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UNIVERSITY OF NORTHERN COLORADO

Greeley, Colorado

The Graduate School

THE ROLE OF INFORMATION AND REFLECTION IN REDUCING
THE BIAS BLIND SPOT: A CROSS-CULTURAL STUDY

A Dissertation Submitted in Partial Fulfillment
of the Requirements for the Degree of
Doctor of Philosophy

Wejdan S. Felmban

College of Educational and Behavioral Sciences
Department of Educational Psychology

December, 2015

This Dissertation by: Wejdan S. Felmban

Entitled: *The Role of Information and Reflection in Reducing the Bias Blind Spot: A Cross-Cultural Study*

Has been approved as meeting the requirement for the Degree of Doctor of Philosophy in
College of Education and Behavioral Sciences, Department of Educational Psychology

Accepted by the Doctoral Committee

Kevin Pugh, Ph.D., Research Advisor

Paul Klaczynski, Ph.D., Committee Member

Eric Peterson, Ph.D., Committee Member

James Kole, Ph.D., Committee Member

Khalil S. Holighi, Ph.D., Faculty Representative

Date of Dissertation Defense _____

Accepted by the Graduate School

Linda L. Black, Ed.D.
Associate Provost and Dean
Graduate School and International Admissions

ABSTRACT

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The current study examined whether two types of intervention reduced the "bias blind spot" (i.e., perceptions of others being more biased than one's self) and whether the bias blind spot was related to culture, reasoning performance, and motivation. The design was a 2 (information: reading or not reading about the bias blind spot) x 2 (reflection reflecting on the effects of biases on other or non-relevant reflection) x 2 (priming: reasoning tasks completed before or after the interventions). Students ($N = 193$) from Western and Middle Eastern cultures participated online or in a class. In each condition, participants responded to several reasoning tasks and were later told the correct answers to the reasoning tasks. In the bias blind spot information condition, participants read about the bias blind spot and, specifically, were told most people believe they are less likely to commit cognitive biases than other people. In the reflection condition, participants were asked to write about possible consequences of the bias blind spot. Priming referred to whether the interventions were given before or after participants solved the reasoning problems. Analyses indicated that neither information nor reflection significantly reduced the bias blind spot. However, priming reduced the bias. When the reasoning tasks were presented before the interventions (priming condition), the bias blind spot was lower than when the tasks were presented after the

interventions. Also, although reasoning performance failed to predict variation in the bias blind spot, motivation to be unbiased was predictive. Further, cultural differences were found: Middle Eastern students showed higher levels of the bias blind spot than did Western students. The findings from the current study might be useful in understanding potential factors that attenuate the bias blind spot and suggest culture as a variable worthy of further examination.

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CHAPTER I

INTRODUCTION

There often is a wide gulf between intention and action, but that it is only reasonable and fair to apply the same standard of judgment to others as to oneself. Following these guidelines would not just be socially charitable—it would also be scientifically informed. (Pronin, 2008, p. 1180)

One of the challenges for human communication is inaccurate perception of reality resulting in misunderstanding (Pronin, 2008). Even with good intentions, social cognition (i.e., feelings, motivation, thoughts, goals and all aspects of making sense of the social world) is affected by biases (Kunda, 1990, 1999), which are systematic and predictable errors in thinking (Evans, 1990). Research on cognitive biases revealed more than 40 kinds of biases that compromised judgment and decision-making (Croskerry, Singhal, & Mamede, 2013). An emerging area of research that furthers our understanding of cognitive and motivational biases is the work on bias perception. According to Pronin, Lin, and Ross (2002), there is an asymmetry in evaluating the self and others. When this evaluation occurs with regard to perceptions of bias, this is termed the “bias blind spot.” Simply put, common biases are easy to detect in others but we are often blind to these same biases in ourselves (Pronin et al., 2002). For example, if a student gets a negative assessment from a teacher, the student might think the teacher is influenced by racial bias. However, the student might have difficulty recognizing his own biases such as a self-serving bias. For example, the student might blame the teacher

for a bad grade instead of lack of effort. Biased perception contributes to misunderstanding, disagreement, and sometimes conflict escalation (Kennedy & Pronin, 2008).

The bias blind spot is the “meta-bias,” leading people to believe that others—but not themselves—interpret reality in a distorted way (Lilienfeld, Ammirati, & Landfield, 2009), contributing to increases in intergroup and interpersonal conflict (Ross, 2013).

One suggestion for reducing the bias blind spot is to increase sensitivity to this cognitive limitation by teaching learners in universities about cognitive and motivational biases.

Educating people alone, however, has not been particularly good at facilitating unbiased thinking (Frantz, 2006). Consequently, researchers have considered additional strategies including efforts to increase participants’ reflection on others (Lilienfeld et al., 2009).

Reflection on the consequences of the bias blind spot might make this cognitive tendency more available to conscious awareness. However, research has not sufficiently confirmed this possibility. Consequently, a purpose of this research was to investigate the role of reflection, when paired with informational learning, in reducing the bias blind spot tendency.

Additional research is needed on individual and cultural factors related to the bias blind spot. Initial research suggested certain cognitive tendencies such as omission bias might be related to the bias blind spot (Han, 2012). Accordingly, the current study investigated how thinking styles and reasoning ability might explain variation in the bias blind spot. Finally, there is a possibility of cultural variation in manifestations of the bias blind spot and the effectiveness of information and reflection at reducing this bias. The current study investigated potential cultural variations between two distinct cultures,

Western and Middle Eastern, using United States and Saudi Arabian individuals in expression of the bias blind spot and response to the intervention.

Statement of the Problem

Building on the work of Wilson and Brekke (1994), the mental contamination research paradigm indicated debiasing is a difficult process because mental processes are sometimes unconscious and uncontrollable. Dual process theory distinguishes between autonomous processing, which is fast, effortless, and evolutionarily adaptive, and analytical processing, which is slower, demanding of cognitive resources, and evolutionarily modern (Evans & Frankish, 2009). Autonomous processing relies on heuristics, which are mental shortcuts. An example of a cognitive shortcut is the availability heuristic, which serves as a fast strategy in reasoning and judgment. It is probable the bias blind spot results from an automatic response when people are asked to evaluate themselves and others. Pronin et al. (2002) examined bias perception in American students by asking them to evaluate the susceptibility of showing eight social biases such as the fundamental attribution error.

The fundamental attribution error refers to people's tendency to attribute mistakes to dispositional factors when explaining the behavior of others (Jones & Nisbett, 1971). However, they attribute situational factors to their own mistakes (Ross, 1977). For example, an automobile dispositional explanation would be the other person does not know how to drive; however, a situational explanation might focus on the environment rather than the person driving, e.g., being interrupted by a phone call. The fundamental attribution error could also be called the observer-actor discrepancy (Jones & Nesbitt, 1971). Interestingly, Pronin et al. (2002) found after participants read explanations of

cognitive biases and were then asked to evaluate themselves versus their peers, they acknowledged their peers were susceptible to the biases but denied it in themselves--a result that was replicated in many studies.

The bias blind spot was successfully reduced by educating people about the unconscious that influences their judgment (Pronin & Kluger, 2008). However, more research is needed to investigate other strategies to mitigate the bias blind spot effect. Reflections on the consequences of the bias blind spot have not been explored. However, reflection has been linked to improving clinical reasoning and decreasing diagnostic errors (Crookery et al., 2013). Clinical cognition and the link to reflection have been investigated within a dual process perspective where intuitive diagnostic errors are overridden by more deliberative reflective thinking. It is probable that reflective thinking about the potential consequences of the bias blind spot might inhibit the automatic response (i.e., perceiving bias as more prevalent in other's thinking but not self) and override the automatic response with deliberative response produced by the analytical processing. This possibility has not been empirically investigated.

It is important to investigate individual differences that might explain variation in the bias blind spot. In the current study, three individual factors were examined: (a) reasoning performance heuristic and biases tasks, (b) thinking dispositions, and (c) motivations to be unbiased. Why might reasoning and open-minded thinking dispositions matter when it comes to showing the bias blind spot? Based on dual process, accounts of cognition, reasoning, and thinking dispositions index different levels in analytical processing. Reasoning indexes the algorithmic level and thinking dispositions index the reflective level.

According to Stanovich (2009), the algorithmic mind refers to general abilities and rules needed to solve problems. The algorithmic mind also refers to the processes and dispositions necessary for constructing problem representations and monitoring the efficacy of selected rules and abilities. Thus, Stanovich proposed two levels of analytical processing. The algorithmic level is comprised of abilities, specific mindware, and general processing resources. For example, fluid intelligence deduction, induction abilities, and numeracy are all included in the algorithmic mind. The other level, the reflective level, includes thinking disposition (i.e., need for cognition) and open-mindedness (Stanovich, 2009). Dewey (1933) defined an open-mindedness attitude or disposition as being free from prejudice, partisanship, and other habits that close the mind, makes it unwilling to consider new idea, and includes an active desire to listen to different possibilities and recognize the possibility of errors. In other words, even if a person has an ability to solve a problem, he/she should be motivated to solve it in an objective way and engage in analytical thinking (Stanovich, 2009). Previous research of the bias blind spot has overlooked potential relationships of the levels of analytical processing such as reasoning performance, open-minded thinking disposition, and motivation. This study addressed those issues.

Need for the Study

This study used several theoretical frameworks in an integrative way to further understand the bias blind spot. Although research on metacognition and using higher order thinking abilities have provided useful information for teacher education, cognitive therapies, conceptual change in students, and teaching critical thinking, it has not been extended to understanding errors in social perception. Exploring the effectiveness of

reflection instruction and its generalizability to individuals from different cultural backgrounds is needed to fill a gap in the research on the bias blind spot. Pronin (2009) commented the bias blind spot is universal. However, evidence for cultural variations in evaluating the self in individualistic and collectivist cultures suggests the bias blind spot might vary in different cultures. For example, individualistic cultures, such as the United States and the United Kingdom, were compared with collectivist cultures such as China, Japan, and India regarding the fundamental attribution error (Lehman, Chiu, & Schaller, 2004).

The Middle East, especially Arabic countries, has not been included in any study about cognitive or social biases. However, when investigating cultural orientation being independent or interdependent, one study (Maddux, San Martin, Sinaceur, & Kitayama, 2011) found Saudi Arabians are in the middle between Eastern and Western cultural values. Saudis were more interdependent than individuals in individualistic cultures and less interdependent than individuals in collectivist cultures. The rationale for selecting Middle East and Western cultures for comparison of the bias blind spot was because possible similarities and differences have not been investigated.

Individual differences in people such as reasoning performance, thinking dispositions, and motivations to be unbiased have not been investigated in relation to the bias blind spot except for one study by West, Meserve, and Stanovich (2012) who found reasoning and open-mindedness were positively related to a perception of bias in the cognitive domain.

Significance of the Study

Investigating the bias blind spot and factors that might mitigate this effect has theoretical contributions and practical implications. According to Pronin (2009), the origin of the bias blind spot is the introspection illusion--the misrepresentations of reality. People believe they perceive reality as it is. Pronin (2008) suggested educational intervention highlights the limitations of introspection. If such interventions are successful in encouraging students to acknowledge the possibility that their social perceptions might be biased, not only might the bias blind spot be reduced but students might also feel more confident in their abilities to construct accurate self-knowledge. A secondary effect of such interventions might be raising students' self-efficacy and improving their understanding of when to inhibit intuitive responses by reflective thinking.

Considering separate research paradigms to investigate the bias blind spot was the theoretical contribution. Resolving conflict would be achieved if students had a better understanding of the bias blind spot and the strategies that mitigate it. Pronin (2009) proposed that investigating the introspection illusion would help in overcoming racism, sexism, and inequality. The same reasoning could be applied to reducing the bias blind spot, which is a special case of the better than average effect (Arkin, Gabrenya, Appelman, & Cochran, 1979). Perceiving the self as superior to others and showing the bias blind spot might increase misunderstanding and intolerance, especially in conflict situations (Pronin, Gilovich, & Ross, 2004; Pronin et al., 2002; Pronin & Schmidt, 2013). More research is needed on reducing misunderstanding because we live in a time where

the world suffers from increasing intergroup conflict, terrorism, and ideological extremism (Lilienfeld et al., 2009).

Research on motivated reasoning and decision-making indicated humans are not always rational or fair due to the operation of motivational biases such as self-serving bias or the over-reliance on cognitive heuristics (Arkin et al., 1979; Baron, 1990; Evans, 1998; Kahneman, Slovic, & Tversky, 1982; Klaczynski, 2001; Kunda, 1990; Stanovich, West, & Toplak, 2011). Dual process theories of cognition and decision-making gained popularity because they could account for both rational and biased thinking (Evans & Frankish, 2009). Dual process perceptive theorizing and relevant research on the links between metacognition and reducing cognitive biases have been limited to the medical field (Croskerry, 2015; Croskerry et al., 2013; Trowbridge, Dhaliwal, & Cosby, 2013). The implications of this research went beyond avoiding medical errors and were extended to understanding miscommunications in relationships or school group projects, disagreements between groups, attributions of academic performance, and student/teacher/employee evaluations.

Rationale for the Study

The current study attempted to fill gaps in four research areas: the bias blind spot and its relation to reflection and investigation of cultural and individual differences. Investigating the sources of the bias blind spot is an emerging endeavor and, thus, there is still much to learn about how to mitigate its effects. For example, Pronin and Kugler (2007) conducted the first investigation aimed at reducing the bias blind spot by educating individuals about unconscious processes that influence human perception. According to Pronin (2008), relying on different information is the source of the bias

blind spot. In the case of evaluating self in terms of being prone to cognitive biases, we rely on introspection. However, because we do not have access to others' introspections, we base our evaluations on their external behavior. Pronin and Kugler (2007) found that educating people about the unconscious forces was successful in reducing the bias blind spot. It is possible that growing skepticism in ones' introspection is not the only route to reduce the bias blind spot. Recently, more attention has been paid to explore ways to reduce the bias blind spot (Morewedge et al., 2015; Pronin & Kugler, 2007; Symborski et al., 2014).

Still unclear is the possibility of instructing people to use reflective thinking and introspection to visualize the impact and consequences of the bias blind spot on other people, attenuating its effect. This reasoning is based on the value of reflection in several domains. For example, reflection has been used as a strategy for change in practice in clinical reasoning (Croskerry et al., 2013), cognitive therapy (Bennett-Levy & Lee, 2014), teachers' practices (Howard, 2003), bracketing researchers' biases (Creswell & Miller, 2000), and students' conceptual change in science (Demastes, Good, & Peebles, 1996; Vosniadou, 1994). Reflection has not been examined before in mitigating the bias blind spot. A fuller understanding of the effects of reflection as an intervention is needed because of the lack of integrating it in empirical investigations of the bias blind spot. Reflection was proposed as a debiasing strategy that might be critical in reducing it. This conjecture is based on the success of increasing participants' empathy using multiculturalism and perspective-taking instruction on reducing stereotyping, intergroup discrimination, and in-group favoritism (Galinsky & Moskowitz, 2000; Todd, Bodenhausen, & Galinsky, 2012; Todd & Galinsky, 2012; Wang, Tai, Ku, & Galinsky,

2014). Thus, students who are instructed to make an effort to see the relevance of the bias blind spot to their personal welfare (Lilienfeld et al., 2009) as well as others' welfare might be less likely to commit the “not me” fallacy than students who are not instructed to think about others and who only read about the bias blind spot. Reflection might make this cognitive tendency more visible and available to the conscious awareness.

Cross-cultural examinations of the bias blind spot are also missing from the literature. It is unclear if the bias blind spot is universal or it varies across cultures. Nisbett, Peng, Choi, and Norenzayan (2001) argued that there are cultural differences in certain cognitive tendencies such as in the case of attributions. They found Asian people have more holistic perceptions and Westerners have analytical preferences. Thus, Asians attribute more behaviors to situational factors and Westerners attribute more behaviors to dispositional factors. A relational approach of self-perception might not be the focus in Western cultures according to Markus and Kitayama (1991). Instead, an independent view of self is more likely. Prompting thinking about the consequences of the bias blind spot in others might cue a relational approach of comparing self to others. The Middle East has not been included in previous cultural investigations about attribution biases. Only one investigation (Maddux et al., 2011) about the interdependent self versus the dependent self showed Saudi Arabia was in the middle. In other words, Saudis showed more dependent views of self than did Asians and more interdependent views of self than Westerners. Comparing the effect of a relational approach in reducing the bias blind spot is needed because of the lack of cultural investigations.

Exploring the role of individual differences such as actual performance on cognitive and motivational biases has been overlooked in bias perception literature. Only

one study examined the role of reasoning performance as well as self-reported bias perception (West et al., 2012); surprisingly, the two were positively related (Maddux et al., 2011). West et al. (2012) also found dispositions were unrelated to the bias blind spot. They created a composite score to index cognitive ability and reflective thinking. The composite score did not significantly relate to the bias blind spot. A composite score was used in the current study and only one scale indexed thinking dispositions. I extended the West et al. study by including cognitive and social biases in the bias blind spot evaluation.

Dual process theorists distinguish between intuitive and analytical processing systems, typically arguing errors are most likely when intuitive or autonomous processing is predominant over deliberative thinking. It is plausible that deeper processing of new information comes after engagement in reflective thinking. There is some support for this contention in the reasoning and decision-making literature. People who received instruction to think logically were more likely to avoid errors, think for longer times (i.e., deliberate), and inhibit intuitive answers (Handley, Newstead, & Trippas, 2011).

An arrival to a balanced view of self might occur when students find information about new cognitive biases and later learn they might have solved the reasoning tasks incorrectly by relying on intuition, learned associations, or stereotypical information. Providing information about the tendency for most people to commit these biases might cue them to avoid rating themselves higher than their peers because such expectations might encourage people to realize biases are common and they might be prone to the same biases as other people.

Thinking dispositions might have an important role given dual process theorist Stanovich (2009) viewed it as the motivation to think in a flexible way. It is possible that after reading about the bias blind spot, students might reject the idea and not be open to self-criticism or negative evaluation of their thinking. It is probable that people who are high in thinking dispositions might engage in analytical reflective thinking without the need for external instruction. Instruction might be more beneficial to students who have low thinking dispositions because they engage in reflective thinking in a way not previously done.

Prior research on reducing hindsight bias supports the contention that reflection and deeper thinking contribute to error correction. Schwarz, Sanna, Skurnik, and Yoon (2007) suggested decision-making will improve if people think enough about an issue, consider all relevant information, and spend more time and effort before making judgments. In the current study, instruction to reflect on potential consequences of the bias blind spot was intended to facilitate an interdependent view of self and thereby promote balanced evaluations of the self.

Evidence that reflection is a powerful learning tool (Howard, 2003) makes it surprising that researchers have not examined the efficacy of reflection on increasing objectivity and reducing the bias blind spot. It is plausible that metacognitive activities would cue students to evaluate their beliefs about their own objectivity objectively after some deliberative thinking and considering new possibilities.

Overview of the Current Study

The present study was designed to explore how educating about the bias blind spot and reflecting about the consequences on others might relate to it. Examining the

effect of information and reflection on reducing the bias blind spot was done through an experimental manipulation. There were four conditions:

1. Information and reflection on the bias blind spot. Participants read the definition of the bias blind spot and reflect on a question about it, i.e., reflect on consequences of bias blind spot on others such as interpreting their actions (individuals and groups whom they do not like or with whom they have conflicts). Next, participants are asked to provide an example of a time when they were less objective.
2. Information plus reflection not relevant to the bias blind spot. Participants read the definition of the bias blind spot and are asked to think about consequences of participating in psychological research.
3. No information and reflection on the bias blind spot. Participants do not receive information about the bias blind spot; however, they reflect on the consequences of being sometimes less objective about a situation and how this might affect how they perceive others. Next, participants are asked to provide an example of a time they were less objective.
4. No information and reflection relevant to the bias blind spot (control group). Participants do not receive information about the bias blind spot and are asked to think about consequences of participating in psychological research.

To test the generalizability of the reflection instruction to reduce the bias blind spot, I conducted a cross-cultural comparison to explore the possible interaction between

reflection and culture. The order of intervention material was also manipulated to test for a priming effect.

Research Questions and Hypotheses

The following research questions guided this study:

- Q1 Are there differences in the bias blind spot among the four conditions?
- a. Information and reflection on the bias blind spot.
 - b. Information and reflection not relevant to the bias blind spot
 - c. No information and reflection on the bias blind spot
 - d. No information and reflection not relevant to the bias blind spot (control group)

- H1 For the experimental conditions: Participants in the information condition would display lower levels of the bias blind spot than participants in the control group because they were not made aware of the bias blind spot effect.

- H2 Participants in the reflection only condition would display lower levels of the bias blind spot than participants in the control group because they were given the opportunity to elaborate on the idea of the bias blind spot.

- H3 Participants in the information only or the reflection only condition would display higher levels of the bias blind spot than participants in the information plus reflection condition because they did not have the opportunity of processing the new information at a deeper level.

In summary, the bias blind spot would be smallest in the combined intervention condition and would be biggest in the control condition.

- Q2 Are there differences in the bias blind spot between Western and Middle Eastern cultures?

- Q3 Is there an interaction effect of the intervention conditions and culture on the bias blind spot?

Research questions 2 and 3 are exploratory and there is not enough prior research to propose a hypothesis.

- Q4 How much variance of the bias blind spot is explained by information, reflection, reasoning performance, thinking dispositions, motivations to be unbiased, and culture?

Study Delimitation

When exploring the relationship between self-evaluation and debiasing, it was difficult to include all relevant variables. Questions beyond the scope of this study involved relationship to self-esteem, humility, and in-group favoritism. These constructs remain open to future investigations.

Limitations of the Study

The limitation of the current study involved the intervention nature since it was a short-term intervention and not a multi-dimensional intervention. The effects might not be long lasting but this kind of design allowed one to see if the variables targeted in this study had influence or not. Future research could utilize more extensive types of intervention and would likely have stronger effects. Moreover, the sample was not a representative sample of Western and Middle Eastern cultures. In addition, all measures relied on self-report. The mode of administration also introduced a bias in the sample. Only Middle Eastern participants who had access to the Internet and computer were able to participate.

Definition of Terms

Bias blind spot. The “not me fallacy” is the tendency to deny the influence of biases on oneself while acknowledging their effect on others (Pronin et al., 2002).

Culture. A particular society that has its own beliefs, ways of life, art (Culture, 2015). Western and Middle Eastern cultures were compared in the current study.

Dual process theory. An account of explaining cognitive errors distinguished between intuitive and analytical processing.

Heuristic. Rule of thumb comes to mind, which is formed from experience and used in problem solving and decision-making.

Instruction. Instructing participants and prompt thinking about consequences for others before responding to bias blind spot questions.

Motivation to be unbiased. Motivation to avoid biased thinking with acknowledgement of biases' negative consequences on society and one's life.

Reasoning performance. Performance on tasks that deliberately cue intuitive processing and over-reliance on heuristic as opposed to analytical processing.

Reflection. Elaborating on the understanding of the bias blind spot by thinking about its influence as well as providing an example.

Reflection and information conditions. The intervention had two components and two experimental conditions were created to test the effectiveness of information and reflection.

1. Information plus reflection on the bias blind spot
2. Information plus reflection not relevant to the bias blind spot
3. No information plus reflection on the bias blind spot
4. No information plus reflection not relevant to the bias blind spot (control group).

Thinking dispositions. The motivation for open-mindedness, impulsivity, and avoiding belief defensiveness.

CHAPTER II

LITERATURE REVIEW

This chapter provides theoretical and empirical support for the current study's research questions. First, I focus on the bias blind spot by providing the background for construct development, consequences, measurement, and origins. Second, I review some debiasing efforts relevant to metacognition and bias awareness. Third, I discuss how the current research differed from prior research and on which theories it was based. Fourth, I explore the links of three individual factors that might be related to the bias blind spot: reasoning performance, thinking dispositions, and motivation to be unbiased.

The Bias Blind Spot: Development and Consequences

Thirteen years ago, Pronin et al. (2002) coined the term *bias blind spot* to refer to people's tendency to see biased thinking in others but fail to see biases influencing them. Pronin et al. extended the notion of Jones and Nisbett's (1971) differences in the perspectives of people observing situations and acting in situations. The fundamental attribution error (FAE) refers to the tendency to make more dispositional attributions (e.g., a person is late because she or he is careless) for others than ourselves (e.g., I am late because the road were busy), particularly for negative outcomes. Pronin et al. illustrated the similarity of the bias blind spot to the fundamental attribution error in that both involve making attributions. However, unlike the FAE, the bias blind spot is specific to perceptions of one's own and others' biases or objectivity. For instance, when

one person disagrees with or has a different opinion from others, that person will construct a reason for the disagreement. In doing so, the person with whom he/she disagrees may conclude the other has misconceptions, is biased in his or her thinking, and the other's misperceptions may have distorted his/her interpretation of reality and judgments. Thus, most of Pronin and her colleague's work was concerned with the consequences of the bias blind spot in conflict situations (Kennedy & Pronin, 2008; Pronin, Kennedy, & Butsch, 2006; Ross, 2014).

Theories about and the implications of the bias blind spot have been discussed in several fields. For example, in the field of law and teaching cultural sensibility for law students, Curcio (2015) found law students perceived themselves as more objective than their clients and less prone to endorsing stereotypical beliefs. Curcio speculated law students perceived themselves as more objective and rational than others because they had knowledge of and experiences with the law. This finding led Curcio to call for instruction intended to teach students how to develop self-awareness and educate them about the bias blind spot. Concerns about awareness of the effects of the bias blind spot on decision-making have also been expressed in the field of intelligence. In a collaborative study by engineers, social psychologist, cognitive psychologists, and educators, an educational game was developed to reduce the bias blind spot in intelligence analysts (Barton et al., 2015; Morewedge et al., 2015). This interest in understanding and reducing the bias blind spot from several fields begs for research that includes educational psychologists. Such research might not only add a new perspective to theorizing in the field but might also contribute to the development of more informed interventions than has been the case in bias blind spot research.

The Bias Blind Spot: Measurement and Origins

A typical method to measure the bias blind spot is as follows. Participants read about several social and motivational biases. Next, they assess their susceptibility to these biases and the susceptibility of the average person (in their classes, universities, or countries) to the same biases. The bias blind spot is evident when the two ratings (self and others) are different. An alternative approach to assessing the bias blind spot, using discrepancy scores between self and others' ratings, has also been used (e.g., West et al., 2012). It is important to note that out of the several biases on which people judge themselves and others (e.g., self-serving biases, the Halo effect, the FAE), people *do* admit they are susceptible to some bias, which is relatively easy to find through introspection. For example, when evaluating self on procrastinating, fear of public speaking, and planning, people do not show a bias blind spot (Pronin et al., 2002). Pronin et al. (2002) concluded the bias blind spot is not just a special case of the "better-than-average" effect (i.e., involving self enhancement motives); rather, they concluded the bias blind spot has both motivational and cognitive influences (i.e., cognitive availability; see Tversky & Kahneman, 1973). To illustrate, students participating in a study in which they search for incidents of procrastinating or fear of public speaking can search their memories and find readily available memories showing they are not immune to these tendencies and thus do not perceive themselves and others differently. Pronin et al. suggested the bias blind spot arises as a result of the interplay between cognitive and motivational factors. In most heuristic and biases problems, in contrast, people are not only motivated to see themselves in a positive light but also appear to have problem finding evidence they are susceptible to biases. In general, therefore, it appears the bias

blind spot operates unconsciously—like most biases measured on implicit tests. As a consequence, people have difficulty finding instances in which they were biased (Lilienfeld et al., 2009; Pronin, 2008).

Pronin (2008) emphasized that other cognitive illusions contribute to the bias blind spot such as naive realism and the introspection illusion. Naive realism is defined by Pronin et al. (2004) as “the conviction that one sees and responds to the world objectively, or ‘as it is,’ and that others therefore will see it and respond to it differently only to the extent that their behavior is a reflection of something other than that reality” (p. 781). Introspection illusion refers to people’s tendency to treat their own introspections as the only standard in evaluating why they behaved in a particular way and whether their judgments were infected by bias. Nonetheless, people treat the introspections of others as only possibilities that can be rejected or accepted based on their lay theories about bias (e.g., people sometimes behave in a self-serving way). As displayed in Figure 1, Pronin (2007) argued the different information used for self versus other facilitates the introspection illusion that impacts how people easily perceive bias in others but rarely detect bias in their thinking or behavior. Because the bias blind spot involves metacognitive judgments (i.e., not thinking objectively about one’s own biases), I argue there is potential for a metacognitive perspective in interventions to attenuate the bias blind spot.

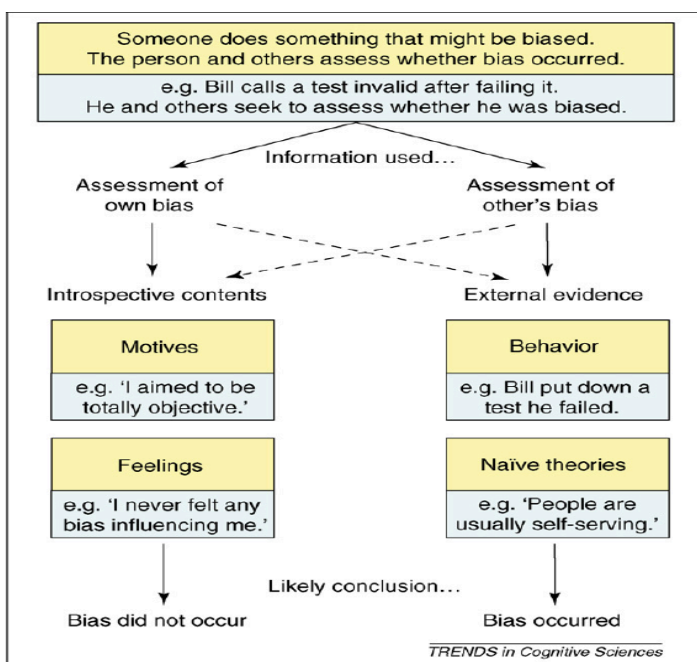


Figure 1. The introspection illusion in perceptions of bias (Pronin, 2007).

Debiasing and Metacognition

In the following section, debiasing attempts for social and cognitive biases are first reviewed, the connection between the bias blind spot and metacognition is then explored, and a review of the empirical evidence for the link between reflection and reasoning improvement is provided. Finally, differences and similarities between past debiasing attempts and the current study are outlined.

Reducing cognitive biases and judgment errors is referred to as debiasing (Arkes, 1991). Several studies that used debiasing techniques received mixed degrees of success (Wilson & Brekke, 1994). The current review was mainly focused on debiasing studies that had metacognitive components. Why was metacognition utilized as a strategy to reduce the bias blind spot in the current study? To answer this question, it is important to first understand what metacognition means. Metacognition refers to cognition about

cognition (Flavell, 1979). In other words, when people try to understand their own thought processes, they are engaged in metacognitive activities.

Indeed, metacognition has been linked to advances in thinking by several theories and is referred to by different terms. For instance, Piaget's (1971) concept of reflective abstraction has been tied to the development of mathematical thinking (Dubinsky, 1991). Kuhn (2002) explored the role of metaknowledge in the development of scientific thinking and Moshman (2015) argued that epistemic cognition as an aspect of metacognition is critical to adolescent development. In addition, metacognition has been linked to improved statistical reasoning through the process of metacognitive intercession; metacognitive intercession refers to inhibiting automatic intuitive answers, comparing those responses to answers generated by analytical processing, and determining the most appropriate answers (Amsel et al., 2008; Klaczynski, 2005). In the attitude change and persuasion literature, Wegener and Petty (1997) proposed a model for bias correction that included people's naive theories of biases as the driving force for attempts to correct biases. Similarly, Pronin et al. (2002) attributed the bias blind spot to people's naive realism—the tendency to believe that we perceive reality as it is—and argued that several factors influence how people construct and sometimes unconsciously distort subjective reality. Bless, Keller, and Igou (2009) proposed people need metacognitive strategies to protect themselves from the influence of irrelevant information that could bias judgments.

Reflection specifically has been explored in qualitative studies to determine how it might improve people's understanding of themselves in different situations. In the medical field, Ogdie et al. (2012) found when medical students learned about the

cognitive biases that affected diagnostic reasoning and then reflected on their experiences (by writing narratives about the consequences of their biases?), 85% were able to describe at least one strategy for avoiding cognitive biases. In the diversity education field, Chen, Nimmo, and Fraser (2009) proposed a model, which they called *A Tool to Support Reflection*, to help teachers become culturally responsive and less biased in their interactions with diverse populations. Teachers could explore their own stereotypical beliefs and biases and reflect on how these beliefs might influence their promotion of diversity in their classrooms. Missing from previous studies were experimental manipulations of reflection; the current study sought to fill this gap by testing if reflection had the potential for reducing the bias blind spot.

Is educating people about bias enough to reduce biases? At present, the answer is uncertain. Hansen, Gerbasi, Todorov, Kruse, and Pronin (2014) argued making people aware they used biased strategies to make an evaluation was insufficient to reduce the bias blind spot. Consistent with this argument, Hansen et al. found after students used a biased strategy to evaluate a test they performing poorly on, they continued to believe their evaluations were objective.

Bias Awareness and Education

Based on the assumption that people are unaware of their biases (Wilson, Centerbar, & Brekke, 2002), several attempts to intervene and decrease biases have provided different results. Several reports indicated educating people about biases has proven insufficient to reduce biases. For example, Frantz (2006) aimed to reduce the liking bias prevalent in conflict situations by reading about the bias blind spot. Participants read about the liking bias, which refers to people's tendency to accept the

actions of an individual they like more than the actions of the individual they do not like as much when they know about a conflict. Frantz compared two debiasing strategies: education about the liking bias and the instruction to “be as fair as possible.” The information failed to reduce the liking bias but participants were less biased than the group instructed to “be fair” (Lord, Lepper, & Preston, 1984).

The provision of bias blind spot information to participants was also investigated as a strategy for reducing omission neglect (Han, 2012), which was defined as people’s insensitivity to unknown or missing information. Han (2012) manipulated the information about the bias blind spot provided to participants. Half of the participants read only the definition of the bias blind spot and the other half read the definition of the bias blind spot with an example of omission neglect (i.e., how people can perceive others as more prone to the omission neglect than themselves). Han's results indicated the information was not generally effective in reducing omission neglect bias. However, omission bias was reduced when information about the self-others’ asymmetry in bias perception was illustrated with examples specific to omission neglect.

Joy-Gaba (2011) aimed to change freshman beliefs about bias in the fifth study within her dissertation. A 10-minute video discussed the bias blind spot, the prevalence of this common bias, and people's susceptibility to the bias. For some participants, the bias blind spot was assessed before the intervention and for others, the bias blind spot was assessed after the intervention. Joy-Gaba found the video was ineffective in changing the beliefs about bias.

By contrast, educating people about biases with a lecture and an activity has effectively reduced people’s ideas about biases. In an earlier part of the same study (Joy-

Gaba, 2012), Study 1 used the same information in the video as in Study 5 except it was a face-to-face, hour-long lecture combined with group activity (i.e., taking the implicit association test to demonstrate the unconscious nature of biases for participants). In contrast to Study 5, Study 1's intervention was effective in changing students' beliefs about bias but not in reducing racial prejudice.

Scopelliti et al. (2015), in their fifth study within a larger research examining the bias blind spot, explored the relationship between the bias blind spot and sensitivity to interventions. Scopelliti et al. focused on reducing a single cognitive bias, the fundamental attribution error, by reading about it. Participants completed the bias blind spot questionnaire, developed to assess 14 cognitive and social biases, and were assigned to either an FAE information or a non-FAE information group. The dependent variable was scores on a set of FAE tasks. Scopelliti et al. found participants educated about the FAE reduced that particular bias but only among participants who already had low bias blind spot scores. That is, people who were low in bias blind spot at the outset of the study were the only groups whose FAE scores were reduced by the intervention.

More relevant to the current intervention was an investigation by Pronin and Kugler (2007). They proposed the bias blind spot is prevalent because people overvalue the input from their own introspections when judging themselves. By contrast, they value behavior when making judgments about others (see Figure 2). Consequently, Pronin and Kugler aimed to reduce the bias blind spot by educating people about the limitations of introspection. Specifically, they presented participants with a journal article that was claimed to appear in *Science*. The article included a review of actual studies, each of which indicated people are typically unaware of their mental processes.

The notion on which Pronin and Kugler operated was knowledge of such findings (such as studies on subliminal primes and behavioral mimicry) would convince participants not to blindly trust their own introspections when evaluating their objectivity. Results were consistent with this hypothesis. Participants who read the article about the limitations of introspection showed less of a bias blind spot than did participants who were not made aware of the limitation of introspection.

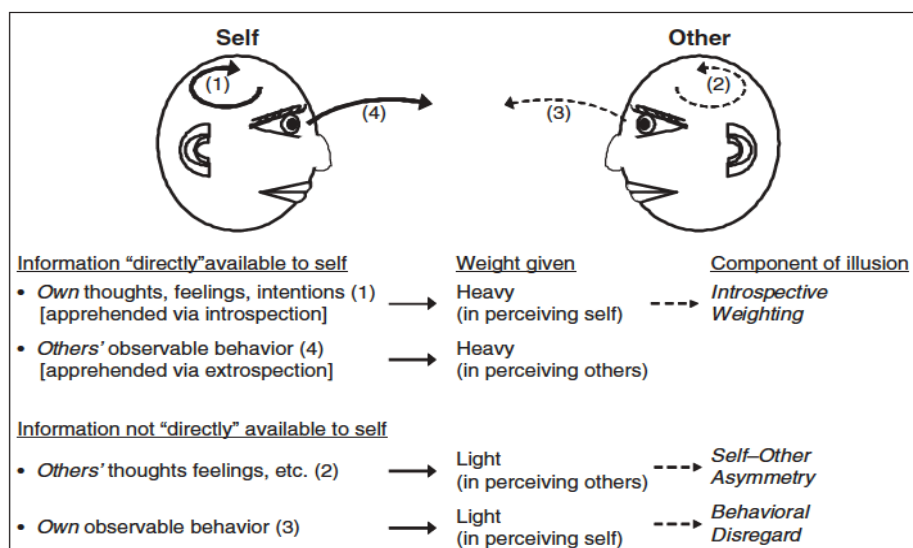


Figure 2. A graphical illustration of the perceptual basis of the introspection illusion (Pronin, 2009).

How Did the Current Research Differ from Prior Research and Theories?

The intervention in the current study included several components borrowed from previous work and theory on social, cognitive, and cultural psychology. First, participants were asked to elaborate on the idea of the bias blind spot. The elaboration likelihood model is a model intended to explain people's responses to persuasive

messages (Petty & Cacioppo, 1986). According to the model, if people are engaged in thinking about an issue (i.e., motivated) and possess the ability to process messages, then elaboration is likely. Relevant to this study, if participants engaged with the task, they would respond carefully and thoughtfully to the questions about the consequences of the bias blind spot. This elaboration was reflected by the extent to which participants express serious thinking on the "thoughts listing task."

A second component of reflection involved considering beliefs and positions opposite to one's own (see Lord et al., 1984). Relevant to the intervention, participants were asked to think about the possibility of being less objective than others and more prone to the bias blind spot. Dewey (1933) emphasized people gained understanding of possibilities if they thought about consequences. Thus, in the current study, participants were asked to think about possible consequences of the bias blind spot.

The participants who engaged in the reflection task were also asked to consider any event that indicated they were not as objective as they thought. The third component of the reflection intervention was personalizing the new information. If the information about the bias blind spot was made more relevant to peoples' life experiences or interpersonal relationships, then motivation to process this new information would increase. Posner, Strike, Hewson, and Gertzog's (1982) model of conceptual change emphasized the role of plausibility and fruitfulness of the new information or concept in order to undergo conceptual change. If participants could see the value of the new information, the chance of connecting it to their lived experience might increase and, thus, the information would be plausible. Plausibility increases the chances of elaboration and reflection.

Along the same line, Petty and Cacioppo (1986) emphasized the types of cognitive processing that could explain the conditions under which attitudes change. If thoughts about a message or topic are favorable, then it is more likely people will engage in highly elaborated thinking. In the current study, the idea that participants could be as or more biased than others might be perceived as *unfavorable*. If this occurred, it increased the likelihood of rejecting the idea and increasing the size of the bias blind spot. Posner et al. (1982) also argued that when people are dissatisfied with an existing concept or idea, they are more likely to construct new concepts and revise beliefs and ideas that made them dissatisfied. It is possible participants in this study were satisfied with the existing concept of “I am better than average” and became less satisfied when presented with the idea they were probably “not different” from other people.

Dole and Sinatra (1998) synthesized ideas from social psychology and cognitive psychology in their cognitive reconstruction of knowledge model (see Figure 3). They proposed there is a continuum for engagement that depended on the characteristics of (a) the information and (b) the learner. First, the new information must be easy to comprehend, coherent, plausible, and compelling in order to have high engagement with the idea or concept. Second, the learner’s prior experience (i.e., schema) and motivation could either facilitate or inhibit engagement. Motivation is discussed further in another section. Dole and Sinatra argued knowledge was reconstructed when all these conditions were met.

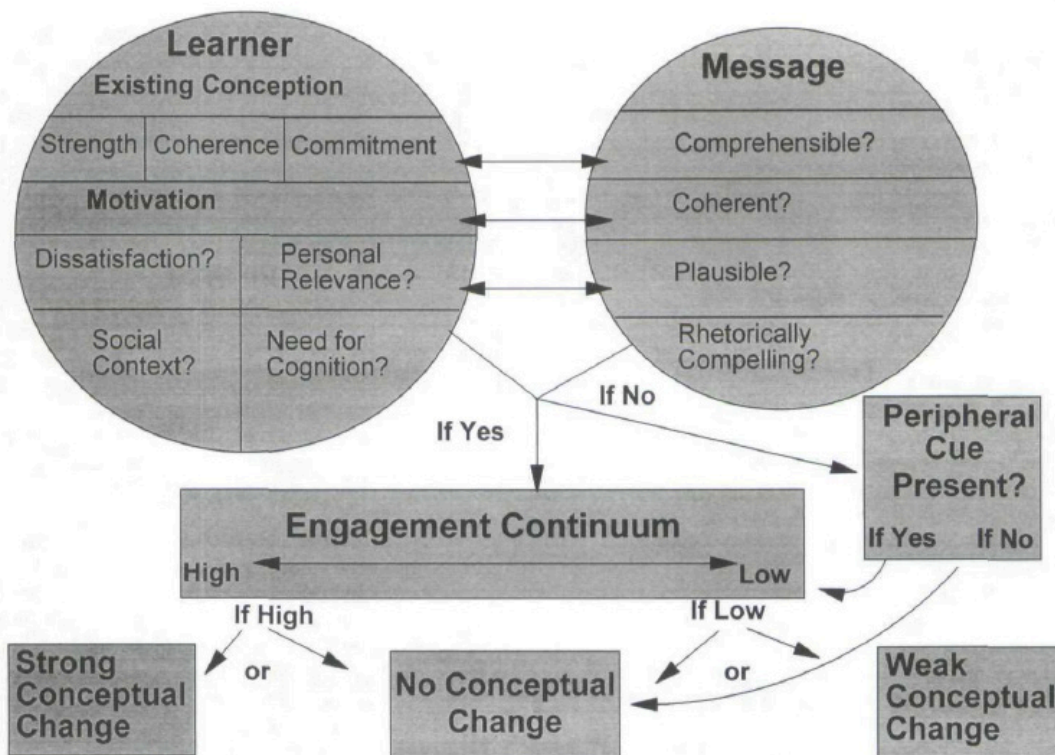


Figure 3. Cognitive reconstruction of knowledge (Dole & Sinatra, 1998).

The fourth component involved framing the reflection questions in a relational context. Because the bias blind spot is relevant to self-other perceptions, questions framed to prime a specific cultural mindset might increase the chances participants would view information about the bias blind spot as more relevant to self and others if such a mindset was not primed. Consider Oyserman's (2011) definition and illustration of priming different cultural mindsets:

Cultural mindset means a set of mental representations or cognitive schema containing culture-congruent mental content (knowledge about the self and the world), cognitive procedures (e.g., “find relationships and connect” or “find main point and separate”) and goals (e.g., “fit in and be sensitive to context” or “stick out and do your own thing”; Oyserman & Lee 2008a, 2008b; Oyserman, Sorensen, Reber, & Chen 2009). When in an individualistic mindset, people attend to content, procedures, and goals relevant to distinction; when they are in a

collectivistic mindset people attend to content, procedures, and goals relevant to connection. (p. 156)

Research on self-construal and culture suggested cultural mindsets are not fixed; instead, they are rather malleable (Oyserman & Lee, 2007). An interdependent view of self emphasizes relationships, harmony, and connectedness (Markus & Kitayama, 1991, see Figure 4). This view was successfully primed in participants from individualistic cultures (i.e., cultures that emphasis uniqueness) via reading an independent or interdependent story (Trafimow, Triandis, & Goto, 1991) or via word search for either the pronoun “I” or “us” (Brewer & Gardner, 1996).

While Western culture emphasizes individualism, independence, and uniqueness and Far Eastern cultures emphasize interconnectedness, no empirical data exist on Middle East cultures and whether the Middle East promotes interdependent or independent views of self (note: exploring this possibility was not a part of the current study). However, regardless of where the two cultures fall in the interdependent or independent distinctions, I argued, based on Oyserman and Lee's (2007) point about malleable cultural mindsets, that connectedness to others can be made salient by the type of questions participants are asked when they think about others. In other words, framing the reflection questions in a relational context might facilitate the perceived similarity of the self to others (and reduce perceived differences). Such perceptions of similarity are, in turn, likely to reduce the degree of the bias blind spot.

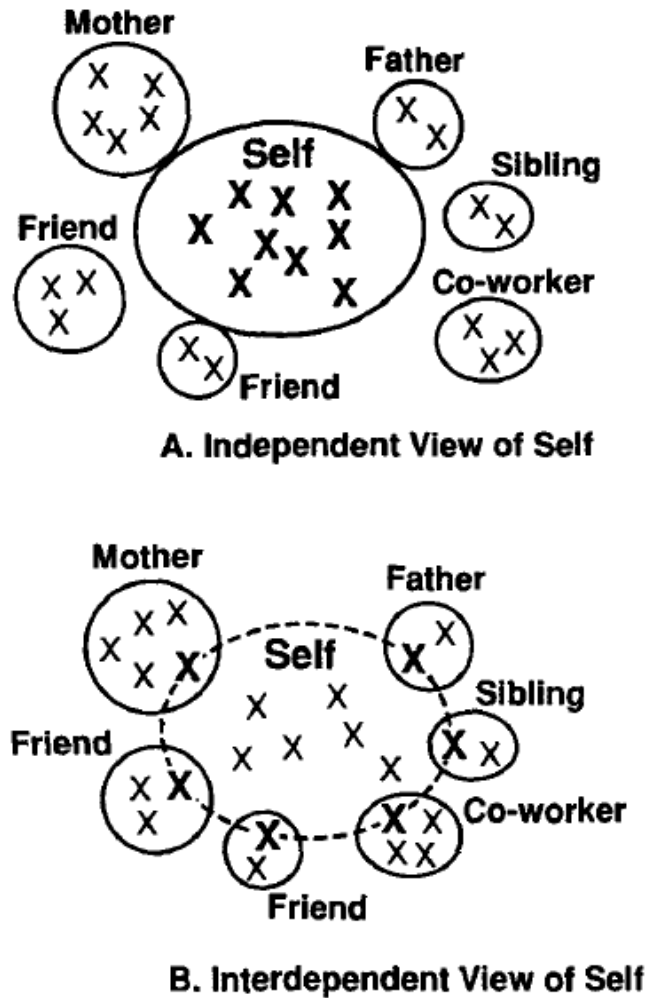


Figure 4. Conceptual representations of the self (Markus & Kitayama, 1991).

Culture and the Bias Blind Spot

Compared to the large database on West-East cross cultural studies (Nisbett et al., 2001), few studies have been conducted with Middle Eastern participants. According to Gregg (2005), conducting research in the Arab world is difficult because “governments maintain surveillance and control over researchers, and neither Western psychology nor recent cross-cultural psychology has much to offer by way of concept or methods” (p. 372).

Two empirical investigations were relevant to the current study. First, the relationship between culture and attritional biases was investigated by Al-Zahrani and Kaplowitz (1993), who found no differences in the self-serving biases of American and Saudi students. It could be argued that several events have happened and changed since 1993 (i.e., 9/11 terrorist attacks on the United States, the Arabic Spring, the conflict in Yemen and Syria, the Islamic State terrorist group, etc.). Consequently, the relationship between culture (i.e., the West-Middle East comparison) and biases remains unclear until sufficient research has been conducted and patterns of relationships—across different historical periods—have been examined. Although some authors argue Arabic individuals have high levels of self-deception (Darwish, 2006; Triandis, 2008), no empirical evidence was provided to support those claims.

Second, Ehrlinger, Gilovich, and Ross (2005) examined self-others' asymmetric perception by comparing Jewish and Arab/Muslims students attending Stanford University. Following the reasoning of Pronin et al. (2002) about the self-other symmetry in perceiving bias, they hypothesized personal connection to the Israeli-Palestinian conflict would be viewed as a source of enlightenment for self but a source of bias for others. This hypothesis was supported only for Arab/Muslim students; they perceived their connection to the conflict as a source of enlightenment but as a source of bias for a Jewish target. Nonetheless, Jewish students did not view their personal connection to the Middle East conflict as enlightening but at the same time considered the connection to the Middle East as biasing for the Arab/Muslim target.

Because extant research has not yielded consistent findings concerning the relationship between culture and biases, such as the bias blind spot, it was not possible to

propose a specific hypothesis for the present study. Instead, culture was examined as an exploratory variable. For example, it is possible the effectiveness of the intervention depends on the cultural background; however, there is no empirical evidence pertinent to this possibility. Thus, the current study attempted to explore the possibility of an interaction between the two interventions and culture.

Individual Factors Related to the Bias Blind Spot

An important step in understanding the effectiveness of bias blind spot interventions is to investigate what makes an individual more or less likely to benefit from the information or reflection intervention and thus show a reduced bias blind spot. In the following section, three likely factors could be related to the bias blind spot: reasoning performance, thinking dispositions, and motivation to be unbiased.

Reasoning Performance

People do poorly on reasoning tasks that include a conflict between fast intuitive processing and slow deliberative processing (De Neys & Glumicic, 2008; Kahneman, 2011; Stanovich, 2009). For example, people fail to apply statistical reasoning when the tasks include stereotypical information that implies different judgments. Irrelevant, stereotypical information distracts people from the correct normative answer in base rate reasoning problems (Kahneman et al., 1982; Klaczynski, 2013). Should reasoning on traditional heuristics and bias reasoning problems be related to the bias blind spot? The bias blind spot is considered meta-bias (i.e., being biased about one's biases)--the belief that one is less prone to cognitive errors or biases compared to others.

In most of the work on the bias blind spot, researchers assumed people inaccurately believed they were better than the average person and would be less prone to

social and motivational biases such as self-serving bias and the hostile media effect.

When participants saw themselves immune to these biases but saw them in other people, Pronin and colleagues (2004) inferred blindness to one's limitations. Assessing people's performance on the actual tasks that could assess committing the bias was never done (see West et al. [2012] for an exception).

Stanovich (2009) developed a taxonomy of thinking errors and classified the bias blind spot as a form of contaminated knowledge, which includes people's lay psychological theories (e.g., misconceptions about how the mind works, people's awareness of the causes of their behaviors; see also Nisbett & Wilson, 1977), the accessibility of information for priming, and for reducing unconscious biases (Petty, Briñol, Tormala, & Wegener, 2007). Pronin et al.'s (2002) research suggested the same thing: people tend to think—inaccurately, but with a higher degree of certainty—that others are more prone to cognitive and motivational biases than they. This inaccurate bias perception, Pronin et al. argued (2004), arises because of (a) people's naïve realism—inaccurately believing one's preconceptions of reality are without distortion, and (b) the introspection illusion—over-reliance on introspection as a source of information about self but using their behaviors to make judgments about others (i.e., in other judgments, behavior is more valued than feelings and thoughts that, unlike behaviors, can be guessed but not seen). In the current study, the assumption that people “inaccurately” see the self as less prone to biases than others was examined. Participants not only read about and rated themselves and others on the likelihood they and others would commit cognitive errors and motivational biases typically found in several heuristics and biases problems,

they also solved the problems by tapping the same reasoning biases on which self-other judgments were based.

West et al.'s (2012) work was relevant to the current study because they explored the bias blind spot in the context of cognitive errors in reasoning and decision-making. West et al. did not assess reasoning directly, although a composite index of “cognitive sophistication” was created by combining scores on a cognitive reflection test, SAT, need for cognition questionnaire, and an actively open-minded thinking questionnaire (see West et al., 2012, p. 511). West et al. proposed a possible negative correlation between the bias blind spot and composite scores. In contrast to their expectations, the cognitive sophistication composite score was not related to the bias blind spot. Indeed, an examination of the zero-order correlations between the bias blind spot and several of the measures used to create the composite revealed several significant positive correlations. Nonetheless, the link between reasoning and the bias blind spot remains unexamined because, as noted above, West et al. did not directly assess reasoning on bias blind spot-relevant problems.

In the current study, participants solved reasoning tasks, read the definition of biases cued by each task, and finally rated both themselves and others on how likely they were prone to cognitive errors. I expected a positive correlation between the bias blind spot and reasoning (at least, in the control condition). Specifically, it was expected participants would solve the tasks fast and rely on intuition instead of solving them slowly with deliberation and logic. Thus, it was likely they would do poorly on the reasoning tasks. When they read the definitions of the biases as well as the correct responses, they would know how common cognitive errors were in human cognition.

Reading about the frequency with which other people committed biases would thus make it easier for people to acknowledge their own proneness to biases because they had recently read about this bias. These participants should rate themselves as being similar to others.

In the current study, it was unknown whether participants felt they had responded correctly. However, prior research indicated people often solved such problems by relying on automatic, intuitive responses and, therefore, were unlikely to be aware of problems that could arise by relying on intuition (Stanovich, 2009).

People do not know if they are better than the average but introspection bias and self- or self-esteem serving biases make it likely people will *think* they did better than they really did. When participants do not perform poorly on the reasoning tasks, the opposite might not be true. If students are aware they actually performed better than most people's average and they are, therefore, *less* prone to errors, they may actually display a higher bias blind spot.

Thinking Dispositions

In the history of psychology, thinking dispositions have been referred to by several different names: cognitive styles, critical thinking dispositions, rational thinking dispositions, and epistemic thinking dispositions (Stanovich et al., 2011). The dispositions are defined as “relatively malleable cognitive styles concerning the pursuit, analysis, and interpretation of information relevant to everyday reasoning” (Klaczynski & Robinson, 2000, p. 402).

Many thinking dispositions measure attitudes about the nature and changeability of building as well as tendencies toward thoughtful analysis and reflective thinking. In

the current study, information and reflection about the bias blind spot was hypothesized to reduce the bias blind spot. It is possible that variation in the bias blind spot could be explained by thinking dispositions.

Individual differences in actively open-minded thinking, a component of most measures of thinking dispositions, have been widely used to predict analytical, reflective thinking in reasoning and cognitive biases literature. Dual process theories of reasoning and judgments emphasize when conflict arises between intuitive heuristic answers and rule-based answers, most people rely on intuitive answers. However, those high in thinking dispositions are more likely to override intuitive responses with thoughtful answers. To view the bias blind spot from a dual process perspective (see Figure 5), West et al. (2012) tested the assumption that analytical, objective answers to bias blind spot questions would correlate negatively with actively open-minded thinking dispositions. Thinking dispositions measured the reflective level of the analytical processing in Stanovich's model (see Figure 5). However, West et al. found a correlation in the opposite direction and in contrast to dual process theory predictions. Thus, participants high in actively open-minded thinking showed a higher degree of the bias blind spot. They attributed the positive correlation to the function of the bias blind spot stating, "Findings indicate a reinterpretation of the bias blind spot as an efficacious processing strategy rather than its more common interpretation as a processing flaw. Perhaps it results from some type of evolutionary-based egocentrism that is efficacious" (p. 516).

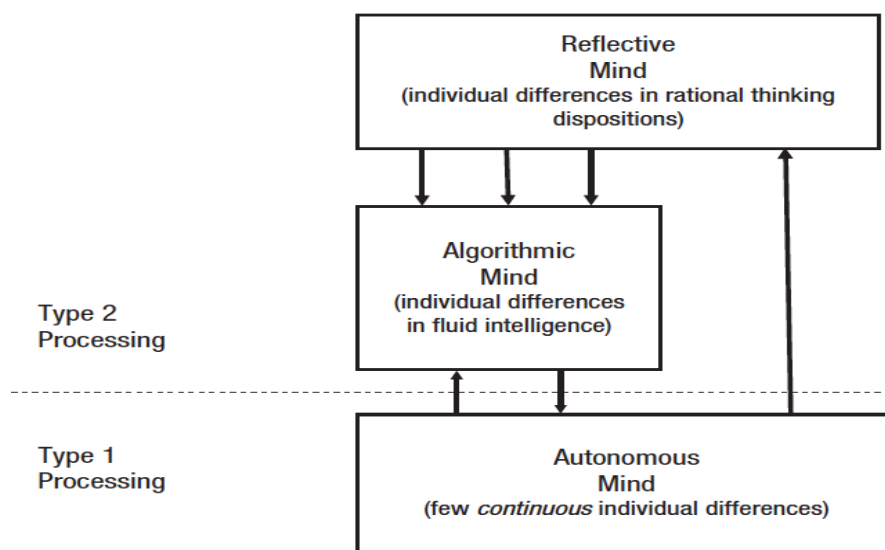


Figure 5. Individual differences in Stanovich's model of the mind (Stanovich, 2009).

West et al. (2012) called for additional research to confirm their results and to explore more variables involving thinking dispositions because even if the bias blind spot was adaptive for people temporarily, it is a type of self-decision that has negative, long-term consequences (Pronin, 2009). Since West et al.'s (2012) study was the only empirical study that examined the relation between the bias blind spot and actively open-minded thinking, the current study aimed to explore the relationship between the bias blind spot and actively open-minded thinking (including "belief defensiveness"). The belief defensiveness scale indexes dispositions to process information analytically and correlates negatively to reasoning biases (Klaczynski & Robinson, 2000).

Motivation

Although a fair amount of research has examined the cognitive aspects of the bias blind spot, motivations to avoid biases have not been empirically linked to the bias blind

spot. However, several lines of thought indicating motivations are unbiased might be related to the degree of the bias blind spot. Some dual process theories of decision-making distinguish between having the ability to think analytically and the motivation to do so (termed thinking dispositions). Stanovich (1999) emphasized the study of individual differences in thinking dispositions in the investigation of cognitive errors.

In the current study, the motivation to think analytically was indexed by thinking styles such as belief defensiveness and flexible thinking. The measure included items asking about thinking styles that could be related to showing the bias blind spot. This measure represented general motivations to think deeply, whereas motivations to be unbiased indexed the specific motive to avoid bias for the welfare of sociality and its relevance to one's life and relationships. Lilienfeld et al. (2009) proposed one of the barriers for debiasing attempts was peoples' perception that bias is not relevant to their lives or their society. Thus, the current study aimed to investigate the link between motivations to avoid bias and interventions to reduce the bias blind spot.

In their model of debiasing, Wilson et al. (2002) proposed several steps to determine peoples' reaction to mental contamination. The first step was awareness of unwanted influencing bias. The second step was the motivation to correct for the bias (see Figure 6). It is possible people might want to correct for the bias if they are motivated to avoid biases. In the same line, Plant and Devine (1998) found motivations to correct social judgments predicted endorsement of stereotypes.

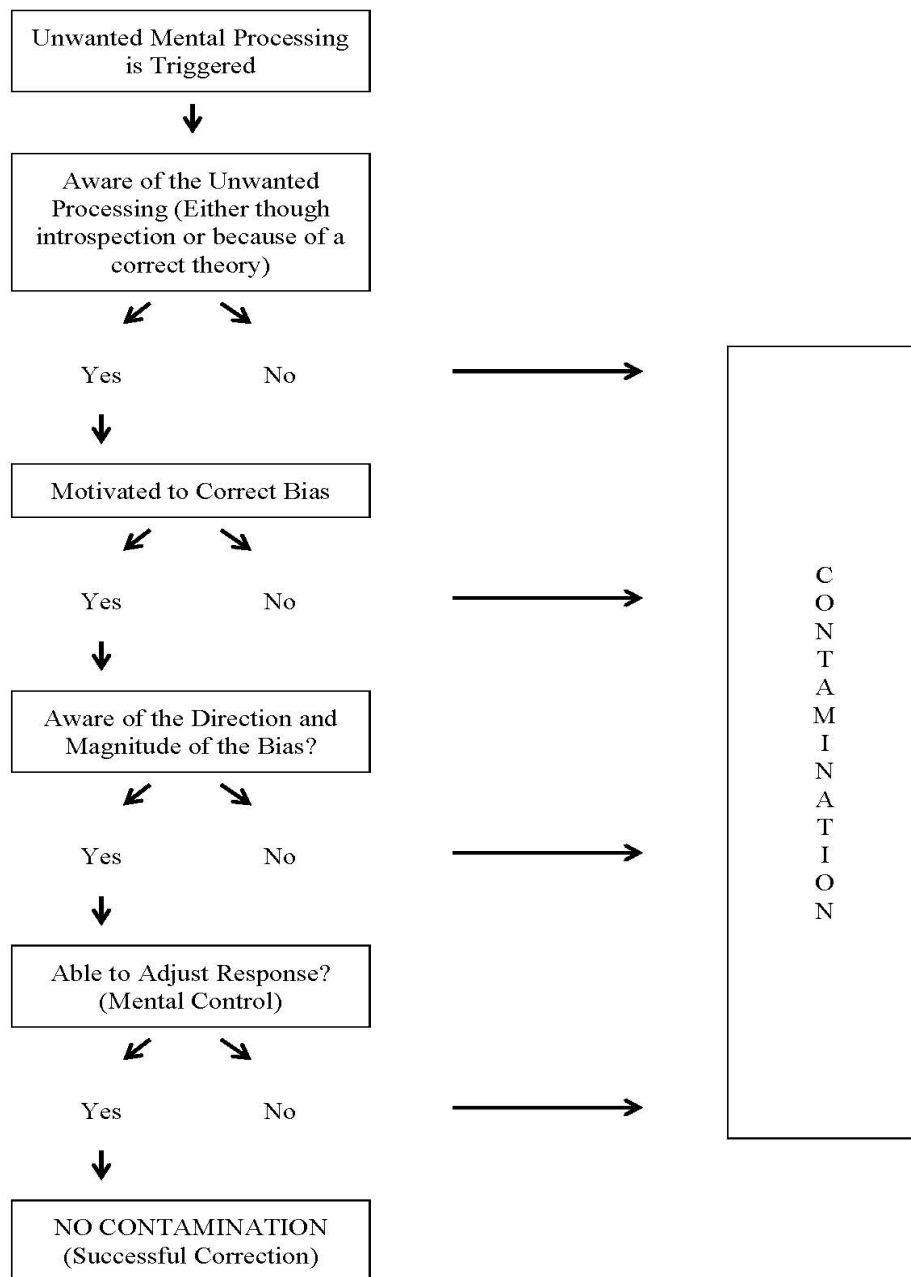


Figure 6. The process of mental contamination and debiasing (Wilson & Brekke, 1994).

In the educational psychology literature, the role of motivation has been central to learning theories. In the context of conceptual change, Dole and Sinatra (1998) emphasized the role of motivation in their cognitive reconstruction of knowledge model.

They included several reasons that motivated people to reconstruct their existing knowledge. First, people can be motivated to engage in conceptual change when they are too dissatisfied with their existing knowledge. In the context of the bias blind spot, Pronin (2008) also emphasized the role of naïve theories of objectivity. The second reason in Dole and Sinatra's model was the presence of personal relevance. Thus, in the current study, the motivation to be unbiased scale asked people to rate how much they thought avoiding biases was relevant to their everyday lives. The third reason in Dole and Sinatra's model was social context. Thus, in the current study, the motivation to be unbiased scale asked people to rate how much they thought avoiding biases was relevant to their society and interpersonal relationships. The fourth reason in Dole and Sinatra's model was the need for cognition. In the current study, the thinking disposition scale indexed several thinking styles that might relate to engagement in analytical thinking including the some items from the need for cognition scale.

Summary

This chapter provided a review of related literature on four research areas. First, development, consequences, measurement, and origins of the bias blind spot were presented. Second, links between metacognition, bias awareness, and bias reduction were explored. Third, current research and theories were discussed. Fourth, the role of individual factors related to reasoning biases was explored in the context of the bias blind spot. Reasoning performance, thinking dispositions, and motivation to be unbiased might explain variations in the bias blind spot.

CHAPTER III

METHODOLOGY

Purpose of the Study

The primary purposes of this study were to (a) investigate the effect of information and reflection on the bias blind spot, (b) compare cultures in terms of the bias blind spot, (c) investigate interactions between culture and interventions on the bias blind spot, and (d) examine the relationship between individual variables (thinking disposition, reasoning, and motivation) and the bias blind spot. A secondary goal was to investigate whether the order of the intervention (i.e., priming) might explain variations in the bias blind spot.

The study utilized quasi-experimental and correlational research designs and three variables were manipulated: information, reflection, and the order of the intervention (i.e., priming). The populations of interest were adults from the United States and the Middle East with the goal of investigating the bias blind spot across cultures. Approval for the study was obtained from the University of Northern Colorado's (UNC) Institutional Review Board (see Appendix A).

Participants

One hundred ninety-three participants completed all surveys. For the Western culture, 115 participants (24% males, 76% females; M age = 23.72, SD = 11.68, mode = 19) were recruited from introductory psychology classes at an American university.

Participants self-reported their highest degree of education as follows: 70% high school, 15% associate degree, 7% bachelor's degree, 6% master's, 1% Ph.D., and 2% did not report their highest degree of education. Western culture students' self-reported nationalities were 87% American, 1% Italian, 1% Canadian, 2% Irish, 2% Norwegian, 2% German, and 5% did not report their nationality.

For the Middle Eastern culture, there were 78 participants (20% males, 78% females; M age = 31.48, SD = 7.80, mode = 26). Participants self-reported their highest degree of education as follows: 15% high school, 3% associate degree, 37% bachelor's degree, 26% master's, 17% Ph.D., and 2% did not report their highest degree of education. Middle Eastern students' self-reported nationalities were 80% Saudi Arabian, 8% Kuwaiti, 4% Egyptian, 1% Omani, 1% Iranian, 1% Sudanese, 1% Turkish, 1% Tunisian, 1% Israeli, and 2% did not report their nationality.

Sampling

Western participants were recruited via instructors' announcement for research volunteers (see Appendix B for PSY 129 and PSY 230 consent forms). Due to limited access to Middle Eastern students in American universities, participants were recruited via online survey using the Qualtrics system (see Appendix C for online consent form). I searched for Arabic students' club forums in the United States, United Kingdom, and Australia. Drop-out rate for the online survey was 63%.

Design

This was a quasi-experimental study. A balanced design was used such that two intervention variables (information and reflection) yielded the following four conditions:

1. Information plus reflection on the bias blind spot. Participants were provided with the definition of the bias blind spot, received instructions to reflect on the consequences of the bias blind spot on interpreting the action of others, and were asked to provide an example about a time they were blind to their bias.
2. Information plus reflection not relevant to the bias blind spot. Participants were provided with the definition of the bias blind spot and were asked to reflect on a non-bias relevant topic (i.e., the potential consequences of participating in psychological research on interpreting the actions of others and providing an example). Note that such reflection was added to make the amount of cognitive work similar to the information plus reflection about the bias blind spot condition.
3. No information plus reflection on the bias blind spot. Participants did not read the information about the bias blind spot but they were asked to reflect on the consequences of being less objective such as judging their own actions differently from their judgments of others' actions or reflecting on the consequences of biases in our world and how this might affect how they perceived others.
4. No information plus reflection not relevant to the bias blind spot (control group). The control group did not read information about the bias blind spot effect. However, they received instruction to reflect on a non-bias relevant topic (i.e., the potential consequences of participating in psychological research on interpreting the actions of others and providing an example).

Each of these conditions was presented in either a priming or non-priming manner, resulting in eight total conditions. Priming in the current study referred to the priming of thinking about thinking via responding to individual difference measures (i.e., thinking styles, motivation to be unbiased, and reasoning tasks) before receiving the intervention. Within each of the four conditions, approximately half the participants received priming and the other half did not.

Participants who completed the survey in class were randomly assigned to one of the eight conditions. Random assignment for online participants was done via club forums, i.e., club forums were randomly assigned to receive a survey representing one of the eight conditions. For example, the Saudi students' club in Colorado received the survey for the control group with no priming condition. The Arab students' club in Texas received the survey for the information intervention in the priming condition.

Instrumentation

The variables and associated instruments are summarized in Table 1. All the instruments were translated by the investigator from English to Arabic and were read by two other Arabic-speaking students who are competent in both Arabic and English to validate the translation. I used back-translating to ensure the equivalence of the Arabic and English versions. The final version of instruments was one reached after consulting another Arabic-speaking student who did back-translating so the English and Arabic versions were as close to identical as possible.

Table 1

Variables and Operational Definitions

Variable Name	Operational Definition	
Dependent Variable	The bias blind spot (BBS): asymmetry in evaluation bias in self and others (Pronin et al., 2002).	A discrepancy score will be created to be the dependent variable (i.e., evaluation of others minus evaluation of self in terms of bias).
Independent Variables	Information	The two conditions were 1. Information 2. No information
	Reflection	The two conditions were 1. Reflection on the BBS 2. Reflection not relevant to the BBS
	Culture	Western and Middle Eastern
Predictor/Moderator Variables	Reasoning performance	As measured by scores on Heuristic and biases tasks; Kahneman et al., 1982).
	Thinking dispositions	As measured by scores on open-mindedness thinking scale and belief defensiveness (West et al., 2012)
	Motivations to be unbiased	As measured by items on the importance of avoiding bias and motivation to avoid bias

The dependent variable: Bias blind spot. Adapted from the Pronin et al.'s (2002) and West et al.'s (2012) bias blind spot scales, 15 items were developed to assess participants' perceptions of their own biases and their perceptions of biases of other people (see Appendix D for bias blind spot survey). Participants were asked to indicate "own" and "other" biases for each of the five cognitive and motivational tendencies: the fundamental attribution error (Ross, 1977), the hostile media effect (Vallone, Ross, & Lepper, 1985), the outcome bias (Baron & Hershey, 1988), the base-rate neglect, and the conjunction error (Kahneman & Tversky, 1973). An example item of evaluation bias in

“others” is “To what extent do you believe the average person in your country is likely to show a hostile media effect?” Pronin et al. (2002) used less hypothetical comparison groups (i.e., typical student at same university) as well as the average traveler in the same airport. For the current study, it was difficult to select which comparison group was the best because this was a cross-cultural study where equivalents in activating a certain prototype were a challenge.

After reading a description of each cognitive/motivational tendency, participants rated the extent to which they were prone to each bias/cognitive error and the extent to which the average person in their countries was prone to each bias. Each rating was made on an 8-point scale anchored at 1 = *Extremely unlikely* and 8 = *Extremely unlikely*. To test the possibility that participants thought people in their own country were more biased than people in other countries (i.e., rule out differences in in-group favoritism), participants responded to the question, “To what extent do you believe the average person in any culture is likely to show hostile media effect?”

Similar to the procedure used by West et al. (2012), which involved measuring the actual reasoning ability and comparing it to self-reported bias perception, participants in this study provided a “self” and “others” evaluation regarding the five cognitive biases. They also solved a parallel task assessing reasoning performance and the ability to avoid bias. However, reasoning performance on the hostile media effect was not assessed in the current study.

Pronin et al. (2002) and West et al. (2012) failed to report the reliability for the bias blind spot scale they developed. Reliability analysis for the current study suggested a relatively low/borderline internal consistency (Cronbach α = .59) and factor analysis

suggested the scale was characterized by one dominant factor (accounting for 37% of the variance). Note the bias blind spot scale was not expected to have a high degree of internal consistency. Individuals were not necessarily expected to have uniform perceptions of their own biases relative to others. They might perceive themselves as being less biased than others in terms of certain cognitive bias.

Predictor/moderator variables.

Reasoning performance. Ten reasoning tasks associated with four cognitive biases were presented to participants (see Appendix E). These four biases (fundamental attribution error, outcome bias, the base-rate neglect, and the conjunction error) are known to activate cognitive shortcuts when making judgments as opposed to basing judgments on careful analysis of task information, leading to systematic errors, fallacies, and thinking biases. Performance on these tasks was used as an indicator of reasoning performance along with participants' evaluation of their susceptibility to common cognitive biases.

1. Fundamental attribution error. The tendency to attribute people's experience of negative outcome (e.g., car accidents) to internal or personal dispositions (e.g., personality) instead of environmental causes is known as the fundamental attribution error (Ross, 1977). Two problems assessed tendencies to attribute negative outcomes of hypothetical people's experience. On each problem, participants read about a situation in which a hypothetical person had a negative experience under ambiguous causal conditions. They indicated whether the negative experience was primarily due to a personality characteristic of the person (e.g., not a good driver;

inattention) or to a feature of the social or physical environment (e.g., other driver's not paying attention). On a 4-point scale, participants rated the likelihood of each cause. Then the degree of fundamental attribution error was computed by subtracting personality rating from environment ratings. Negative scores indicated the participant attributed the event more to environment than to personality. Positive scores indicated committing a fundamental attribution error.

2. Outcome bias. Four reasoning tasks were adapted from West et al. (2012) and Klaczynski (2001) to assess susceptibility to committing outcome bias defined as the tendency to perceive a decision as good or bad based on its outcome. People tend to forget the quality of the decision must be judged on what was known at the time the decision was made and not how it worked out. Participants read about hypothetical positive and negative outcomes for a decision regarding surgery (see Appendix E). On a 6-point scale, participants rated the quality of the decision to go ahead with the surgery: 1 = *Extremely bad*, 3 = *Neither bad nor good*, and 6 = *Extremely good*. Each correctly answered question received one point--such that for the positive outcome task (i.e., success of surgery), the normative responses were the ones indicating the decision to go with the surgery, based on the high odds (8%) of dying during the operation, were “bad, very bad, or extremely bad decision.” Conversely, the normative responses for the negative outcome task (dying of patient) were ones indicating the decision to go with the surgery based on the low odds (2%) of dying during the

operation were “good, very good, or extremely good decision” regardless of the outcome. Then the degree of outcome bias was computed by subtracting the rating on the positive outcome task from the rating of the negative outcome task. Negative scores indicated the participant judged the decision to be good based on statistical information and not on the outcome. Positive scores indicated committing an outcome bias.

3. Base-rate neglect. The tendency to ignore overall probabilities when judging how likely something or a person is (e. g., in a sample of 100 people, 70 people are female) and instead focusing too much on stereotype-activating information (e.g., competent at math) is known as base-rate neglect. Two problems created by Kahneman and Tversky (1973) and De Neys and Franssens (2009) assessed tendencies to overlook the statistical information (i.e., the base rate information) in the presence of stereotypical descriptions. On each problem, participants read about a hypothetical person who participated in a study and then they indicated whether the person *definitely* or *probably* belonged to a certain group. For example, in predicting “Jack’s job,” the following four alternatives were presented:

- A. Jack is definitely an engineer.
- B. Jack is probability an engineer.
- C. Jack is probably a lawyer.
- D. Jack is definitely a lawyer.

Following the practices established by Stanovich and colleagues (e.g., Kokis, Macpherson, Toplak, West, & Stanovich, 2002; Stanovich &

West, 1998; West, Toplak, & Stanovich, 2008), a response was judged normative (scored "1") when judgment of group membership was based on statistical information and non-normative responses (scored "0") when judgment of group membership was based on stereotype-activating information.

4. **Conjunction fallacy.** A conjunction error is when people fail to lower the probability as the number of conjoined events grows. Participants were presented with two conjunction problems: the “Linda” problem (adopted from Kahneman et al., 1982) and the “Ahmed” problem, which was created for the current study and modeled after the “Linda” problem. Each reasoning problem included brief vignettes describing a person’s appearance, personal tastes, and background information that were designed to cue stereotypical beliefs. Two possible descriptions of the individual were presented. One item included the conjunction of two descriptions or behaviors and the other item depicted only one description or behavior. On a 6-point scale, participants rated the likelihood of two statements: one containing a conjunction of events and the other stating a single event. In any conjunction, $p(A \text{ and } B: \text{bank teller and a feminist})$ could not exceed $p(A: \text{bank teller})$ or $p(B: \text{feminist})$ because $p(A \text{ and } B)$ necessarily included all subcategories (e.g., bank tellers who are feminist must be members of the superordinate category of “bank teller”). Therefore, the normative response involved rating each component of the conjunction as more probable than the conjunction.

Reliability analysis for the current study suggested a relatively low internal consistency (Cronbach $\alpha = .68$) and factor analysis suggested the scale was characterized by one dominant factor (accounting for 28.4% of the variance).

Thinking dispositions. This 15-item survey was adopted from two instruments that measured critical thinking values and open-mindedness (see Appendix F). To avoid misunderstanding of the word “belief” by participants from both cultures, the words “opinion” and “view” were used to negate the connection between the word “belief” and religious beliefs. The scale was named “thinking styles” for participants. Two sources were used to create a short version of a thinking dispositions scale. Nine items measuring traits the individuals should possess when questioned about their opinions were adapted from the belief defensiveness scale developed by Klaczynski, Fauth, and Swanger (1998). An item example was “I try to see the evidence from other people’s point of view.”

Another six items were adopted from Stanovich and West’s (1997) actively open-minded thinking (AOT) questionnaire that consisted of several subscales assessing openness-values, openness-ideas, and flexible and reflective thinking. An item example was “I consider myself broad-minded and tolerant of other people’s lifestyles” (Stanovich & West, 1997). Negatively worded items were reverse scored so higher scores indicated open-mindedness. Each item on the current study was rated on a 6-point scale, 1--*Strongly disagree* to 6--*Strongly agree*. Scores on the thinking dispositions scale ranged from 15 to 90.

Regarding reliability, Klaczynski and Robinson (2000) administered a longer version of the scale on young and old adults and reported a high reliability ($\alpha = .80$). Administering the AOT scale on undergraduate students also yielded a high reliability

(.83) on the original 41-item questionnaire (West et al., 2012). In the current study, reliability analysis suggested a low internal consistency of the short version (Cronbach $\alpha = .47$) and factor analysis suggested the scale was characterized by one dominant factor (accounting for 19.4% of the variance). Due to the low reliability and validity of the thinking styles measure, it was excluded from subsequent analyses.

Motivation to be unbiased. Three items were created for the current study to describe participants' level of motivation and recognition of the biases' impact on society and one's life (see Appendix G). The response format for two items--“How important do you think avoiding biases is to the society in which you live?” and “How important do you think avoiding biases is to your own life?”—on the 5-point Likert scale was 5--*Very important*, 3--*Somewhat important*, and 1--*Not at all important*. Those items were reverse scored so higher scores indicated higher level of motivation. Similarly, a 5-point Likert scale was used for the third question: “How motivated are you to avoid biases?” (5--*Very motivated*, 3--*Somewhat motivated*, 1--*Not at all motivated*). The possible score range was 3-15 based on summing the responses to the three items.

Reliability analysis suggested a moderate internal consistency (Cronbach $\alpha = .76$) and factor analysis suggested the scale was characterized by one dominant factor (accounting for 68.5% of the variance).

Procedure

Participants either completed an instrument with the five scales in a class or through a Qualtrics online survey. Completing the instrument took approximately 30-40 minutes in one session. In the priming condition, participants first completed the thinking disposition scale and then they completed the reasoning tasks. Next, they read

about five common cognitive tendencies--the fundamental attribution error (Ross, 1977), the hostile media effect (Vallone et al., 1985), the outcome bias (Baron & Hershey, 1988), the base-rate neglect, and the conjunction error (Kahneman & Tversky, 1973)--and then completed the motivation to be unbiased scale. Next, the experimental manipulation was administered (see Appendix H).

In the next part of the procedure, participants completed the bias blind spot measure on the five types of cognitive tendencies they read about (see Appendix I). The order of rating self versus others was counterbalanced on the bias blind spot measure. Half of the participants were asked first about their own susceptibility to each of the five cognitive tendencies they read about and then were asked about the susceptibility of the average person in their country to each bias. The remainder of participants rated the susceptibility of the average person in their country to each bias before rating themselves.

In the no-priming condition, participants first received the experimental manipulation of the information or reflection intervention, they then completed the thinking disposition scale, and, finally, they completed the reasoning tasks. Next, they read about five common cognitive tendencies-- the fundamental attribution error (Ross, 1977), the hostile media effect (Vallone et al., 1985), the outcome bias (Baron & Hershey, 1988), the base-rate neglect, and the conjunction error (Kahneman & Tversky, 1973)--and then completed the motivation to be unbiased scale.

To conclude the procedure, participants completed the demographic information survey (see Appendix J). Note that the reflection questions were free-response questions and content was not analyzed for the current study.

Data Analysis

Data analysis was conducted using SPSS version 19. Descriptive statistics including means, standard deviations, and ranges were calculated for each of the variables and demographic data. Next, assumptions were examined before answering each of the research questions. An analysis of variance was conducted to test whether there were group differences among intervention groups and the control groups. Multiple liner regression analyses were conducted to determine how much the variables explained significant proportions of variance in the bias blind spot.

Power Analysis

Since models that include interaction effects might be analyzed by multiple liner regression methods (Montgomery, Peck, & Vining, 2012), a power analysis was performed to estimate the number of participants required for conducting a linear multiple regression so, if present, a small effect size (0.15) could be detected with six predictors. Using an alpha level of .05 and an f of 2.19, 98 participants were needed to produce a power level of 0.80.

CHAPTER IV

RESULTS

The results of this study are presented in the following order. First, descriptive statistics are presented for each of the principal variables as well as the bivariate correlations. Second, the research questions are addressed by an analysis of variance and a regression analysis.

Descriptive Statistics

In Table 2, means, standard deviations, and correlations for each cognitive bias are presented. Listwise deletion based on all variables in the procedure was used except when noted. Bias blind spot (BBS) scores were calculated for cognitive biases by subtracting each participant's rating of bias in others from the rating of bias in him/herself. The bias blind spot scores for the five cognitive biases were correlated positively to each other at low to moderate levels. A composite score was created from the means of the five cognitive biases to be the bias blind spot total. Following the procedure by West et al. (2012), this total bias blind spot score was used as the dependent variable in subsequent analyses.

Table 2

Means, Standard Deviations, and Correlations for Each Cognitive Bias

BBS Variable	Mean	SD	Correlation				
			1	2	3	4	5
1. FAE	.80	1.59					
2. HM	.78	1.52	.15*				
3. OB	.93	1.67	.25**	.18*			
4. BR	.67	1.59	.24**	.29**	.29**		
5. CE	.50	1.11	.23**	.10	.28**	.22**	
6. BBS total	3.68	4.69	.62**	.57**	.67**	.68**	.53**

Note. N = 193. FAE = Fundamental Attribution Error, HM = Hostile Media Effect, OB = Outcome Bias, BR = Base-Rate Neglect, CE = Conjunction Error.

* $p < .05$. ** $p < .01$

Table 3 displays the descriptive statistics and correlations for the dependent variable (bias blind spot) and the non-categorical predictors (i.e., reasoning and motivation). Due to the low reliability and validity of the thinking styles measure, it was excluded from subsequent analyses. As expected, motivation was correlated positively with the bias blind spot. In contrast to expectation, reasoning was not correlated significantly with the bias blind spot.

Table 3

Descriptive Statistics and Correlations

Variable	<i>N</i>	<i>M</i>	<i>SD</i>	Correlations	
				1	2
Predictors					
1.Reasoning	193	3.53	1.39	--	
2.Motivation	193	12.64	2.77	-.00	--
Outcome Variable					
3.The bias blind spot	193	3.68	4.65	-.10	-.15*

* $p < .01$

Table 4 displays the descriptive statistics for the categorical variables of condition (information, no-information; relevant reflection, non-relevant reflection), culture (Western, Middle Eastern), and priming (primed, not primed). The level of the bias blind spot was slightly lower in both the information and reflection conditions and significantly lower in the primed and Western culture conditions (see Figure 7 for bias blind spot percentages for both cultures). To investigate if these differences were statistically significant accounting for reasoning and motivation, I conducted an analysis of variance.

Table 4

Descriptive Statistics for the Bias Blind Spot for the Experimental Groups and Culture

	Information		Reflection		Priming		Culture	
	Yes	No	Yes	No	Yes	No	Western	Middle Eastern
Number	93	94	100	87	137	50	115	78
BBS	3.48	3.88	3.41	4.00	3.19	5.04	2.84	4.93
	(4.14)	(5.11)	(4.38)	(4.95)	(5.00)	(3.19)	(4.57)	(4. 52)

Note. Standard deviations in parentheses. BBS = bias blind spot.

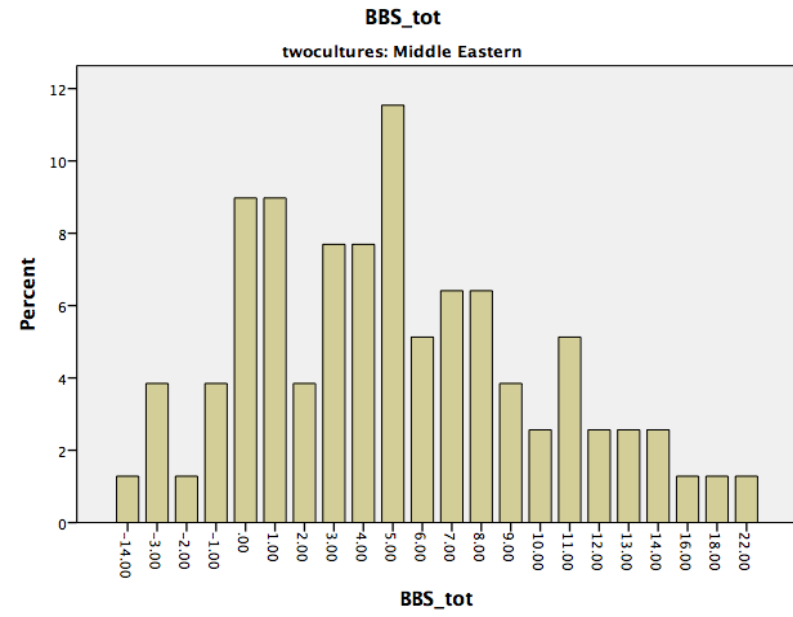
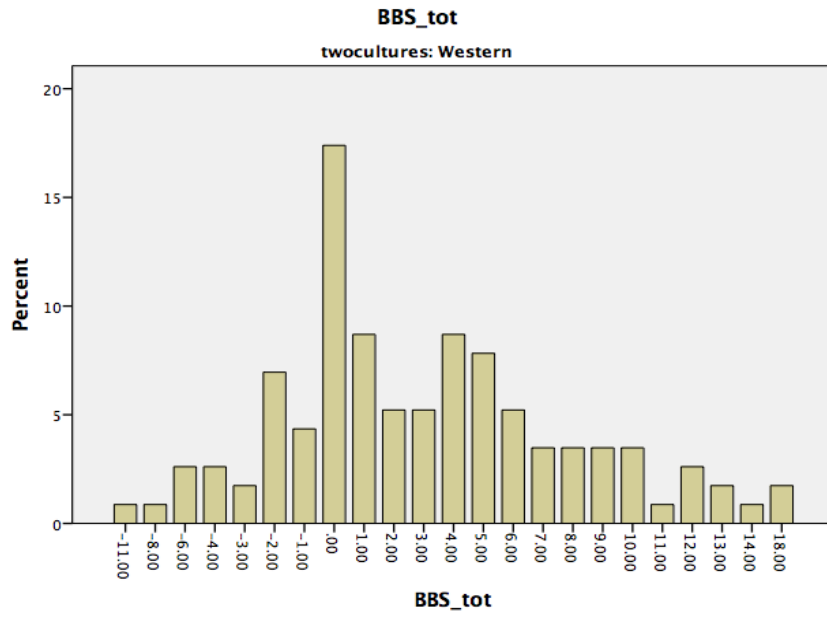


Figure 7. The bias blind spot score percentages for the Western (left) and Middle Eastern cultures (right).

Assumption of Analysis of Variance

To check the assumption of analysis of covariance, histograms, plots, and Levene's test statistics were examined to assess the homogeneity of variances, normality, independence of errors, and normality of error distribution. Levene's test of equal error variances was not significant, $F(15, 171) = 1.27, p = .22$, indicating the assumption of equal error variances was met. In addition, for each independent variable, the relationship between the dependent variable and the covariate was linear. Furthermore, the covariates and independent variables were independent. The covariates did not interact with the independent variable and dependent variables; thus, these assumption were adequately met.

Results of the Analysis of Variance

A four-way analysis of variance on the bias blind spot total score was conducted with information (present, not present), reflection (bias blind spot relevant, bias blind spot irrelevant), priming (primed, not primed), and culture (Western, Middle Eastern) as between-subjects variables. In contrast to expectations, no main effects were found for the reflection, information, and the reflective x information interactions. Hence, no significant effects were found for either intervention condition (see Table 5). Table 6 displays the confidence intervals for the two intervention conditions (two interventions, each with two levels).

However, a main effect was found for culture, $F(1, 185) = 8.56, p = .004$, Cohen's $d = 0.42$, with participants from Western culture showing lower bias blind spot scores than Middle Eastern participants (see Table 5 and Figure 8). Although not one of the primary variables in the current study, priming was also included in the analysis.

Surprisingly, the results indicated a significant priming effect, $F(1, 185) = 8.92, p = .003$, Cohen's $d = 0.44$. When the interventions were primed by presenting reasoning and thinking styles measures first, the bias blind spot score was lower compared to when the measures were administered after the intervention (see Table 6 and Figure 8).

In addition, priming interacted with culture, $F(1, 184) = 4.60, p = .03$. Even though not a research question, regression analysis was conducted for each culture separately to explore if priming correlated with one culture but not the other. Analysis indicated priming was a significant predictor for Western participants ($\beta = -.33$) but not for Middle Eastern participants ($\beta = .06$).

Although all groups displayed the bias blind spot, the bias blind spot was greater for Middle Eastern students compared to Western students. Moreover, students who received the individual difference measures before the intervention showed lower bias blind spot than students who received the individual difference measures after the intervention.

Table 5

Tests of Between-Subjects Effects

Source	Type III Sum of Squares	<i>df</i>	Mean Square	<i>F</i>	Sig.	Partial Eta Squared
Corrected Model	627.16 ^a	7	89.59	3.40	.002	.114
Intercept	2809.10	1	2809.10	106.63	.000	.366
Information	23.19	1	23.19	.88	.349	.005
Reflection	40.12	1	40.12	1.52	.219	.008
Culture	225.38	1	225.38	8.55	.004	.044
Priming	235.07	1	235.07	8.92	.003	.046
Information * Reflection	19.33	1	19.33	.73	.393	.004
Information * culture	21.09	1	21.09	.80	.372	.004
Reflection * culture	10.64	1	10.64	.40	.526	.002
Error	4873.53	185	26.34			
Total	8338.00	193				
Corrected Total	5500.69	192				

*Dependent Variable: The bias blind spot total

^a. $R^2 = .114$ (Adjusted $R^2 = .080$)

Table 6

Estimated Marginal Means for Bias Blind Spot in the Interaction Term: Information X Reflection

Information	Reflection	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
No information	Not BBS reflection	6.04	.73	4.59	7.48
	BBS reflection	4.16	1.08	2.01	6.30
Yes information	Not BBS reflection	4.43	1.06	2.34	6.53
	BBS reflection	3.99	.66	2.67	5.31

Note. Differences in means are not statistically significant. BBS = bias blind spot

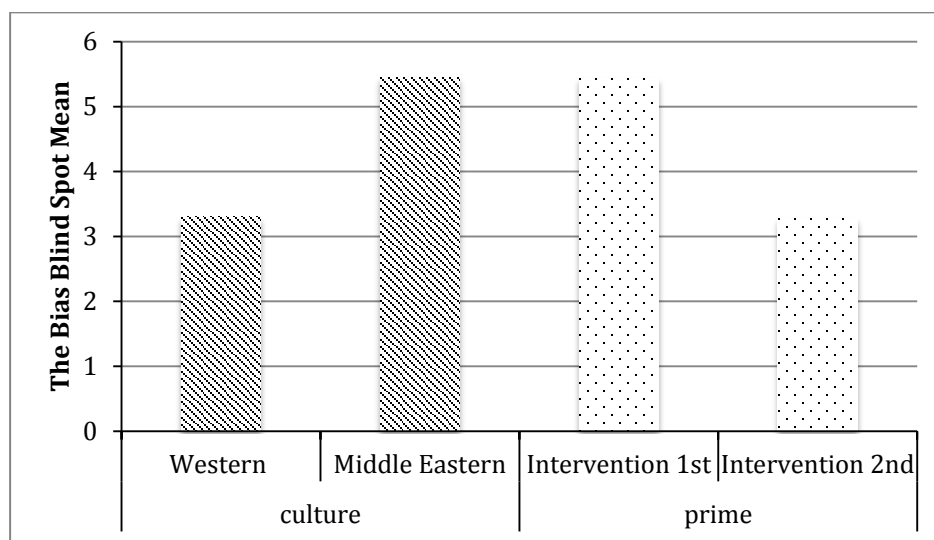


Figure 8. Estimated marginal means for bias blind spot in the priming conditions and cultures.

To explore the possibility that gender might have been related to bias blind spot scores or that gender and culture might have interacted, an analysis of variance with gender and culture as between-subjects variables was conducted on bias blind spot scores

(see Table 7). This analysis revealed no main effects of gender, $F(1, 188) = .94, p = .33$, and no interaction between gender and culture, $F(1, 188) = 1.93, p = .16$.

The bias blind spot is a difference score (i.e., other bias rating - self bias rating). For the next analysis, the difference score was not used as the dependent variable. Instead, an analysis of variance with self and other rating as repeated measures was conducted to explore whether self bias ratings and other bias ratings differed by culture. Results of this analysis revealed no significant interaction between culture and bias rating, $F(1, 189) = 1.98, p = .16$; similarly, bias rating (i.e., self and other) did not interact with priming, $F(1, 189) = 3.30, p = .16$.

Table 7

Descriptive Statistics for Bias Perception, Culture, and Priming

Bias Perception	Culture	Priming	Mean	<i>SD</i>	<i>N</i>
Self Rating	Western	No	23.50	3.98	36
		Yes	26.82	5.16	79
		Total	25.78	5.04	115
	Middle Eastern	No	23.33	3.81	15
		Yes	24.77	5.32	63
		Total	24.50	5.07	78
	Total	No	23.45	3.89	51
		Yes	25.91	5.31	142
		Total	25.26	5.08	193
Others Rating	Western	No	29.02	3.42	36
		Yes	28.65	3.95	79
		Total	28.77	3.78	115
	Middle Eastern	No	28.06	4.86	15
		Yes	29.93	4.74	63
		Total	29.57	4.79	78
	Total	No	28.74	3.87	51
		Yes	29.22	4.35	142
		Total	29.09	4.22	193

In the next section, a regression analysis was conducted to see how much variation in the bias blind spot was explained by the interventions--cultural and individual differences.

Assumption of Regression

To check the assumption of regression analysis, histograms, plots, and collinearity statistics were examined to assess the presence of linear relationship, multivariate normality, lack of multicollinearity (i.e., strong correlations among two or more variables), homoscedasticity (i.e., constant variance of error), independence of errors, normality of error distribution, and reliability of measures (Montgomery et al., 2002).

Data cleaning is important in multiple regression (Tabachnick & Fidell, 2012) because non-normally distributed variables with outliers can influence significance tests. Six multivariate outliers were identified by visual inspection of boxplots of the dependent variable across the levels of independent variables. Regression analysis was conducted with and without the multivariate outliers and yielded very similar results; thus, the decision of removing the outliers was taken.

As shown in Figures 9 and 10, errors seemed to be normally distributed in the histogram and the probability–probability plot, thus meeting the assumption of normality of error distribution. As shown in Figure 11, the scatterplot of the bias blind spot predicted values and the residuals seemed to be scattered without a pattern, thus meeting the assumptions of linear relationship, multivariate normality, and constant variance of error.

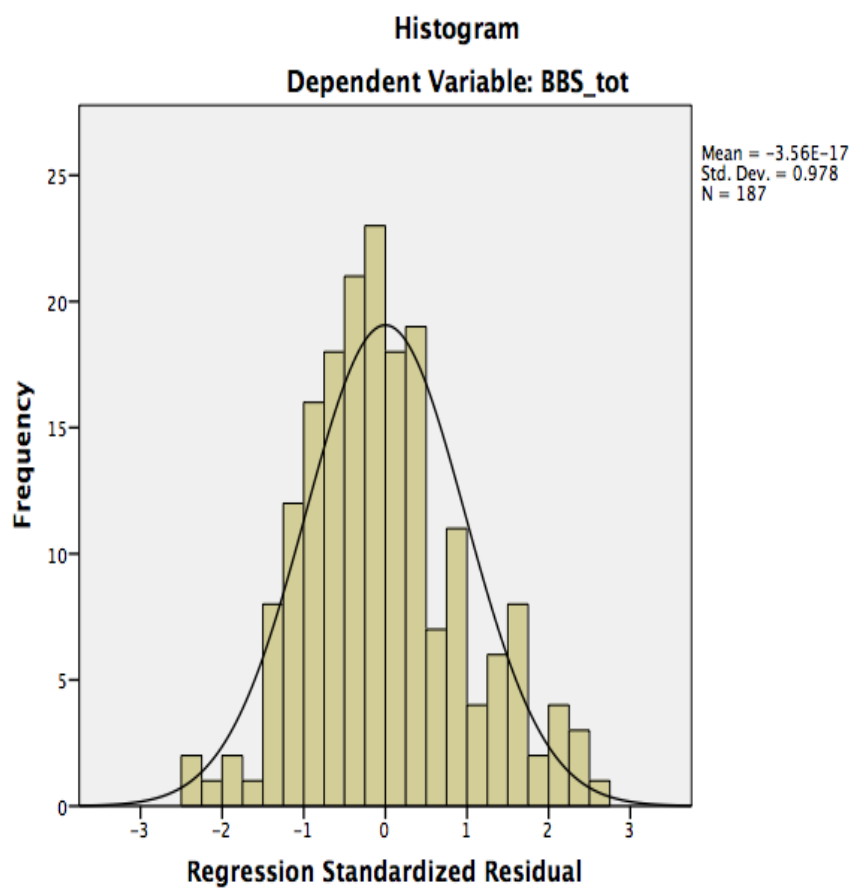


Figure 9. Histogram for the regression standardized residuals.

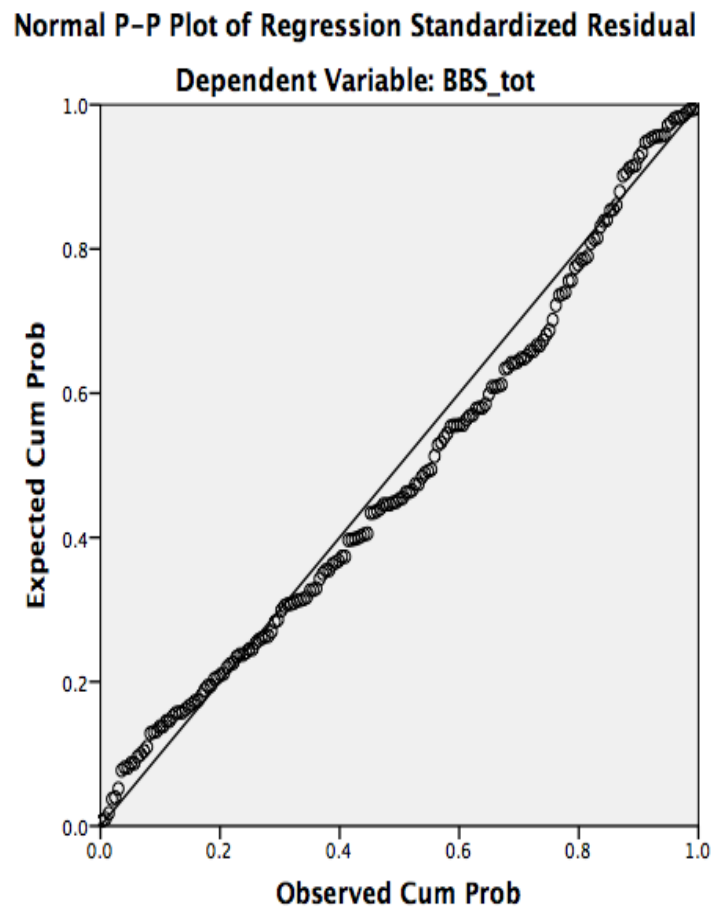


Figure 10. Normal P-P plot and regression standardized residuals.

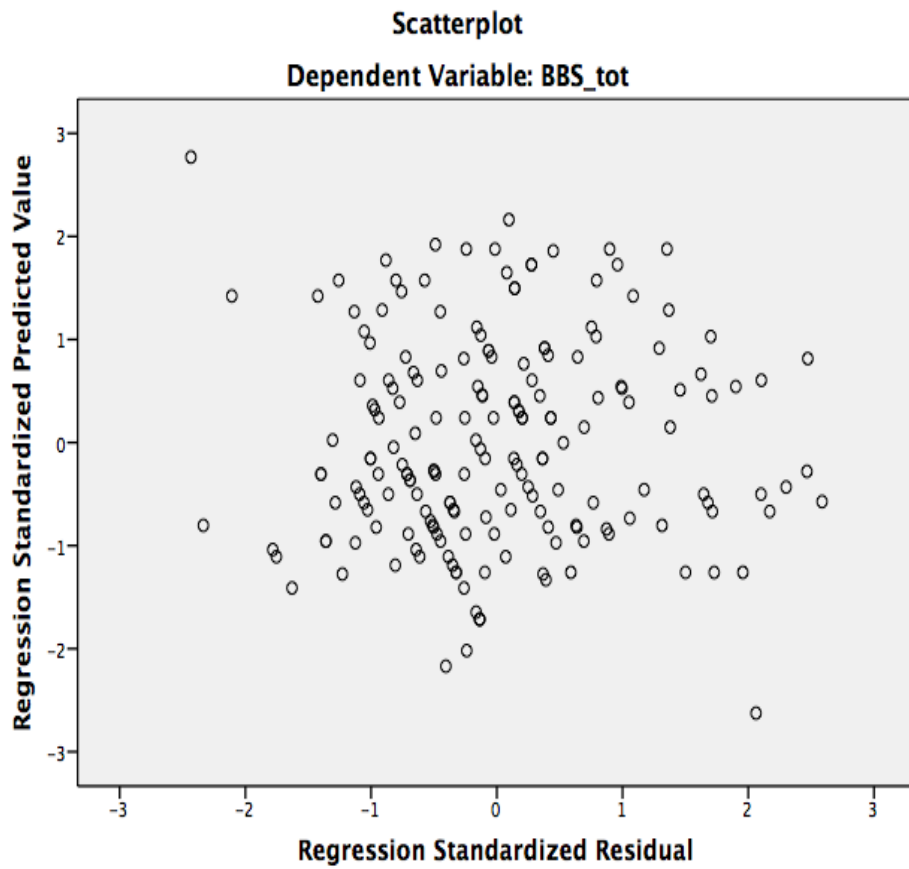


Figure 11. Scatterplot for the bias blind spot regression standardized residuals and predicted values.

Multicollinearity was assessed from several criteria and one of them was the variance inflation factor (VIF). Multicollinearity is suggested when the VIF is larger than 10 (Mertler & Vannatta, 2005). Multicollinearity seemed not to be present as shown in Table 8: all VIFs < 10. In summary, as shown in the figures, all regression assumptions seemed to be met so regression analysis was conducted.

Table 8

Collinearity Statistics

Variables	Variance Inflation Factor
Information	1.12
Reflection	1.10
Cultures	1.04
Priming	1.03
Reasoning	1.01
Motivation	1.01

Note. $N = 193$.

Results of the Regression Analysis

A multiple linear regression analysis was conducted to determine if variables used in the analysis of variance with the addition of the individual difference measures could explain variance in the bias blind spot. The regression model was information, reflection, priming, culture, reasoning, motivation, as well the information x reflection, information x culture, reflection x culture.

The regression equation was significant, $R^2 = .14$, Adjusted $R^2 = .09$, $F(9, 192) = 3.33$, $p < .001$. In the presence of all variables, three variables were significant predictors and no interactions were significant. Consistent with the ANOVA findings, the intervention conditions were not significant predictors of bias blind spot (see Table 9). However, culture, priming, and motivation were significant predictors (see Table 9). In contrast to expectations, motivation was negatively correlated with the bias blind spot ($r = -.15$). Higher levels of motivation were associated with lower levels of the bias blind spot. In addition, even controlling for the predictive variables of culture and priming, motivation to avoid bias was a significant predictor of the bias blind spot.

Table 9

Parameters Estimates

Variables	Unstandardized Coefficients		Standardized Coefficients	<i>t</i>	95.0% Confidence Interval for B		Correlations		
	B	Std. E	β		Lower Bound	Upper Bound	Zero-order	Partial	Part
Information	1.02	2.71	.10	.37	-4.32	6.37	-.07	.02	.02
Reflection	.12	2.53	.01	.05	-4.87	5.13	-.11	.00	.00
Cultures	3.74	1.24	.34	3.01**	1.29	6.19	.19	.22	.21
Prime	-2.41	.85	-.20	2.82**	-4.10	-.72	-.16	-.21	-.20
Reasoning	-.34	.26	-.08	-1.27	-.86	.18	-.10	-.08	-.08
Motivation	.26	.13	.14	2.01*	.00	.52	.16	.14	.13
Inf*Ref	1.35	1.66	.12	.81	-1.92	4.63	-.05	.06	.05
Cult*Ref	-1.27	1.87	-.18	-.68	-4.96	2.41	-.07	-.05	-.04
Cult*Inf	-1.68	1.88	-.25	-.89	-5.39	2.02	-.04	-.06	-.06

Note. *N* = 193.

p* < .05. *p* < .001

Summary and Answers to the Research Questions

Q 1 Are there differences in the bias blind spot among the four conditions?

1. Information + reflection on the bias blind spot
2. Information + reflection not relevant to the bias blind spot
3. No information + reflection on the bias blind spot
4. No information + reflection not relevant to the bias blind spot.

In contrast to expectations, the intervention groups did not differ significantly from the control groups. Although not a principal research question, findings suggested priming was an important factor in reducing bias. When participants were presented individual differences measures before the interventions, the bias blind spot was lower than when participants completed the individual differences measures after the interventions.

Q2 Are there differences in the bias blind spot between Western and Middle Eastern participants?

There was no hypothesis about the direction of the relationship between the bias blind spot and culture. However, consistent with the findings of Ehrlinger et al. (2005) on cultural differences, I found a difference between Western and Middle Eastern participants with the latter showing a higher bias blind spot.

Q3 Is there an interaction effect between the interventions conditions and culture on the bias blind spot?

Culture did not interact with the interventions. There was no hypothesis about the interaction because this was an exploratory question.

Q4 How much variance of the bias blind spot is explained by information, reflection, reasoning performance, thinking dispositions, motivations to be unbiased, and culture?

The thinking dispositions variable was not included in the regression analysis due to low reliability. Since priming was significantly correlated to the bias blind spot, it was

included in the regression analysis. The overall model was statistically significant and explained 11% of the variance in the bias blind spot in the current sample. In this model, culture, priming, and motivation were variables that explained a significant proportion of variance in the bias blind spot.

CHAPTER V

DISCUSSION

This chapter provides a summary of the goals of the study and highlights the results. Interpretations and discussions of the results and educational implications are also included. In addition, the limitations of the study and the areas for future research are presented. The discussion of the results is divided into three main sections: (a) intervention effectiveness, (b) cultural differences in bias blind spot, and (c) individual factors related to the bias blind spot.

Overview

The principal goals of the current study were to determine whether the bias blind spot could be reduced by (a) providing information about the bias blind spot and/or (b) having participants reflect on the consequences of blind spot biases. In addition, the extent to which the bias blind spot characterized participants from two different cultures (i.e., American and Middle Eastern) was explored as was the possibility that intervention efficacy differed by culture. A final goal was to investigate the relationships of several individual difference variables—specifically, motivations to be unbiased, performance on several reasoning tasks, and thinking dispositions—to the bias blind spot.

The main findings can be summarized as follows. First, neither reading about the bias blind spot nor reflection significantly reduced the bias blind spot. However, priming did reduce the bias blind spot. When the reasoning tasks were administered prior to the

interventions, bias blind spot scores were reduced. Of the individual difference variables, only motivation to be unbiased was significantly related to bias blind spot scores. Finally, cultural differences were found with Middle Eastern students, showing higher bias blind spot scores than Western students.

Interpretation of Findings

Intervention Effectiveness

The first research question was about the effectiveness of an intervention that comprised two parts: providing information about the bias blind spot and reflecting on the consequences of the bias blind spot on peoples' relationships. In contrast to expectations, the information intervention, whether alone or when combined with the reflection intervention, was not effective in reducing the bias blind spot. Similarly, the reflection intervention did not significantly reduce the bias blind spot. In the next sections, I list possibilities for why providing bias blind spot information did not significantly reduce the bias blind spot and then why reflection instructions did not reduce the bias blind spot. Finally, I discuss why the combination of information and reflection did not reduce the bias blind spot.

The information intervention. I argue information in the intervention failed to attenuate the bias blind spot possibly because (a) the content was not consistent with participants' prior knowledge, (b) the intervention was not focused on introspection, and (c) the information did not explicitly inform participants how they could have avoided the bias blind spot. These possibilities are discussed next.

The first possibility is the information might not have been compelling because it was not consistent with participants' prior knowledge. Prior knowledge includes schema

about self and about others. Prior knowledge and schema about self are discussed next. The prior knowledge about other (i.e., the reference group) is discussed further in the culture section. According to Dole and Sinatra (1998), to facilitate the reconstruction of knowledge, the content of the message should be convincing and compelling. In the current study, it is likely the information about the bias blind spot was not consistent with participants' prior knowledge and, thus, did not seem plausible or compelling. For example, people in general might be unwilling to even acknowledge they are sometimes biased unless they are presented with compelling information. The results of the study suggested participants trusted their own thinking and rejected the idea they could have been prone to the bias blind spot. In addition and in contrast to knowledge about themselves, participants lacked clear knowledge of other people. Because the provision of information informed them cognitive biases are common, they might have inferred the group to which they were comparing themselves was susceptible to biases. Participants might then have applied that new information only to others but excluded themselves.

A second possibility is the information was not focused on over-reliance on introspection--the source of the bias blind spot (Pronin, 2009). For example, consider the successful intervention in the Pronin and Kugler (2007) study. They succeeded in reducing the bias blind spot by presenting a fictional article that appeared in *Science* magazine. The article was focused on introspection and included examples of the influence of the unconscious in driving people's judgment and actions. By contrast, the information intervention in the present study was only about the definition of the bias blind spot, which might have been less convincing than the intervention used by Pronin and Kugler. In addition, the Pronin and Kugler intervention focused on unconscious

processes and biases that arise when people rely on introspection and it might have motivated participants to be skeptical about their introspections and rely instead on their behaviors. If so, the reduction in the bias blind spot might have occurred, as Pronin and Kugler argued, because participants judged both themselves and others on the same basis: behavior. Although providing information about the bias blind spot is important, Pronin (2009) argued it is not sufficient to attenuate the bias blind spot until participants have read about how the bias and, specifically, until participants have read the bias blind spot occurred because of over-reliance on introspection.

A third possibility might be the information was not explicit on how to avoid the bias blind spot. For instance, Scopelliti et al. (2015) included information about the strategy to avoid the fundamental attribution error. Scopelliti et al. argued, “To combat this error, we have to acknowledge the importance of situations in determining behavior” (p. 17). Perhaps if I had explicitly informed participants that to avoid the bias blind spot, they needed to have rated themselves and the reference group identically. If such precise instructions—i.e., instructions that, if participants followed them, *would* eliminate the bias blind spot—failed, then the extent to which participants were capable enough and/or motivated enough to follow more complex instructions would be called into question. Future research needs to address this issue. By contrast, if most participants did follow such exact instructions, then a step for further research would be to examine the characteristics of participants who did not follow them. Finally, if all participants followed the instructions and thereby eliminated the bias blind spot, then future researchers could focus on more realistic instructions.

The reflection intervention. In the current study, the reflection questions apparently did not activate analytical thinking, at least with respect to evaluating self's and others' biases. Specifically, the reflection group performed no better than the control group, i.e., the self was seen as less prone to biases than other people in both conditions. Below, several possibilities for the failure of the reflection intervention to reduce the bias blind spot are discussed. I argue the instructions to reflect on the consequences of the bias blind spot failed to lead to (a) elaboration on the idea of the bias blind spot and (b) transfer of learning because the connection to the reference group was not made clear by the reflection questions.

First, it is possible elaboration on the idea of the bias blind spot did not happen. As discussed above, elaboration requires motivation and ability; thus, participants might have lacked the motivation to process the information about the bias blind spot. In addition, participants might have lacked sufficient abilities (e.g., working memory capacity to process the information). If so, then this difficulty might have been compounded because the bias blind spot information was difficult to comprehend (Dole & Sinatra, 1998) or because people were self-protective and did not want to open themselves up to possible criticisms.

Another possibility for the ineffectiveness of the intervention involves transfer (Barnett & Ceci, 2002). The findings of Han (2012) supported this supposition. Han designed an experiment to reduce the effect of omission neglect by educating students about the bias blind spot. The intervention was effective when the article introducing the idea of the bias blind spot included an extra paragraph on an example of self-other asymmetry in omission neglect. This additional specification was absent in the current

study--when participants were asked to engage in reflective thinking by telling a personal story relevant to the bias blind spot, most referenced an incident with a partner.

However, when participants were asked to evaluate self and the average person in their country on the five cognitive biases, they were prone to self-other asymmetries in perceived susceptibility to biases. It might be the content of the reflection activity was not specific to viewing average people in their country. Thus, participants' experiences during the reflecting phase did not successfully transfer to the bias evaluation because of a disconnect with the reference group. What participants thought about the average person or what conflicts they experienced are unknown. The disconnect in content seems possible when cognitive biases rated in the bias blind spot questionnaire (e.g., the base rate neglect) were not the same types of biases upon which people were reflecting.

Why was the combination of information and reflection intervention ineffective in reducing the bias blind spot? It is important to acknowledge cognitive and motivational biases are difficult to reduce as indicated by the debiasing research (Fischhoff, 1982; Wilson et al., 2002). It is possible the bias blind spot is resistant to change. Also, it is possible to view the measures of individual differences as interventions on their own. This was termed measurements intervention by Winne and Perry (2000). For example, the thinking disposition measure included items about flexible thinking and open-mindedness. By thinking about these items, participants must engage in reflective thinking (i.e., thinking about their own thinking). This measure could have already primed reflective thinking and metacognition for both the experimental and control groups. Thus, the difference was probably reduced by the measurements (Masui & De Corte, 2005). This issue of priming is further discussed in detail.

Priming and the Bias Blind Spot Reduction

The findings indicated the order of intervention affected the magnitude of the bias blind spot in both cultures. This was a surprising finding and was not one of the main research questions in the current study. However, results should be interpreted with caution due to the large difference in the sample for the priming and no-priming conditions. Priming involved three components: the thinking disposition survey, the reasoning on heuristics and cognitive biases problems, and the motivations to be unbiased scale. Priming was investigated by several researchers interested in consumer behavior and advertising. The findings are discussed through the lens of priming components proposed by Higgins and King (1981): availability and accessibility. Availability means an individual will have the related schema available with respect to the primed message. Accessibility refers to how the priming message activates schemas, thereby making them activated on future cognitive tasks (Hwang, Gotlieb, Nah, & McLeod, 2007). How can this explanation be applied to the present study? I expanded the logic of Higgins and King to understand why priming was successful in activating reflective thinking schema. It is possible that presenting participants the reasoning tasks first facilitated the availability in memory of incidents when they were biased or not objective. Solving the reasoning tasks and then rating themselves on their own susceptibility to cognitive biases might have made participants skeptical of their abilities. By contrast, when participants simply read the descriptions of the cognitive biases and then rated their susceptibility to these biases, they might have searched their memories for incidents that either supported or refuted the possibility that they were as or more susceptible to various biases than others. More specifically, evidence showed people typically are selective in searching

their memories for evidence relevant to their beliefs; typically, people retrieve information that supports self-enhancing beliefs. Consequently, the likelihood was small that participants retrieved memories showing themselves as *more* biased than others and high that they retrieved memories indicating they were *less* biased than others (Klaczynski & Fauth, 1996; Klaczynski & Narasimham, 1998; see Kunda, 1990, for a review). Thus, participants might have overestimated their abilities to avoid biases.

It is possible priming was successful in reducing participants' overconfidence about their ability to avoid cognitive biases as suggested by the finding that the order of the intervention and the bias blind spot survey affected responses. There is also the possibility the questions about the motivations to be unbiased might have cued participants to avoid biased responses in measures presented later. In addition, the information a person was less prone to committing cognitive biases was not available in memory at the time participants evaluated themselves. However, if incidents about being prone to cognitive bias were available in memory at the time of their self-evaluations, then participants would likely have had some evidence pointing to their susceptibility and perhaps led them to realize they were similar to others. The reasoning tasks provided opportunities for participants to actually solve the tasks and *perhaps* judge their performance *before* rating themselves on the bias blind spot question, which might have provided a foundation for more realistic self-other comparisons. Because it is unknown whether participants judged their performance, it is assumed most participants believed they performed well but there was no measure of decision confidence (De Neys, Cromheeke, & Osman, 2011) to support this possibility in the current study.

Accessibility could explain the differences between the groups who solved the reasoning task first compared to the group who solved the reasoning task after the intervention. Without having accessible schemas about one's performance and the cognitive reasoning tasks, people could rate themselves and others without conscious, careful thought. In contrast, accessible schemas about actual performance on reasoning tasks might have increased the likelihood of participants rating themselves based on more analytic processing, leading them to consider both introspective evidence and behavioral information (Pronin & Kugler, 2007). This approach to evaluating the self could reduce the "introspection illusion" (Pronin & Kugler, 2007, p. 565), which is the tendency to value one's own thoughts and ignore behavior when people rate themselves. Pronin and Kugler (2007) proposed the bias blind spot arises from the asymmetry in valuing introspective information for themselves but not for other people. For judging others, people tend to look only at their behavior and ignore their intentions.

Cultural Differences in the Bias Blind Spot

The second research question was about whether there was a cultural difference in the degree of the bias blind spot. Findings showed culture was a significant predictor of the bias blind spot. Specifically, Middle Eastern students showed a higher level of the bias blind spot than did Western students. The third research question was whether the intervention effectiveness varied by culture. In the current study, analyses failed to reveal significant interactions among culture, information, and reflection.

Several possibilities could explain cultural difference in the bias blind spot. First, participants' assumptions about the reference groups could have magnified or reduced the perceived difference in bias. People's feelings, experiences, and stereotypes about the

reference group could explain the cultural difference in the tendency to show the bias blind spot. However, data about how participants grouped identification were not collected in the current study, leaving the possibility unexamined.

Western and Middle Eastern participants compared themselves to different reference groups. Saudi students might have compared themselves to the average person in Saudi Arabia and American students might have compared themselves to the average person in the United States. Differences in stereotypes or schemas associated with these reference groups could have magnified or reduced perceived self-other similarities. The Middle East is represented in the news as an area of conflict and stress (e.g., dispute between Israel and Palestine, ISIS, Syria, Yemen war) and the stereotype of the Muslim Arabic as a terrorist. Middle Eastern women are typically stereotyped as oppressed by men. It could be Middle Eastern participants overestimated the presence of bias and irrationality in their mentality of the people in their country. In contrast to Middle Eastern participants, Western participants might have viewed their people as fair, good, and objective (i.e., more like themselves). Western students might have had a stronger tendency to acknowledge similarity to the people in their country because of socialization to a culture of perceived tolerance, equality in schools, and diversity (Chen et al., 2009). Exposure to diversity and egalitarian values might facilitate a less judgmental and more balanced view and evaluation of others and the self.

A second possibility that could explain the higher perceived differences is education. First, a student might think “I am better than average in my country in the Middle East because I read about these biases and therefore I am more enlightened.” Second, it could be students who study abroad (e.g., in the United States, United

Kingdom, Australia, etc.) to continue their education feel the advantage of getting an education in relatively advanced countries. In this view, culture is actually a subculture--one that does not represent all Middle Eastern people. Geographical separation is a possible reason for Middle Eastern students to feel dissimilar than average people in their countries. Further, borrowing the concept of stereotype threat (Steele & Aronson, 1995), Middle Eastern participants may have felt the need to show less group identification and to “disassociate” from the people in their country because of the negative stereotypes they might have been exposed to in the Western country in which they study. It is also possible the perceptions are accurate instead of biased. Those more educated participants might be less biased than those less educated. To my knowledge, no research on bias reduction has been conducted to support this speculation because participants are usually college students.

Individual Factors Related to the Bias Blind Spot

Reasoning performance. The fourth research question was concerned with predicting variation in the bias blind spot from individual differences in reasoning performance. In the current study and in contrast to expectations, reasoning failed to predict the bias blind spot. Based on Pronin et al.'s (2002) conceptualization of the bias blind spot wherein people tend to perceive themselves as immune to bias, I hypothesized a reasoning performance would correlate with the bias blind spot. This illusion of objectivity inferred a gap between people's self-reports about the degree of bias influence on them versus the actual performance of reasoning or judgment tasks that triggered cognitive biases. Surprisingly and as mentioned before, priming was a predictor and reasoning itself was not a predictor. However, presenting the reasoning task before the

intervention material (referred to as priming here) predicted variance in the bias blind spot. There was the possibility that actually solving the problem activated a reflective thinking schema. This actual experience was different from abstract, imagined experiences (as in the Pronin et al.'s study) because the latter did not provide a baseline of one's actual ability to avoid social biases. Further, whereas the reasoning task tapped cognitive biases (West et al., 2012), the self-other comparisons that tapped the bias blind spot were both motivational and cognitive. This difference in the type of bias might have contributed to the failure of reasoning performance to predict the bias blind spot.

Thinking dispositions. Thinking dispositions, such as open mindedness and belief defensiveness, were expected to correlate with the bias blind spot. It might be that people high in need for cognition (Cacioppo & Petty, 1982) or open mindedness or other thinking dispositions would have been more affected by reflection (Stanovich, 2009). So maybe a measure of need for cognition would have predicted either the bias blind spot directly or the efficacy of the bias blind spot intervention. Unfortunately, the measure designed to tap into these constructs was unreliable. Thus, the question about the link between the bias blind spot and thinking dispositions is still open.

Motivation to be unbiased. The fourth research question concerned predicting variation in the bias blind spot from individual differences in the motivation to be unbiased. Motivation to be unbiased was measured by three items involving the degree to which students realized the value of avoiding bias in self-evaluations (e.g., personal relations) and the importance of avoiding biases for the welfare of society. Although the relationship was small, in contrast to expectations, motivation was positively correlated with the bias blind spot. Note that a negative correlation between motivation and the bias

blind spot was found. However, in regression analysis including other variables, the relationship was positive between motivation and the bias blind spot. Given that motivation was not significantly related to these other predictors, the meaning of these results is unclear. This finding was not consistent with models proposing bias correction and motivation are negatively associated. Motivation was emphasized in several models including mental contamination theories, dual-process theories of attitude change and knowledge reconstruction, and theories of racial biases (Cacioppo, Petty, Feinstein, & Jarvis, 1996; Chaiken & Trope, 1999; Devine, Forscher, Austin, & Cox, 2012; Dole & Sinatra, 1998; Wilson et al., 2002). Some dual-process theories of reasoning and decision-making also emphasized the role of motivation and, in particular, the motivation to expend the effort required to perform well on a task (Evans & Frankish, 2009). In the current study, it is unknown why the motivation to be unbiased was positively correlated with the bias blind spot. Since the bias blind spot occurs unconsciously (Pronin, 2009), it is possible explicit self-reported motivation to be unbiased was not aligned with implicit biases. This possibility should be examined in future studies.

Educational Implications

Assessing objectivity or bias in self and others is relevant to the field of educational psychology and learning. Most research on the bias blind spot has been published in social psychology literature, often in research on conflict. I believe the concept and its consequences can and should be applied to educational settings and that, in time, educational interventions should be developed to reduce disagreement and misunderstanding among students and other students as well as students and teachers (i.e., disagreements that arise because of misperceptions and biased self-other

comparisons). The perception of bias in others might affect students' motivation to learn and to lessen students' enjoyment of learning. For instance, students who perceive their instructors as biased might not only be resentful but also might make faulty attributions of poor performance to instructors—ignoring their own weaknesses—and consequently might not strive to improve themselves.

Fostering objectivity and critical thinking are concerns that can be seen in several fields, although most theory and research concerns education (Morewedge et al., 2015). More generally, the present findings contributed to a more nuanced view of the process that drives social comparisons and knowledge about self. The bias blind spot is parallel to the illusion of knowing (Glenberg, Wilkinson, & Epstein, 1982; Koriat, 1998) documented in the educational psychology literature. Whereas illusion of knowing refers to the inaccurate assessments of one's comprehension, the bias blind spot reflects inaccurate assessments of one's own and others' objectivity. It seems in both cases, people over-rely on lay theories of how the mind works and ignore external evidence showing introspection and self-knowledge are often the flawed (Dunning, Heath, & Suls, 2004). Pronin et al. (2002) extended the notion that people think they are better than average in personality traits and abilities to the domain of cognitive shortcomings (i.e., believing self is less prone to bias than others).

Knowledge of how the bias blind spot develops and how it can be avoided could probably be informative to both teachers and students. On one level, teachers could benefit from knowing it is sometimes difficult to detect their own biases and their cognitive biases might affect their evaluations of students. For example, consider the halo effect (Thorndike, 1920). A teacher can be prone to the halo effect, wherein initial

impressions can influence assessments of students as a whole. If the teacher has the impression that student X is dishonest, then the teacher could give a biased evaluation or lower grade based on a possibly erroneous perception (Wilson & Brekke, 1994).

Reflective thinking and metacognitive activates could be powerful tools in improving teacher self-evaluation as well as the evaluation of students. For example, knowledge of the asymmetry in perceptions of bias in the self and others means if we want to evaluate ourselves, we rely more on our internal thoughts and ignore our behavior. However, in judging students, teachers—like participants in the present research and other studies of the bias blind spot—probably base their evaluations on behavioral cues, the only information to which they have access. This sets up the potential for double standards of evaluation-- judging themselves on the basis of introspection and their students on the basis of behavior. This tendency could create problems if teachers are not aware they are just as likely as their students to cognitive errors and misperceptions and if they are not aware they rely on different cues (i.e., introspection versus behavior) in judging themselves and their students. Students also might wrongly perceive their teachers as being biased against them because of differences in race, gender, ethnicity, or/and religion. This, in turn, could lead to difficulties in accepting feedback, lower motivation to learn, and misattributed successes and failures.

Similarly, the bias blind spot has implications for supervising group assignments. I argue that students should not only learn the content but also the skills of resolving disagreements and learning to cooperate in the classroom. Efforts to cooperate with others might be impeded because students might misperceive their own efforts in a

project (relying on introspection but ignoring behavior might lead students to the belief that they contributed more than they actually did). This problem might be compounded by misperceptions of their peers' efforts, which are judged on the basis of what they see (i.e., behavior). Such perceptions might decrease trust in the rest of the group, which could lead to more conflict, less cooperation, and/or withdrawal from the group activities.

The findings also have implications in resolving cultural misunderstanding. However, in the case of the Middle East, my concern is if educated people have biased perceptions of others (i.e., see themselves as superior to others in their countries, for example), then they will come to believe others in their countries are incapable of thinking at high levels. The consequence of such thinking might be reduced motivation to improve the quality of education for people as a whole. Indeed, it is possible the bias blind spot is a factor that leads more educated people to isolate themselves from the events that dominate their countries and perhaps from the less educated people in their countries—although this is a question for future research. Also, the cultural differences found in this study suggest the need for customized programs and efforts to reduce bias blind spot, and bias in general, in different cultures (Al Sadi & Basit, 2013).

Limitations

Four features of the present work limited the conclusions that could be drawn about the relationship among the bias blind spot, culture, and individual differences. First, the sampling of Middle Eastern participants was different from the sampling of Western participants. Western participants completed the surveys in class and in groups. Due to limited access to Middle Eastern students at the participating university, participants completed the surveys individually and online. It is unknown how these

differences could have affected the results. Second, the sample was not representative. The Middle East consists of several countries that encompass many sub-cultures; indeed, according to Ross (2014), one of the more important limitations of cross-cultural studies is the tendency to ignore within-culture differences. For example, students who participated in this study were not representative to all Middle Eastern people; the same is true for the undergraduate students in the United States—they likely did not represent Americans in general. A third limitation involved missing data. Approximately, 400 Middle Eastern individuals opened the link of the survey but only 187 completed it and only one participant completed the demographic information—that participant left a comment asking to stop wasting his or her time over philosophy. Thus, it is recommended long surveys be avoided. Future studies could focus on few variables to avoid the frustration of participants and the problem of missing data. Fourth, the measurement of thinking dispositions and styles was not reliable and, therefore, was not included in the analysis. Consequently, it remains unknown whether thinking dispositions predicted the bias blind spot or the efficacy of interventions intended to reduce the bias blind spot. In addition, the reliability on the reasoning and the bias blind spot measures were borderline.

Future Studies

Directions for future studies are divided into three areas for bias blind spot research: (a) recommendations for bias blind spot interventions, (b) recommendations for additional bias blind spot studies of culture, and (c) recommendations for additional studies regarding the association between the bias blind spot and individual difference variables.

First, the findings suggested priming helped attenuate the bias blind spot. However, future studies are needed to investigate which aspect of priming was effective. Recall that priming referred to the measures completed either before or after the intervention. Priming, however, involved three different measures: the thinking disposition measure, the reasoning problems, and the motivations to be unbiased measure. It is not yet clear which of these was responsible for the effects associated with priming--it might have been one, two, or all three of the priming measures. In addition, future studies should test the possibility that reflecting on cognition could have different results than reflecting on the bias blind spot.

Reflective thinking was investigated by analyzing narratives in several studies using a qualitative design (Hoffman-Kipp, 2003; Masui & De Corte, 2005; Ogdie et al., 2012). The findings from such qualitative investigations have the potential for deeper understanding of the bias blind spot and, therefore, should be a subject of future research. Although analyzing the content of the reflection questions (i.e., thought-listing tasks) was not a formal part of this research, examining the content could help identify which participants engaged in reflective thinking about the bias blind spot, whether they thought about experiences actually relevant to the bias blind spot, and whether individuals who reflected on specific experiences of bias were able to generalize from their personal experiences to different situations and problems. Future studies should also explore the possibility that reflection and deliberation influence the thinking of people in real conflict situations (e.g., as in the Middle East). Another recommendation for future study entails investigating how knowledge about the bias blind spot might influence thoughts about the self, thus possibly leading to different attributions in disagreement situations. Research is

also needed to test the possibility that the current intervention could be more effective by, for example, adding information about the limitations of introspection (see Pronin & Kugler, 2007).

Second, for cross-cultural studies exploring the bias blind spot, a recommendation for future research is to include measures of group identification as well as descriptions of the "average person" in a specific culture. Following this recommendation could provide a clearer picture of the reference group. In previous research, it was not clear which reference group participants compared themselves to or what they believed about the people in that group. Also, as a follow-up to the current study, cross-validation studies are needed to determine whether the measures and the current findings hold up under different context and cultures.

Third, as noted above, individual difference variables might play important roles in the degree of the bias blind spot. Future research needs to identify factors likely to play central roles in self-other comparisons. Examples of such individual difference variables are self-esteem, humility, and modesty. In addition, future studies should devise better measurements of thinking styles including need for cognition. Furthermore, measuring the believability of the bias blind spot information or confidence of the reasoning performance would be fruitful to better determine whether or not participants rejected the bias blind spot idea. Also, measuring other motives besides the motivation to be unbiased, such as the motivation to learn strategies to reduce bias, is needed in future studies.

Conclusion

The findings suggested the information and reflection interventions were not sufficient to reduce the bias blind spot. Mechanisms underlying the reduction in the bias blind spot from priming in the present study remain unknown. Priming contained three components: the thinking disposition questionnaire, the reasoning problems, and the questions about motivations to be unbiased. At present, it is not possible to determine which of these components was responsible for the observed reduction or whether all three were necessary to reduce the bias blind spot. For instance, the thinking disposition questions required participants to think about their own thinking and, specifically, to think about their intellectual motivations and beliefs. These metacognitive thoughts might have increased sensitivity to, and awareness of, the bias blind spot and thus might have had an attenuating effect. Questions about one's motivations to be unbiased might have had a similar effect. Finally, solving the reasoning problems might have given participants an appreciation for the difficulty of the problems and therefore prompted them to be more objective in their self-other comparisons.

It is important to acknowledge that investigating the bias blind spot is a growing field; there is still much work to be done to explore and identify factors that help attenuate the bias blind spot. The present study contributed to the broader field of cognitive and motivational biases by adding a new dimension, culture, and by showing the instructions to reflect did not reduce the bias blind spot. In addition, as noted above, individual differences in motivation and contextual factors such as priming were related to the extent to which participants displayed the bias blind spot.

As mentioned earlier, Pronin (2008) argued there is a gap between people's intentions and their behaviors; as the current findings indicated, people appeared to be blind to their *own* shortcomings but not to shortcomings in others. Although applying the same standard to the self and others is difficult, determining the conditions under which people are able to make reasonably objective comparisons might have important implications for educational interventions, social policies, and understanding the nature of between-group as well as interpersonal conflict. There is hope that when people think about their own thinking and keep in mind their own susceptibility to unconscious biases, they might be less judgmental of others, more tolerant to differences, and more willing to communicate even in the presence of disagreements.

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APPENDIX A

INSTITUTIONAL REVIEW BOARD APPROVAL

UNIVERSITY of
NORTHERN COLORADO



Institutional Review Board

DATE: April 17, 2015

TO: Wejdan Felmban, M.A.

FROM: University of Northern Colorado (UNCO) IRB

PROJECT TITLE: [681386-2] Cognitive Tendencies and Reasoning

SUBMISSION TYPE: Amendment/Modification

ACTION: APPROVAL/VERIFICATION OF EXEMPT STATUS

DECISION DATE: April 16, 2015

Thank you for your submission of Amendment/Modification materials for this project. The University of Northern Colorado (UNCO) IRB approves this project and verifies its status as EXEMPT according to federal IRB regulations.

Hello Wejdan,

Thank you for your quick response to my request for modifications. I am approving your IRB application, however, I just noticed that your Consent needs to have the name and contact information of your Research Advisor added below your contact information. Please make this addition before using the Consents.

Your application is approved and good luck with your research.

Sincerely, Nancy White, PhD, IRB Co-Chair

We will retain a copy of this correspondence within our records for a duration of 4 years.

If you have any questions, please contact Sherry May at 970-351-1910 or Sherry.May@unco.edu. Please include your project title and reference number in all correspondence with this committee.

This letter has been electronically signed in accordance with all applicable regulations, and a copy is retained within University of Northern Colorado (UNCO) IRB's records.

APPENDIX B

CONSENT FORM FOR HUMAN PARTICIPANTS IN RESEARCH—IN CLASS FORMAT

1. PSY 120 Consent Form



CONSENT FORM FOR HUMAN PARTICIPANTS IN RESEARCH UNIVERSITY OF NORTHERN COLORADO

Project Title: Exploring the relationship among cognitive Tendencies, Reasoning, and Culture

Researchers: Wejdan Felmban and Professor Kevin Pugh School of Psychological Sciences

E-mail: Wejdan.Felmban@unco.edu, Kevin.Pugh@unco.edu

Phone: (970) 405-6654 (Felmban)

In this study, we are interested to learn more about how adults think or reflect on social issues and how culture might influence thinking. We believe that exploring of the relationship between cognitive tendencies, reasoning, and culture can help educators learn more about the learning and self-evaluation of adults from different cultures. I would like to invite you to take part in a study to test the quality of the surveys and inform us more about the topic. If you agree to participate, you will read about several cognitive tendencies then complete 5 surveys and 8 reasoning tasks. **Each instrument is to be completed only one time for a total of 30-45 minutes.**

For the thinking problems and surveys, you will not provide your name. You will only be asked to provide demographic information, such as your age, gender, and major. We will take every precaution to protect the confidentiality of your participation. We will assign a participant number to you. Your responses will not be connected to your name. When we report data, your name will not be used. Data collected and analyzed for this study will be stored on a password-protected computer. Results of the study will be presented as average responses for many students, and not as responses for any individual students.

There will be no foreseeable risks to you or other participants beyond those that are normally encountered while learning about social and cognitive psychology courses. The risks are no greater than those normally encountered during regular classroom participation. Foreseeable risks include completing a self-reflection activity, similar to self-reflection exercises assigned to students in the classroom and the stress one might encounter completing an exam-like instrument.

You understand that participation in this study is only one way earn research credits in PSY 120 class and that you may select an alternative study. **Participants will be awarded research credits for participating in the investigation for the PSY 120 class.**

Participation is voluntary. You may decide not to participate in this study and if you begin participation you may still decide to stop and withdraw at any time. Your decision will be respected and will not result in loss of benefits to which you are otherwise entitled. Having read the above and having had an opportunity to ask any questions, please complete the questionnaire if you would like to participate in this research. By completing the questionnaire, you will give us permission for your participation. You may keep this form for future reference. If you have any concerns about your selection or treatment as a research participant, please contact Sherry May, IRB Administrator, Office of Sponsored Programs, Kepner Hall, University of Northern Colorado Greeley, CO 80639; [970-351-1910](tel:970-351-1910).

By clicking 'I Agree' below, you state that you understand the purpose of this research, what to expect, your rights, and that you want to participate in to the research study.

We appreciate your help with our study!

2. PSY 230 Consent form



CONSENT FORM FOR HUMAN PARTICIPANTS IN RESEARCH UNIVERSITY OF NORTHERN COLORADO

Project Title: Exploring the relationship among cognitive Tendencies, Reasoning, and Culture

Researchers: Wejdan Felmban and Professor Kevin Pugh School of Psychological Sciences

E-mail: Wejdan.Felmban@unco.edu, Kevin.Pugh@unco.edu

Phone: (970)_405-6654 (Felmban)

In this study, we are interested to learn more about how adults think or reflect on social issues and how culture might influence thinking. We believe that exploring of the relationship between cognitive tendencies, reasoning, and culture can help educators learn more about the learning and self-evaluation of adults from different cultures. I would like to invite you to take part in a study to test the quality of the surveys and inform us more about the topic. If you agree to participate, you will read about several cognitive tendencies then complete 5 surveys and 8 reasoning tasks. **Each instrument is to be completed only one time for a total of 30-45 minutes.**

For the thinking problems and surveys, you will not provide your name. You will only be asked to provide demographic information, such as your age, gender, and major. We will take every precaution to protect the confidentiality of your participation. We will assign a participant number to you. Your responses will not be connected to your name. When we report data, your name will not be used. Data collected and analyzed for this study will be stored on a password-protected computer. Results of the study will be presented as average responses for many students, and not as responses for any individual students.

There will be no foreseeable risks to you or other participants beyond those that are normally encountered while learning about social and cognitive psychology courses. The risks are no greater than those normally encountered during regular classroom participation. Foreseeable risks include completing a self-reflection activity, similar to self-reflection exercises assigned to students in the classroom and the stress one might encounter completing an exam-like instrument.

You understand that participation in this study is only one way earn extra credits in PSY 230 class and that you may select an alternative opportunity. **Participants**

will be awarded extra credit for participating in the investigation for the PSY 230 class.

Participation is voluntary. You may decide not to participate in this study and if you begin participation you may still decide to stop and withdraw at any time. Your decision will be respected and will not result in loss of benefits to which you are otherwise entitled. Having read the above and having had an opportunity to ask any questions, please complete the questionnaire if you would like to participate in this research. By completing the questionnaire, you will give us permission for your participation. You may keep this form for future reference. If you have any concerns about your selection or treatment as a research participant, please contact Sherry May, IRB Administrator, Office of Sponsored Programs, Kepner Hall, University of Northern Colorado Greeley, CO 80639; **970-351-1910**.

By clicking 'I Agree' below, you state that you understand the purpose of this research, what to expect, your rights, and that you want to participate in to the research study.

We appreciate your help with our study!

APPENDIX C

CONSENT FORM FOR HUMAN PARTICIPANTS IN RESEARCH—ONLINE FORMAT

Online Participants Consent Form



CONSENT FORM FOR HUMAN PARTICIPANTS IN RESEARCH UNIVERSITY OF NORTHERN COLORADO

Project Title: Exploring the relationship among cognitive Tendencies, Reasoning, and Culture

Researchers: Wejdan Felmban and Professor Kevin Pugh School of Psychological Sciences

E-mail: Wejdan.Felmban@unco.edu, Kevin.Pugh@unco.edu

Phone: (970-405-6654 (Felmban)

In this study, we are interested to learn more about how adults think or reflect on social issues and how culture might influence thinking. We believe that exploring of the relationship between cognitive tendencies, reasoning, and culture can help educators learn more about the learning and self-evaluation of adults from different cultures. I would like to invite you to take part in a study to test the quality of the surveys and inform us more about the topic. If you agree to participate, you will read about several cognitive tendencies then complete 5 surveys and 8 reasoning tasks. **Each instrument is to be completed only one time for a total of 30-45 minutes.**

For the thinking problems and surveys, you will not provide your name. You will only be asked to provide demographic information, such as your age, gender, and major. We will take every precaution to protect the confidentiality of your participation. We will assign a participant number to you. Your responses will not be connected to your name. When we report data, your name will not be used. Data collected and analyzed for this study will be stored on a password-protected computer. Results of the study will be presented as average responses for many students, and not as responses for any individual students.

There will be no foreseeable risks to you or other participants beyond those that are normally encountered while learning about social and cognitive psychology courses. The risks are no greater than those normally encountered during regular classroom participation. Foreseeable risks include completing a self-reflection activity, similar to self-reflection exercises assigned to students in the classroom and the stress one might encounter completing an exam-like instrument.

If you agree to provide us with your name, email and contact information, your name will put into a drawing for one of five gift cards to Amazon worth USD\$10.00 each.

Participation is voluntary. You may decide not to participate in this study and if you begin participation you may still decide to stop and withdraw at any time. Your decision will be respected and will not result in loss of benefits to which you are otherwise entitled. Having read the above and having had an opportunity to ask any questions, please complete the questionnaire if you would like to participate in this research. By completing the questionnaire, you will give us permission for your participation. You may keep this form for future reference. If you have any concerns about your selection or treatment as a research participant, please contact Sherry May, IRB Administrator, Office of Sponsored Programs, Kepner Hall, University of Northern Colorado Greeley, CO 80639; [970-351-1910](tel:970-351-1910).

By clicking 'I Agree' below, you state that you understand the purpose of this research, what to expect, your rights, and that you want to participate in to the research study.

We appreciate your help with our study!

APPENDIX D

THE BIAS BLIND SPOT SURVEY

Please revisit the descriptions of the common cognitive tendencies while you answer the following questions:

	Extremely unlikely	Very unlikely	Unlikely	Somewhat unlikely	Somewhat likely	Likely	Very highly likely	Extremely likely
1. To what extent do you believe that you are likely to show the fundamental attribution error?	1	2	3	4	5	6	7	8
2. To what extent do you believe the average person in your country is likely to show the fundamental attribution error?	1	2	3	4	5	6	7	8
2. To what extent do you believe the average person in any culture is likely to show the fundamental attribution error?	1	2	3	4	5	6	7	8

3. To what extent do you believe that you are likely to show hostile media effect?	1	2	3	4	5	6	7	8
4. To what extent do you believe the average person in your country is likely to show hostile media effect?	1	2	3	4	5	6	7	8
2. To what extent do you believe the average person in any culture is likely to show hostile media effect?	1	2	3	4	5	6	7	8
5. To what extent do you believe that you are likely to show outcome bias?	1	2	3	4	5	6	7	8

6. To what extent do you believe the average person in your country is likely to show outcome bias?	1	2	3	4	5	6	7	8
2. To what extent do you believe the average person in any culture is likely to show outcome bias?	1	2	3	4	5	6	7	8
7. To what extent do you believe that you are likely to likely to show base-rate neglect?	1	2	3	4	5	6	7	8
8. To what extent do you believe the average person in your country is likely to show base-rate neglect?	1	2	3	4	5	6	7	8

2. To what extent do you believe the average person in any culture is likely to show base-rate neglect?	1	2	3	4	5	6	7	8
9. To what extent do you believe that you are likely to show conjunction error?	1	2	3	4	5	6	7	8
10. To what extent do you believe the average person in your country is likely to show conjunction error?	1	2	3	4	5	6	7	8
2. To what extent do you believe the average person in any culture is likely to show conjunction error?	1	2	3	4	5	6	7	8

APPENDIX E
REASONING PERFORMANCE TASKS

Fundamental Attribution Error Problem

1. As you were checking out of a grocery store, the clerk turned around and began chatting with another clerk. When the clerk finally allowed you to pay, you said, "thank you," but the clerk turned her back on you and again began chatting with the other clerk. Why did the clerk act like she did? Rate each of the following possibilities.

a. She was bored with her job.

Very Unlikely 1	Somewhat Unlikely 2	Somewhat Likely 3	4	Very Likely
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b. She was more concerned with gossiping than with good customer relationships

Very Unlikely 1	Somewhat Unlikely 2	Somewhat Likely 3	4	Very Likely
-----------------------	---------------------------	-------------------------	---	----------------

c. The other clerk kept saying things to her and she had to reply.

Very Unlikely 1	Somewhat Unlikely 2	Somewhat Likely 3	4	Very Likely
-----------------------	---------------------------	-------------------------	---	----------------

d. She overheard you saying something about her and therefore was rude.

Very Unlikely 1	Somewhat Unlikely 2	Somewhat Likely 3	4	Very Likely
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Outcome Bias task (positive)

2. A 55-year-old man had a heart condition. He had to stop working because of chest pain. His pain also interfered with other things, such as travel and recreation. A successful heart bypass operation would relieve his pain and increase his life expectancy by five years.

However, 8% of the people who have this operation die from the operation itself.

He decided to go ahead with the operation.

The operation succeeded.

Evaluate the man's decision to go ahead with the operation

All things considered, the man's decision to go ahead with the operation was

Extremely bad good	very bad	neither bad nor good	good	very good	extremely
1	2	3	4	5	6

Outcome Bias task (negative)

3. A 55-year-old man had a brain tumor. He had to stop working because of severe headaches. His pain also interfered with other things, such as travel and recreation. A successful operation would relieve his pain and increase his life expectancy by five years.

However, 2% of the people who have this operation die from the operation.
He decided to go ahead with the operation.
The operation failed and the patient died.

Evaluate the man's decision to go ahead with the operation

All things considered, the man's decision to go ahead with the operation was

Extremely bad	very bad	neither bad nor good	good	very good	extremely good
1	2	3	4	5	6

Base-Rate task

4. A panel of psychologists has interviewed and administered personality tests to 30 engineers and 70 lawyers, all successful in their respective fields. On the basis of this information, thumbnail descriptions of the 30 engineers and 70 lawyers have been written. One of the descriptions is below. After reading the description, please indicate what you think the person's job. Here is the description:

Jack is a 45-year-old man. He is married and has four children. He is generally conservative, careful, and ambitious. He shows no interest in political and social issues, and spends most of his free time on his many hobbies, which include home carpentry, sailing, and mathematical puzzles.

What is Jack's job?

- A. Jack is definitely an engineer.
- B. Jack is probability an engineer.
- C. Jack is definitely a lawyer.
- D. Jack is definitely a lawyer.

Base-Rate task

5. In a study, 100 people were tested. The participants were:

85 Muslims and 15 Buddhists.

Sarah is a randomly chosen participant of the study. Sarah is 19 years old. She likes to philosophize and she hates materialism. She wears second-hand clothes and would love to go to India one day.

What is most likely true of Sarah?

- A. Sarah is definitely a Buddhist.
- B. Sarah is probability a Buddhist.
- C. Sarah is definitely a Muslim.
- D. Sarah is definitely a Muslim.

Conjunction task

6. Linda is 31 years old, single, outspoken, and very bright. She majored in philosophy. As a student, she was deeply concerned with issues of discrimination and social justice, and also participated in anti-nuclear demonstrations.

Complete the sentences using one of the following choices

A. It is ____ that Linda is a bank teller.

Extremely improbable	very improbable	somewhat probable	moderately probable	very probable	extremely probable
1	2	3	4	5	6

A. It is ____ that Linda is a bank teller and is active in the feminist movement.

Extremely improbable	very improbable	somewhat probable	moderately probable	very probable	extremely probable
1	2	3	4	5	6

Conjunction task

7. Ahmed is 31 years old, socially withdrawn, and spends a lot of time thinking about his soul. He majored in Chemistry and is deeply concerned with issues of discrimination because he believes there is no justice in the world. He wears traditional Arabic clothes and has a long beard.

Complete the sentences using one of the following choices

A. It is ____ that Ahmed is a fundamentalist.

Extremely improbable	very improbable	somewhat probable	moderately probable	very probable	extremely probable
1	2	3	4	5	6

B. It is ____ that Ahmed is a fundamentalist and is violent.

Extremely improbable	very improbable	somewhat probable	moderately probable	very probable	extremely probable
1	2	3	4	5	6

APPENDIX F
THINKING DISPOSITIONS

Thinking Dispositions

Read each item carefully. Circle the number that shows how much you agree with each statement.

	Strongly Disagree	Disagree	Slightly Disagree	Slightly Agree	Agree	Strongly Agree
1. I find good reasons to criticize evidence that is against my view.	1	2	3	4	5	6
2. For most of the decisions I make, I think about how they could affect other people.	1	2	3	4	5	6
3. I try to see the evidence from other people's point of view.	1	2	3	4	5	6
4. I like to remain skeptical about an issue until all the evidence is in.	1	2	3	4	5	6
5. I treat evidence for and against my opinions equally.	1	2	3	4	5	6
6. In most conflicts between people, I can see which side is right and which side is wrong.	1	2	3	4	5	6
7. People should take into consideration evidence that goes against their opinions.	1	2	3	4	5	6
8. I displaying curiosity about the views of other people.	1	2	3	4	5	6
9. I change my opinion when I am presented evidence that shows my opinion is wrong	1	2	3	4	5	6
10. I defend my opinions when someone attacks them.	1	2	3	4	5	6
11. I find good reasons to accept evidence that favors my opinion.	1	2	3	4	5	6
12. I believing that personal experience is more important than impersonal statistics when making decisions about principles.	1	2	3	4	5	6
13. It is best to agree with others, rather than say what you really think, if it will keep the peace.	1	2	3	4	5	6
14. I consider myself broad-minded and tolerant of other people's lifestyles.	1	2	3	4	5	6
15. Some people think that men are superior to women; others people think that men and women are equal. It is quite possible that both groups are correct.	1	2	3	4	5	6

APPENDIX G

MOTIVATION TO BE UNBIASED

Motivation to Be Unbiased

1. How important do you think avoiding biases is to the *society* in which you live?
Very important somewhat important not at all important
1 2 3 4 5
2. How important do you think avoiding biases is to *your own life*?
Very important somewhat important not at all important
1 2 3 4 5
3. How motivated are you to avoid biases?
Very motivated somewhat motivated not at all motivated
1 2 3 4 5

APPENDIX H

INTERVENTION AND CONTROL CONDITION MATERIALS

Intervention and Control Condition Materials

Condition (1) Information + reflection on the bias blind spot

Participants will read the following information on the bias blind spot:

People see themselves differently from how they see others. They are immersed in their own emotions, and cognitions at the same time that their experience of others is dominated by what can be observed externally. This basic asymmetry has broad consequences.

Psychologists have found that people realize the operation of cognitive and motivational biases much more in others than in themselves. This cognitive tendency has been called “not me fallacy.” For example, when asked to estimate the chances they will get divorced, most unmarried people say the chances *for themselves* are very low. But, when asked to estimate the chances *other people* will get divorced, most people say the chances *for other people* are very high (50% chances or higher). Another example of the bias blind spot is when people think their own reasoning is fair and objective, but think that other people, especially people they do not like, are biased and unfair in their reasoning about social issue.

After that they will complete the following reflection activities:

REFLECT:

A. Think about any potential consequences of the bias blind spot on how you might interpret the actions of people you dislike or groups that you have conflicts with. Please list at least two consequences.

1.

2.

B. Reflect upon a time when thought you were more objective than others but later realized you probably were not. How did this affect your relationship with the people involved in the situation.

Condition (2) Information + reflection not relevant to the bias blind spot

Participants will read the following information on the bias blind spot:

People see themselves differently from how they see others. They are immersed in their own emotions, and cognitions at the same time that their experience of others is dominated by what can be observed externally. This basic asymmetry has broad consequences.

Psychologists have found that people realize the operation of cognitive and motivational biases much more in others than in themselves. This cognitive tendency has been called “not me fallacy.” For example, when asked to estimate the chances they will get divorced, most unmarried people say the chances *for themselves* are very low. But, when

asked to estimate the chances *other people* will get divorced, most people say the chances *for other people* are very high (50% chances or higher). Another example of the bias blind spot is when people think their own reasoning is fair and objective, but think that other people, especially people they do not like, are biased and unfair in their reasoning about social issue.

After that they will complete the following reflection activities:

REFLECT

A. Think about any potential consequences of participating in psychological research on how you might interpret the actions of people you dislike or groups that you have conflicts with.

Please list at least two consequences.

1.

2.

B. Provide an example on how beneficial participating in psychological research would be for you?

Condition (3) no information + reflection on the bias blind spot

Participants will complete the following reflection activities:

REFLECT

A. Think about any potential consequences of being less objective such as when judging you own actions differently from you judgments of others' actions. Or reflect on the consequences of biases in our world and how might this effect how they perceive others. Or think about any potential consequences of being influenced by cognitive tendencies on how you might interpret the actions of people you dislike or groups that you have conflicts with.

Please list at least two consequences.

1.

2.

B. Reflect upon a time when thought you were more objective than others but later realized you probably were not. How did this affect your relationship with the people involved in the situation.

Condition (4) no information + reflection not relevant to the bias blind spot
(control group)

Participants will complete the following reflection activity:

REFLECT

A. Think about any potential consequences of participating in psychological research on how you might interpret the actions of people you dislike or groups that you have conflicts with.

Please list at least two consequences.

1.

2.

B. Provide an example on how beneficial participating in psychological research would be for you?

APPENDIX I

DESCRIPTIONS OF COMMON COGNITIVE TENDENCIES

Descriptions of Common Cognitive Tendencies

Psychologists have learned a great deal about flaws, biases, and errors that are typically found in adults. We would like you to read about several of these findings and let us know your reaction to each.

1. Fundamental Attribution Error

Psychologists have claimed that some people show a tendency to believe that a person's mistakes occur because of the person's personality—instead of the situation). For example, when a student does poorly in a test, people think that the student is not intelligent, but overlook the possibilities that the teacher was bad or that the test was hard.

2. Hostile Media Effect

Psychologists have claimed that some people show a “hostile media” effect in the way they view television or newspaper coverage of controversial or partisan issues. That is, they tend to perceive essentially neutral media reports as presenting a favorable view of the other side, and a negative view of their own side. As a result, they see the media as “hostile,” or “biased against” their side.

3. Outcome Bias

Psychologists have found that people tend to judge the quality of a decision based on how the decision worked out. That is, people sometimes forget that the quality of the decision must be judged on what was known at the time the decision was made, not how it worked out, because the outcome is not known at the time of the decision. It is a mistake to judge a decision maker's ability, after the fact, based mostly on the outcome of that decision. When people do this, it is called outcome bias.

4. Base-Rate Neglect

Psychologists have shown that people tend to ignore overall probabilities when judging how likely something is and instead focus too much on the specific situation. For example, when judging the likelihood of a shark attack, people tend to focus on a news report of a single attack, rather than on the fact that although several millions of people swim in ocean water, only a few people are killed by sharks every year. When people focus on the specific example and ignore the overall probability, this is termed base-rate neglect.

5. Conjunction Error

Psychologists have found that people tend to believe that things go together when in fact they do not necessarily go together. There is an error in estimating a higher probability that these two things occur together, or are conjoined, than the probability of each thing occurring separately. For example, this error, called the conjunction error, would be made when people think that the chances of someone being my brother and being a teacher is higher than the chances that someone is either my brother or a teacher. In reality, the probability of someone being my brother and a teacher is lower than either someone being my brother or a teacher.

APPENDIX J

DEMOGRAPHIC INFORMATION

Demographic Information

Age _____

Gender _____

Nationality _____

Ethnicity _____

Native language _____

Highest degree:

High school

Associates (two year college degree)

B. S. or B. A.

M. S. or M. A.

Ph.D or equivalent

If applicable: Are you in:

PSY 120

PSY 230

Year in school _____

GPA (if you are a graduate student, please report your undergraduate GPA)

Thank you! We appreciate your help with our study!