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Mitigating bias blind spot via a serious video game

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ABSTRACT

We employed a serious video game to train participants on bias blind spot (BBS), capturing training effects on BBS mitigation and knowledge at three points in time. Experiment 1 (N = 703) compared the effects of hybrid training (a combination of implicit and explicit training) to implicit training; Experiment 2 (N = 620) tested the effects of just-in-time versus delayed feedback; and Experiment 3 (N = 626) examined the effects of singleplayer versus multiplayer learning environments. We also tested differences in game duration (30 vs. 60 min play) and repetition (single vs. repeated play). Overall, the video game decreased BBS linearly over time and increased BBS knowledge at posttest, but knowledge decayed at 8-week posttest. These and other results are discussed, along with the implications, limitations, and future research directions.

Video game inductions are prevalent in experimental psychology, neuroscience (Bavelier et al., 2011) and increasingly in education, communication, and the growing field of game studies. Games are a unique and valuable pedagogical tool (Squire & Jenkins, 2004). Scholars have explored video game effects on enjoyment (e.g., Vorderer, Klimmt, & Ritterfeld, 2004), learning (e.g., Gee, 2003; Squire, 2003), violence (e.g., Hartmann, Krakowiak, & Tsay-Vogel, 2014; for a review, see Anderson & Bushman, 2001), health (e.g., Peng, 2009), and executive functions (e.g., Buelow, Okdie, & Cooper, 2015). We attempt to make a theoretical contribution to the literature on judgment and decision making by focusing on how video games can be used to mitigate bias, and particularly blind spot (BBS; Pronin, Lin, & Ross, 2002).

BBS is a failure to recognize bias in oneself while overestimating it in others (Pronin et al., 2002). Studies repeatedly demonstrate BBS (e.g., Pronin & Kugler, 2007; Pronin et al., 2002), yet attempts to mitigate this bias (e.g., Frantz, 2006; Lord, Lepper, & Preston, 1984; Pronin et al., 2002; Stapel, Martin, & Schwarz, 1998) have been met with limited success (Pronin, 2007). To mitigate BBS, we developed a serious video game called MACBETH (*Mitigating Analyst Cognitive Bias by Eliminating Task Heuristics*). In three experiments, examining game effects over time, we manipulated game duration, the number of times participants played, the kind of bias-training and feedback they received, and whether players trained alone or with partners to determine which conditions may be more favorable for BBS mitigation and knowledge improvement. We begin our paper with an explanation of what BBS is and why this bias poses a problem for decision making.

1. Bias blind spot

BBS stems from the unconscious tendency to value one's knowledge, experiences, and introspections over the knowledge,

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experiences, and introspections of others (Pronin & Kugler, 2007). The underlying mechanism responsible for BBS is introspective weighting (Pronin, 2009): Because people have ready access to their own introspective information, but not to the introspections of others, they tend to overestimate the diagnostic utility of their own introspections (Pronin & Kugler, 2007). For example, when considering our favorite sports team's chances to win in a tournament, we might think our own predictions about our team are more accurate than the predictions of others. After all, we have thought a lot about our team and followed its successes and failures, so in our minds our thoughts about its chances to win are based on a careful analysis. Conversely, when thinking about the reasons why other people would favor a team—because we do not have access to their thoughts—we are quick to dismiss their reasoning as being biased solely due to team loyalty.

BBS is detrimental to human judgment (Frantz, 2006; Pronin & Schmidt, 2013; cf. Gigerenzer & Gaissmaier, 2011), often with serious consequences. For example, corporate executives may ignore the role of self-benefit in their questionable business practices, doctors may be blind to the role of financial self-gain in providing substandard patient care, employers may deny the role of sexism in discriminatory promotions, and politicians may ignore the role of their own ideology in their support of social policies (Pronin & Schmidt, 2013). Clearly, finding successful strategies to mitigate BBS would offer an important step in improving human decision-making processes. In the section below, we discuss the difficulties encountered in previous research attempting to mitigate BBS and present an alternative mitigation approach.

1.1. Mitigating BBS

Because people believe they would know if they were biased (Pronin, 2007), forewarning strategies directing them to avoid bias have been marginally effective at best, and reinforcing at worst (Frantz, 2006; Lord et al., 1984; Pronin et al., 2002; Stapel et al., 1998). As Frantz (2006) noted, "encouraging people to be fair as a means of correcting bias may cause them simply to state more emphatically what they have already concluded. From their perspective, they *are* being fair" (p. 158, emphasis in original).

Research on metacognition examining thoughts about one's own cognitive processes (Tormala, Clarkson, & Petty, 2006) may shed light on why forewarning mitigation strategies can be counterproductive. When people are unable to remember examples of their own biased decision making—as a result of introspective weighing—they arrive at a metacognitive conclusion supportive of their initial belief in their own lack of bias. Metacognitive conclusions that support one's own initial beliefs have been shown to increase self-confidence about those beliefs (Tormala et al., 2006). Thus, forewarning mitigation strategies may be ineffective because, instead of causing people to reexamine their conclusions about their own biases, such forewarnings reinforce the certainty with which people hold themselves to be unbiased.

Yet, research on metacognition may offer an effective approach to mitigating BBS. For example, Tormala et al. (2006) made their participants believe they generated weak arguments, causing participants to metacognitively conclude they resisted a persuasive message poorly. As a result, the participants became less certain about their attitudes, and more vulnerable to counter-persuasion. Concerning BBS, these findings suggest exposing people to evidence demonstrating their susceptibility to bias may reduce their certainty about their own lack of bias and make them more receptive to counter-persuasion in the form of bias training.

In our study, a bias-training serious video game served as the delivery system through which evidence of being biased was presented to players. The game offered players opportunities to demonstrate bias, and their biased decisions were revealed to them either implicitly through a reward structure of the game (e.g., through loss of points for biased decisions), or explicitly through bias education. By observing how their biases had cost them points—or even the entire game—players could more easily metacognitively evaluate their own actions in the game as demonstrably biased, thereby sensitizing them to their own BBS. Below, we further discuss how serious video games can be an effective tool for BBS training.

2. Mitigating BBS via serious games

Employing serious games (those for which entertainment is not the main focus; Michael & Chen, 2006) has a longstanding history in education research (Connolly, Boyle, MacArthur, Hainey, & Boyle, 2012). Compared to traditional modes of learning (e.g., lectures) that involve intentional acquisition of declarative knowledge, serious video games are learner-centered, interactive, and involving (Garris, Ahlers, & Driskell, 2002), allowing users to internalize information experientially through active engagement with the material by learning through practice (Ciavarro, Dobson, & Goodman, 2008). Games have the ability to "stimulate the imagination, spark curiosity, encourage discussion and debate, and enable experimentation and investigation" (Squire & Jenkins, 2004, p. 9). Indeed, research demonstrates that both problem solving and decision making can be improved through video game play (Buelow et al., 2015).

The opportunity for interactive and experiential learning—a unique feature of video games—is at the core of many educational theories (Kolb, 1984), which posit that players will gain a more in-depth understanding of the subject by solving problems, experimenting with solutions, and becoming aware of the consequences of their actions. Experiential approaches increase awareness of the consequences of a player's actions, thus allowing them to be more aware of their own biases, thereby helping to overcome one of the biggest obstacles to BBS mitigation (Pronin, 2007). Next, we discuss how to incorporate educational training into a serious videogame.

3. Implicit vs. hybrid (combined implicit and explicit) training in serious games

Gaming research indicates implicit learning embedded in games can provide a more enjoyable educational experience as it simulates intrinsic motivation for learning (Ciavarro et al., 2008; Tüzün, Yılmaz-Soylu, Karakuş, İnal, & Kızılkaya, 2009). To make learning more enjoyable, encoding the learning material through game mechanics rather than interrupting the game immersion to explicitly deliver knowledge is advised (Habgood, Ainsworth, & Benford, 2005). However, it is unclear whether this approach always increases learning, since immersive gaming may not be ideal for the acquisition of declarative knowledge (Habgood et al., 2005).

The evidence for the effectiveness of implicit game-based learning comes from research attempting to teach relatively simple content such as geography (Tüzün et al., 2009) or proper sports conduct (Ciavarro et al., 2008). Bias mitigation, in contrast, is more complex as it involves modifying automatic behaviors. High-complexity concepts, such as BBS mitigation, may be better learned by combining explicit and implicit instruction, given that implicit knowledge facilitates easier discovery of the rules and structure of a task, whereas explicit knowledge generates clearer learning models by helping to answer the *why* questions (Mathews et al., 1989).

The research on BBS offers evidence for the effectiveness of an explicit bias training approach. For instance, Pronin and Kugler (2007) conducted a study in which participants read a short