressure affects attentional distractibility. In four studies, we investigated attentional distractibility by irrelevant stimuli in situations in which individuals thought that their intellectual ability was either assessed or not. We hypothesized that participants under evaluative pressure implement attentional control settings that are more tuned toward the relevant features of the task at hand, therefore making distraction from irrelevant stimuli more contingent on individuals' goals. As a result, the extent to which an irrelevant stimulus will be distracting depends on whether its features match the properties defined in the control settings implemented by behavioral goals. In a first study, we showed that when participants were informed that their intelligence was being assessed, they were less distracted by the abrupt onset of an irrelevant spatial cue. We proposed that this reduced distraction originated in the mismatch between the physical features of the cue (i.e., a black dot) and the filtering settings implemented to achieve the task (i.e., searching for the letter *O* among three *Q*s). Studies 2 and 3 supported this interpretation by demonstrating that the behavioral interference generated by a potential distracting spatial cue under evaluative pressure increased or decreased depending on whether it matched—in terms of color or shape—the features of the to-be-detected target. Finally, Study 4 indicated that this contingent interference occurred not at the perceptual (i.e., attentional capture) but at the response selection stage. Indeed, evaluative scrutiny did not moderate whether or not the distracting cue captured visual attention. Evaluative pressure actually influenced cognitive control by modulating how much the irrelevant cue primed the participant's response. Throughout our studies, participants had to select a response that matched the localization of the target, leaving open the possibility that the cue, because it carries location information, could activate response (visuomotor priming) and therefore interfere with subsequent selection of the response to the target. Study 4 revealed that under evaluative pressure, participants became more (less) prone to select the location response primed by the cue when the latter matches (mismatches) their attentional set (i.e., the features of the search-for-target). Altogether, these findings have important theoretical implications.

This article significantly contributes to the literature in which the degree to which attention can be involuntarily influenced by top-down processes is examined. Confronted with a task, individ-

<sup>7</sup> To assess the possibility that evaluative pressure does not moderate goal-contingent attentional capture, we ran another study using the identification task developed by Folk and Remington (1998) with a manipulation of evaluative pressure. The findings were perfectly similar to the results of Study 4: Confirming Folk and Remington (1998), the cuing effect was moderated by task goal,  $F(1, 51) = 225.87, p < .001, \eta_p^2 = .82$ , but the three-way interaction between evaluative pressure, cue color (similar or not to target), and cue spatial validity was nonsignificant ( $F < 1$ ).

<sup>8</sup> For the localization task, mean error rate was again very low (.008) and thus not analyzed.

uals implement attentional control settings that can have two unintended consequences. First, because the perceptual component of the sets acts like a filter for incoming information, attention is involuntarily deployed to distractors that share a defining feature with the searched-for target, whereas distractors that do not share this defining feature are ignored, a phenomenon referred to as *contingent attentional capture* (Folk & Anderson, 2010; Folk & Remington, 1998; Folk et al., 1992). Second, because cognitive control settings also prepare goal-relevant response selection (response set), distractors that share a defining feature with the searched-for target can prime a target-relevant response. For example, such a distractor can induce an automatic response inhibition that is dependent on the top-down processes, a phenomenon referred to as a *goal contingent motoric inhibition* (see Anderson & Folk, 2012a, 2012b). Though there is accumulative evidence that attention can be distracted from the task at hand by nonrelevant information that nevertheless matches task goals, little research to date has investigated how factors external to the task itself can modulate this distractibility. The present research provides clear evidence that cognitive control can be affected by a factor totally independent from task characteristics: the situational context in which the task is completed. We indeed showed that evaluative pressure translates into the implementation of attentional control settings that give higher processing priority to stimuli whose features match those of the searched-for target and strengthen the association between these stimuli and the target response. Importantly, the distracting potential of irrelevant stimuli depends on whether their features match with the current behavioral goals. If the features of an irrelevant stimulus do not match the attentional set, pressure will reduce distractibility. However, if the features of an irrelevant stimulus match the set, pressure will increase visuomotor priming from this stimulus and result in greater distraction.

The present findings further our understanding of the impact of self-evaluative threat on attention and cognitive control. When individuals perform in the presence of a better-off peer, or are targeted by a negative stereotype of their group ability, or are pressured to perform at their best, they experience a self-threat that can disrupt performance (Inzlicht & Schmader, 2012; Schmader & Beilock, 2012). Research in which the attentional consequences of self-evaluation threat has been studied more directly has recently highlighted opposition to two hypotheses. On the one hand, the self-evaluation threat account (Muller & Butera, 2007) states that when people are under evaluative pressure, they experience involuntary attentional focusing because part of their attentional resources is allocated to the threat, resulting in less attention being available to process peripheral information. On the other hand, the mere effort hypothesis (McFall et al., 2009) proposes that experiencing evaluative pressure should increase the emission of the "prepotent" responses, which are the dominant responses for a given task (e.g., looking at an abrupt onset; McFall et al., 2009).

Our findings are congruent with the self-evaluation threat hypothesis that predicts that evaluative pressure results in pressured participants giving stronger attentional weight to stimuli that are central for task resolution (Muller & Butera, 2007). Accordingly, we found that for participants under evaluative threat, the magnitude of the cuing effect was more contingent on task goals than for control participants. However, this higher sensitivity was very specific. Indeed, it did not occur when the cue did not share a

response feature with the target, indicating that heightened attentional focusing under threat, as postulated by Muller and Butera (2007), did not strictly operate at an early stage of processing (i.e., attentional capture). Instead, our findings indicate that evaluative pressure modulates whether distracting information is given attentional weight in response elaboration. In other words, though our results confirm the idea that evaluative pressure induces goal-contingent attentional selectivity, they also plead against the assumption that self-evaluation threat leads to *general* attentional focusing.

Our findings are not compatible with the core assumption of the mere effort hypothesis (McFall et al., 2009). According to this account, evaluative pressure maximizes well-learned and automated reactions or prepotent responses. Because looking toward the abrupt onset of a stimulus constitutes such a response, the mere effort account predicts that being under evaluative scrutiny will result in more attention devoted to the abrupt appearance of an irrelevant stimulus. Our findings clearly indicate that it is not the case. First, pressure did not moderate attentional capture of the abrupt onset. Second, whether or not the abrupt onset was given attentional weight in response elaboration did not depend on some predefined prepotency (i.e., its reflexive nature), but was contingent on whether or not its features fit with the overachieving goals. Despite this fundamental discrepancy, the mere effort hypothesis shares, however, with the present work the idea that evaluative threat modulates attentional distractibility through a mechanism of involuntary response activation.

This mechanism of response activation under evaluative pressure remains to be determined. Participants may be in a higher state of readiness when under threat, which would likely facilitate response activation by cue features. The effect of evaluative pressure may also be seen in terms of the priming of action-relevant feature dimensions. Recent research within the ideomotor framework suggests that preparing to act involves a weighting mechanism, which primes the perceptual dimensions that are relevant for coding the action (Memelink & Hommel, 2013). Preparing to select between left versus right and up versus down key presses (as in our localization task) may automatically increase the saliency of horizontal and vertical stimulus features, which would then automatically trigger a matching response (Hommel, 2000; Memelink & Hommel, 2013). This mechanism would lead to an increased sensitivity to cue features in our task, and would facilitate the priming of a spatially corresponding response. Such a weighting mechanism may be exacerbated under evaluative pressure and facilitate processing of the information relevant for action. Further research will have to address these issues.

Clarifying the cognitive underpinning of the processes responsible for why evaluative pressure modulates attentional distractibility only at the response selection stage should benefit from systematic manipulation of evaluative pressure. Indeed, it is well admitted that evaluative situations can impact cognition through at least two routes (Schmader et al., 2008): Pressure can trigger distracting thoughts that impair executive control (e.g., Beilock, Rydell, & McConnell, 2007; Cadinu, Maass, Rosabianca, & Kiesner, 2005; Croizet et al., 2004; Schmader & Johns, 2003). It can also engage individuals in explicit monitoring of behavior, which may disrupt behavior by altering automatized sequences of cognition (i.e., proceduralized skills; see Beilock & Carr, 2001). The modulation of contingent attentional selectivity at the re-

sponse stage could therefore result from the threat-induced depletion of attentional resources, which translate into fewer resources available for peripheral information (i.e., an "attentional focusing effect"; see the self-evaluative threat hypothesis). It could also be a direct consequence of higher monitoring of performance resulting in the implementation of stronger control attentional sets (see Beilock & DeCaro, 2007). Thus under both routes, evaluative pressure could increase the attentional weight of potential distractors that match the attentional set. Recent research suggests, however, that these routes could be disentangled. Indeed DeCaro et al. (2011) showed that pressure situations that involve being watched by another person tend to lead individuals to higher monitoring of performance, whereas situations that involve concerns over performance outcome make individuals particularly susceptible to cognitive distraction. In the present studies, we implemented a performance situation in which participants were both being watched by the experimenter and also informed that the test was diagnostic of their intellectual ability. In other words, our manipulation combines both types of pressure. A heuristic venue to highlight the reason why the impact of evaluative pressure is limited to the response control settings will be to investigate how these specific pressure situations independently impact cognitive distractibility in attentional paradigms.

Interestingly, our findings that the social situation impacts cognition at the response selection stage echo recent research by Augustinova and Ferrand (2012) on the effect of mere social presence on Stroop interference reduction (Huguet et al., 1999, Experiment 1; Klauer, Herfordt, & Voss, 2008; Sharma, Booth, Brown, & Huguet, 2010). These authors demonstrated that the mere presence of another individual in the room actually diminishes the Stroop effect by reducing the response competition generated by the standard Stroop-incongruent trials (e.g., BLUE in green). They found that social presence did no longer reduce Stroop interference when the incongruity was solely semantic (e.g., the word SKY written in green), thereby reinforcing the idea that previous reduction of Stroop interference under social presence operated at the response selection stage (visuomotor priming) and not at an earlier identification stage (reading). Altogether with this research, our work pleads for the necessity to carefully design studies in which cognitive interference is investigated. Indeed, as pointed out earlier by Gawronski, Deutsch, LeBel, and Peters (2008), there are many paradigms, such as the Implicit Association Test (Greenwald, McGhee, & Schwartz, 1998) and the Stroop task, that involve a response interference component in addition to the semantic or perceptual interference component of interest. Such confounded interferences, if not identified and differentiated, may lead to hasty conclusions with regard to the nature of the processes' modulation at stake (Gawronski et al., 2008). Our research showed that it is also true for spatial cuing paradigms.

Finally, the present research has important practical implications with regard to the impact of evaluative situations on performance. Our work suggests that during an important exam or test, or in any situation in which one has the feeling of being evaluated, individuals will process and answer in priority any information that carries one feature relevant for task resolution, and will filter out stimuli that do not carry an important feature. As adaptive as it may first appear, feature-based selection also implies that they will be easily lured by irrelevant information that nevertheless carries

some prioritized features or that they will ignore helpful pieces of information that carry nonprioritized features. Feature-based selection can thus mislead pressured individuals who will be prompted to initiate nonadaptive responses for some highly distracting stimuli (i.e., irrelevant stimuli whose features are the same as the important features). Future research will have to examine whether our findings extend to high-stake situations that are not evaluative. Indeed, giving higher attentional weight to certain distracting information can have serious consequences especially when individuals have to react quickly to various events, for example, during a dangerous flight maneuver or in police or military interventions.

## References

- Adamou, M., Pun, C., Pratt, J., & Ferber, S. (2008). Your divided attention, please! The maintenance of multiple attentional control sets over distinct regions in space. *Cognition*, 107, 295–303. doi:10.1016/j.cognition.2007.07.003
- Allport, A. (1989). Visual attention. In M. I. Posner (Ed.), *Foundations of cognitive science* (pp. 631–682). Cambridge, MA: MIT Press.
- Anderson, B. A., & Folk, C. L. (2012a). Contingent involuntary motoric inhibition: The involuntary inhibition of a motor response contingent on top-down goals. *Journal of Experimental Psychology: Human Perception and Performance*, 38, 1348–1352. doi:10.1037/a0030514
- Anderson, B. A., & Folk, C. L. (2012b). Dissociating location-specific inhibition and attention shifts: Evidence against the disengagement account of contingent capture. *Attention, Perception, & Psychophysics*, 74, 1183–1198. doi:10.3758/s13414-012-0325-9
- Ansorge, U., & Heumann, M. (2003). Top-down contingencies in peripheral cuing: The roles of color and location. *Journal of Experimental Psychology: Human Perception and Performance*, 29, 937–948. doi:10.1037/0096-1523.29.5.937
- Augustinova, M., & Ferrand, L. (2012). The influence of mere social presence on Stroop interference: New evidence from the semantically-based Stroop task. *Journal of Experimental Social Psychology*, 48, 1213–1216. doi:10.1016/j.jesp.2012.04.014
- Autin, F., & Croizet, J.-C. (2012). Improving working memory efficiency by reframing metacognitive interpretation of task difficulty. *Journal of Experimental Psychology: General*, 141, 610–618. doi:10.1037/a0027478
- Bacon, W. F., & Egeth, H. E. (1994). Overriding stimulus-driven attentional capture. *Perception, & Psychophysics*, 55, 485–496. doi:10.3758/BF03205306
- Baron, R. S. (1986). Distraction-conflict theory: Progress and problems. *Advances in Experimental Social Psychology*, 19, 1–40. doi:10.1016/S0065-2601(08)60211-7
- Baumeister, R. F., Heatherton, T. F., & Tice, D. M. (1994). *Losing control: How and why people fail at self-regulation*. San Diego, CA: Academic Press.
- Becker, S. I., Folk, C. L., & Remington, R. W. (2010). The role of relational information in contingent capture. *Journal of Experimental Psychology: Human Perception and Performance*, 36, 1460–1476. doi:10.1037/a0020370
- Beilock, S. L., & Carr, T. (2001). On the fragility of skilled performance: What governs choking under pressure? *Journal of Experimental Psychology: General*, 130, 701–725. doi:10.1037/0096-3445.130.4.701
- Beilock, S. L., & Decaro, M. S. (2007). From poor performance to success under stress: Working memory, strategy selection, and mathematical problem solving under pressure. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 33, 983–998. doi:10.1037/0278-7393.33.6.983
- Beilock, S. L., Rydell, R. J., & McConnell, A. R. (2007). Stereotype threat and working memory: Mechanisms, alleviation, and spillover. *Journal*

- of Experimental Psychology: General*, 136, 256–276. doi:10.1037/0096-3445.136.2.256
- Cadinu, M., Maass, A., Rosabianca, A., & Kiesner, J. (2005). Why do women underperform under stereotype threat? *Psychological Science*, 16, 572–578. doi:10.1111/j.0956-7976.2005.01577.x
- Croizet, J.-C., Despres, G., Gauzins, M., Huguet, P., Leyens, J.-P., & Meot, A. (2004). Stereotype threat undermines intellectual performance by triggering a disruptive mental load. *Personality and Social Psychology Bulletin*, 30, 721–731. doi:10.1177/0146167204263961
- Crouzeviaille, M., & Butera, F. (2013). Performance-approach goals deplete working memory and impair cognitive performance. *Journal of Experimental Psychology: General*, 142, 666–678. doi:10.1037/a0029632
- DeCaro, M. S., Thomas, R. D., Albert, N. B., & Beilock, S. L. (2011). Choking under pressure: Multiple routes to skill failure. *Journal of Experimental Psychology: General*, 140, 390–406. doi:10.1037/a0023466
- Easterbrook, J. A. (1959). The effect of emotion on cue utilization and the organization of behavior. *Psychological Review*, 66, 183–201. doi:10.1037/h0047707
- Elliot, A. J., Maier, M. A., Binser, M. J., Friedman, R. S., & Pekrun, R. (2009). The effect of red on avoidance behavior in achievement contexts. *Personality and Social Psychology Bulletin*, 35, 365–375. doi:10.1177/0146167208328330
- Fayant, M. P. (2011). *Perception d'autrui en tant que standard ou but dans le cadre de la comparaison ascendante: rôle de la menace de l'autoévaluation et des états d'approche* [Social perception as a standard or a goal in upward social comparison: The role of self-evaluative threat and approach state] (Unpublished doctoral dissertation). LIPS, Université Pierre-Mendès France.
- Folk, C. L., & Anderson, B. A. (2010). Target-uncertainty effects in attentional capture: Color-singleton set or multiple attentional control settings? *Psychonomic Bulletin & Review*, 17, 421–426. doi:10.3758/PBR.17.3.421
- Folk, C. L., & Annett, S. (1994). Do locally defined feature discontinuities capture attention? *Perception & Psychophysics*, 56, 277–287. doi:10.3758/BF03209762
- Folk, C. L., & Remington, R. (1998). Selectivity in distraction by irrelevant featural singletons: Evidence for two forms of attentional capture. *Journal of Experimental Psychology: Human Perception and Performance*, 24, 847–858. doi:10.1037/0096-1523.24.3.847
- Folk, C. L., Remington, R. W., & Johnston, J. C. (1992). Involuntary covert orienting is contingent on attentional control settings. *Journal of Experimental Psychology: Human Perception and Performance*, 18, 1030–1044. doi:10.1037/0096-1523.18.4.1030
- Folk, C. L., Remington, R. W., & Wright, J. H. (1994). The structure of attentional control: Contingent attentional capture by apparent motion, abrupt onset, and color. *Journal of Experimental Psychology: Human Perception and Performance*, 20, 317–329. doi:10.1037/0096-1523.20.2.317
- Förster, J., & Dannenberg, L. (2010). GLOMOsys: A systems account of global versus local processing. *Psychological Inquiry*, 21, 175–197. doi:10.1080/1047840X.2010.487849
- Gawronski, B., Deutsch, R., LeBel, E. P., & Peters, K. R. (2008). Response interference as a mechanism underlying implicit measures: Some traps and gaps in the assessment of mental associations with experimental paradigms. *European Journal of Psychological Assessment*, 24, 218–225. doi:10.1027/1015-5759.24.4.218
- Greenwald, A. G., McGhee, D. E., & Schwartz, J. L. (1998). Measuring individual differences in implicit cognition: The Implicit Association Test. *Journal of Personality and Social Psychology*, 74, 1464–1480. doi:10.1037/0022-3514.74.6.1464
- Harkins, S. G. (2001). Social influence effects on task performance: The ascendancy of social evaluation over self-evaluation. In J. P. Forgas & K. D. Williams (Eds.), *Social influence: Direct and indirect processes* (pp. 271–292). Philadelphia, PA: Psychology Press.
- Harkins, S. G. (2006). Mere effort as the mediator of the evaluation–performance relationship. *Journal of Personality and Social Psychology*, 91, 436–455. doi:10.1037/0022-3514.91.3.436
- Higgins, E. T. (1997). Beyond pleasure and pain. *American Psychologist*, 52, 1280–1300. doi:10.1037/0003-066X.52.12.1280
- Hommel, B. (1993). Inverting the Simon effect by intention: Determinants of direction and extent of effects of irrelevant spatial information. *Psychological Research*, 55, 270–279. doi:10.1007/BF00419687
- Hommel, B. (2000). The prepared reflex: Automaticity and control in stimulus-response translation. In S. Monsell & J. Driver (Eds.), *Control of cognitive processes: Attention and Performance*, Vol. XVIII (pp. 247–273). Cambridge, MA: MIT Press.
- Huguet, P., Galvaing, M. P., Monteil, J. M., & Dumas, F. (1999). Social presence effects in the Stroop task: Further evidence for an attentional view of social facilitation. *Journal of Personality and Social Psychology*, 77, 1011–1025. doi:10.1037/0022-3514.77.5.1011
- Inzlicht, M., & Schmader, T. (Eds.). (2012). *Stereotype threat: Theory, process, application*. New York, NY: Oxford University Press.
- Jonides, J. (1981). Voluntary versus automatic control over the mind's eye's movement. In J. B. Long & A. Baddeley (Eds.), *Attention and performance* (Vol. 9, pp. 187–204). Hillsdale, NJ: Erlbaum.
- Klauer, K. C., Herfordt, J., & Voss, A. (2008). Social presence effects on the Stroop task: Boundary conditions and an alternative account. *Journal of Experimental Social Psychology*, 44, 469–476. doi:10.1016/j.jesp.2007.02.009
- Logan, G. D. (1983). On the ability to inhibit simple thoughts and actions: I. Stop signals studies of decision and memory. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 9, 585–606. doi:10.1037/0278-7393.9.4.585
- Logan, G. D., & Cowan, W. B. (1984). On the ability to inhibit thought and action: A theory of an act of control. *Psychological Review*, 91, 295–327. doi:10.1037/0033-295X.91.3.295
- McFall, S. R., Jamieson, J. P., & Harkins, S. G. (2009). Testing the mere effort account of the evaluation–performance relationship. *Journal of Personality and Social Psychology*, 96, 135–154. doi:10.1037/a0012878
- Mehta, R., & Zhu, R. J. (2009). Blue or red? Exploring the effect of color on cognitive task performances. *Science*, 323, 1226–1229. doi:10.1126/science.1169144
- Memelink, J., & Hommel, B. (2013). Intentional weighting: A basic principle in cognitive control. *Psychological Research*, 77, 249–259. doi:10.1007/s00426-012-0435-y
- Muller, D., Atzeni, T., & Butera, F. (2004). Coaction and upward social comparison reduce the illusory conjunction effect: Support for distraction–conflict theory. *Journal of Experimental Social Psychology*, 40, 659–665. doi:10.1016/j.jesp.2003.12.003
- Muller, D., & Butera, F. (2007). The focusing effect of self-evaluation threat in coaction and social comparison. *Journal of Personality and Social Psychology*, 93, 194–211. doi:10.1037/0022-3514.93.2.194
- Normand, A., & Croizet, J. C. (2013). Upward social comparison generates attentional focusing when the dimension of comparison is self-threatening. *Social Cognition*, 31, 336–348. doi:10.1521/soco.2013.31.3.336
- Rosenbaum, D. A., & Kornblum, S. (1982). A priming method for investigating the selection of motor responses. *Acta Psychologica*, 51, 223–243. doi:10.1016/0001-6918(82)90036-1
- Schmader, T., & Beilock, S. (2012). An integration of processes that underlie stereotype threat. In M. Inzlicht & T. Schmader (Eds.), *Stereotype threat: Theory, process, and application*. Oxford, United Kingdom: Oxford University Press.

- Schmader, T., & Johns, M. (2003). Converging evidence that stereotype threat reduces working memory capacity. *Journal of Personality and Social Psychology, 85*, 440–452. doi:10.1037/0022-3514.85.3.440
- Schmader, T., Johns, M., & Forbes, C. (2008). An integrated process model of stereotype threat effects on performance. *Psychological Review, 115*, 336–356. doi:10.1037/0033-295X.115.2.336
- Seibt, B., & Förster, J. (2004). Stereotype threat and performance: How self-stereotypes influence processing by inducing regulatory foci. *Journal of Personality and Social Psychology, 87*, 38–56. doi:10.1037/0022-3514.87.1.38
- Sharma, D., Booth, R., Brown, R., & Huguet, P. (2010). Exploring the temporal dynamics of social facilitation in the Stroop task. *Psychonomic Bulletin & Review, 17*, 52–58. doi:10.3758/PBR.17.1.52
- Theeuwes, J. (1991). Cross-dimensional perceptual selectivity. *Perception & Psychophysics, 50*, 184–193. doi:10.3758/BF03212219
- Theeuwes, J. (1992). Perceptual selectivity for color and form. *Perception & Psychophysics, 51*, 599–606. doi:10.3758/BF03211656
- Theeuwes, J. (1994). Endogenous and exogenous control of visual selection. *Perception, 23*, 429–440. doi:10.1080/p230429
- Verbruggen, F., Liefoghe, B., & Vandierendonck, A. (2004). The interaction between stop signal inhibition and distractor interference in the flanker and Stroop task. *Acta Psychologica, 116*, 21–37. doi:10.1016/j.actpsy.2003.12.011
- Yantis, S. (1993). Stimulus-driven attentional capture. *Current Directions in Psychological Science, 2*, 156–161. doi:10.1111/1467-8721.ep10768973
- Yantis, S., & Hillstrom, A. P. (1994). Stimulus-driven attentional capture: Evidence from equiluminant visual objects. *Journal of Experimental Psychology: Human Perception and Performance, 20*, 95–107. doi:10.1037/0096-1523.20.1.95
- Yantis, S., & Jonides, J. (1990). Abrupt visual onsets and selective attention: Voluntary versus automatic allocation. *Journal of Experimental Psychology: Human Perception and Performance, 16*, 121–134. doi:10.1037/0096-1523.16.1.121
- Zajonc, R. B. (1965). Social facilitation. *Science, 149*, 269–274. doi:10.1126/science.149.3681.269

Received November 7, 2012

Revision received September 3, 2013

Accepted October 3, 2013 ■

Copyright of Journal of Experimental Psychology. General is the property of American Psychological Association and its content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use.