Using implementation intention as a debiasing tool for UX practitioners’ bias blind spot

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Abstract

User Experience (UX) practitioners are of great societal relevance through the design of all digital products which millions of people are interacting with on a daily basis. Due to many possible stressors, their work may be prone to various cognitive biases to which they could be blind to. However, they might also be blind to their own blindness. This study aimed to examine whether (H1) UX practitioners display a bias blind spot. Moreover, it examined whether (H2) bias blind spot could be reduced through an implementation intention, and (H3) whether years of UX experience could moderate the relationship between implementation intention and bias blind spot among UX practitioners. A purposive sample (\(N = 130\)) of UX practitioners (89 UX designers, 22 UX researchers, 10 UX strategists, 6 others; \(M_{\text{age}} = 29.88, SD_{\text{age}} = 5.47\)) of over thirty nationalities (41% Dutch, 19% Romanian, 40% other) was used for a between-subject experimental design study with random allocation. Results showed that UX practitioners display a bias blind spot \((p < .01)\) and that this might be reduced short-term with the help of an implementation intention \((p = .02)\). Lastly, years of experience did not moderate the relationship between implementation intention and bias blind spot \((p = .09)\), thus the third hypothesis was not supported by the findings. Practical implications regarding collaboration and ethical decision-making are discussed in the last section of the paper.

*Keywords*: UX practitioners, blind spot bias, debiasing, implementation intention
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In our irrational world, one finds it easy to point out someone’s fallibility but is blind to one’s own. Through an experimental design study, this paper aims to investigate an implementation intention as a debiasing tool in order to reduce bias blind spot among User Experience, hereafter UX, practitioners. Debiasing refers to any intervention focused on reducing one’s biases (Kenyon & Beaulac, 2014). Through a user-centered approach, UX practitioners not only design digital products meant to provide meaningful and relevant experiences to users (Norman & Nielsen, 2020) but they also help businesses generate brand loyalty, reduce costs, and increase profits (Kambala, 2019; O’Brien, 2018). However, the societal relevance of UX practitioners goes beyond that, and here is why: UX practitioners support the daily life of millions of people through the digital products that they design. Among these digital products there are products which inform (e.g. news), entertain (e.g. Netflix), stimulate productivity (e.g. To-Do list), keep one healthy both physically (e.g. 7 Min Workout), and mentally (e.g. Headspace) (Yalanska, 2017). In short, the work of UX practitioners contributes to various fields of society, such as healthcare, government, or education while being part of the daily routines of people.

When one’s work impacts such a large number of people, a high degree of responsibility arises. Hence, ideally, each step of UX practitioners’ work needs to be consciously deliberated in order to maximize the advantages and minimize the disadvantages for the users. Clearly, it can be argued that conscious deliberation does not always lead to the best outcome as it is rather subjective and besides, people are not as rational as once believed. Currently, there is abundant evidence to support human cognitive fallibility (Gilovich, Griffin, & Kahneman, 2002). It seems
to be the case that human judgment is often distorted by irrational, yet consistent, errors, also called cognitive biases (Kahneman, 2012; Kahneman & Tversky, 1996; Tversky & Kahneman, 1974). From an evolutionary perspective, cognitive biases are useful by-products of a quick way of thinking to conserve energy and deal with recurrent problems that our ancestors encountered in the past. However, this quick way of thinking is not always accurate (Haselton, Bryan, Wilke, Frederick, & Galperin, 2009). Every person inherited this adaptive rationality which means that UX practitioners are no exception. This indicates that everyone, including UX practitioners, is prone to cognitive biases, and thus to errors in their judgment. Intriguingly, becoming more knowledgeable can be a curse rather than a blessing. One might be tempted to assume that the more experience UX practitioners gain, the better judgment (less biased). Unfortunately, research shows that experts might be more susceptible to specific cognitive biases than non-experts (Montibeller & von Winterfeldt, 2015). As every UX practitioner advances in their career, this could make them become more biased.

Due to the relatively recent acknowledged importance of such cognitive biases that could impact the work of UX practitioners of any level (junior, mid-level, or senior), many online sources from the UX industry approached the topic. Most importantly, the intention is to provide information about how to effectively reduce them (Subramanian, 2018; Whitenton, 2016; Sun, 2017). The attempts to raise awareness among UX practitioners about their cognitive biases might ironically be threatened by another cognitive bias. Namely, people exhibit a bias blind spot as “they are less likely to detect bias in themselves than in others” which was found to be linked to resistance to debiasing trainings (Scopelliti et al., 2015). This is highly problematic as the pursuit of increasing understanding among UX practitioners about the errors which interfere with their judgment and how to prevent them, is most likely to fail. Therefore, the debiasing goal is
especially challenging when UX practitioners are blind to their own susceptibility to cognitive biases.

In regard to scientific literature, a PsycInfo search (March 22, 2020) displays 6.759 results for “cognitive biases”, while “debiasing” yields only 284 results. This seems to indicate that the principal aim of the researchers has been understanding human irrationality rather than attempting to tackle it. In addition, the existing research on debiasing is limited to high-risk industry contexts (e.g. aviation, medical) in which human errors have immediate and serious consequences on peoples’ lives but not so much is known within other contexts. Findings show methods to improve human judgment both effective (Almashat, Ayotte, & Margrett, 2008; Arkes, Guilmette, Faust, & Hart, 1988; Shaffer, Focella, Scherer, & Zikmund-Fisher, 2016; Ludolph, 2018) and ineffective (Oliver, Oliver, & Body, 2017) within health context, transportation (Svenson, 2017) or aviation (Walmsley & Gilbey, 2017). Among successful debiasing methods are training interventions, video games (Morewedge et al., 2015), “consider the alternative” (Mussweiler, Strack, & Pfeiffer, 2000), and direct warnings (Lewandowsky, Ecker, Seifert, Schwarz, & Cook, 2012). Nonetheless, these successful debiasing methods are subject to several limitations besides the generalizability of effects, ecological validity, financial costs, and time efficiency. Another weakness regarding these methods may be their lasting effects. It can be argued that explicitly telling one to consider the alternative or to be less biased could work in reducing bias immediately after the intervention. However, people are not usually aware when cognitive biases are affecting their judgment as they arise unconsciously. Whether or not the individual would consciously apply the new knowledge acquired through the debiasing intervention in their daily life is questionable. Most of the debiasing effect might be context-specific and as soon as people will leave the lab they will fall back to their patterns (Madva,
Lastly and most importantly, finding successful debiasing tools to improve human judgment is ambitious when people are blind to their own susceptibility to cognitive biases.

Therefore, there are two main points which this study aims to tackle. First, it is crucial to address one’s susceptibility to cognitive biases as a first step towards improving human judgment overall. To do so, people need to be aware of their own fallibility to be able to deal with it. Secondly, there is a need for researching potential debiasing effects that have long-lasting effects that can be transferable outside the lab to real-world settings. Examining debiasing tools which could be practiced consciously but elicited unconsciously later on may have an increased possibility of promoting long-lasting effects (Aczel, Bago, Szollosi, Foldes, and Lukacs, 2015).

The two main points could be accomplished by attempting to reduce bias blind spot by fostering behavioral change. A potential way to achieve behavioral change is through an implementation intention as a debiasing tool. Due to constraints, the current study will not follow the lasting effects of the debiasing method proposed but it will be a first step into understanding its potential as a debiasing tool and provide insights for further research.

Implementation intentions are “if-then” plans which specify the situation, followed by the desired behavior to be performed. Previous research shows that implementation intention is a powerful tool for goal attainment through habit formation (Adriaanse, Gollwitzer, de Ridder, de Wit, & Kroese, 2010; Bayer, Achtziger, Gollwitzer, & Moskowitz, 2009; Brandstätter & Gollwitzer, 2001). For example, within the context of UX, this could be used as follows: a UX practitioner could plan that if they get creatively stuck in the ideation phase then they would have to leave the desk for a walk. This specific implementation intention is based on the research finding that walking boosts creativity (Oppezzo, 2014). Consciously creating the mental link between the situation or cue and the desired behavior or goal, the anticipated situation becomes
highly activated and easily accessible. Every time the situation arises, and the linked behavior is being performed, the relationship between the two becomes stronger. The stronger the relationship, the higher chances of automatizing the behavior which is the goal in itself. In this way, the behavior will become a habit that is immediate and does not require conscious intent (Gollwitzer P. M., 1999). There is one main limitation of the implementation intention and that is that this tool requires effort and conscious intent until it becomes automatic. However, once automation is reached, the potential for long-lasting effects is increased. Hence, the current study conceptualizes debiasing UX practitioners of bias blind spot as a goal to be achieved through habit formation.

To conclude, this paper intends to fill a gap in the field of bias blind spot and debiasing literature among UX practitioners. By starting with addressing one’s own blindness to bias susceptibility through an implementation intention, this study aims to check the short-term effect of such intervention by answering the following research question: “Does implementation intention reduce UX practitioners’ bias blind spot?” By answering this research question, evidence for the effects of implementation intention as a debiasing tool will be provided. This may represent the first step into improving human judgment by understanding debiasing as behavioral change.

User experience

To delineate the scope of this paper, it might be of importance to provide more information about the typical UX process which UX practitioner follow in their work. This provides a clearer picture with regards to the various opportunities for cognitive biases to arise. The following will serve this purpose.
User experience (UX) has been defined as “the process design teams use to create products that provide meaningful and relevant experiences to users” (Interaction Design Foundation, n.d.), or “the intent to understand people’s behavior, emotions and struggles with the purpose of enabling organizations to make better products and services for those people” (Axbom, 2016). Interestingly, some conceptualize it as a problem-solving mindset with empathy at its core (Gray, 2016). Closely related to human-computer interaction and interaction design, UX requires a multidisciplinary approach involving computer science, psychology, sociology, and engineering (Kou & Gray, 2018). UX has been an arising occupation that is both rapidly growing and in high demand (Stevens, 2019).

Generally, UX practitioners follow a UX process which is grounded in a method called design thinking; an iterative user-centered approach to problem-solving used in many professions (most notably, design, IT, and business) which is associated with innovation of products and services within social contexts (Cross, 2011). The process involves five distinct stages: empathize, define, ideate, prototype, and test (Gibbons, 2016; Dam & Teo, 2020). Empathize is the first stage of the process and aims at understanding the needs, motivations, and behavior of the users. To gain information in this stage, UX practitioners use appropriate research methods (e.g. interviews, observations, data analytics) which aid the problem definition stage. In the second stage, user persona or scenarios can be created to acquire a deeper understanding of the user and the context for the problem aimed to solve. Next, solutions are being generated in the ideation stage by various possible means (e.g. brainstorming or mind mapping) and then these are translated and implemented within prototypes. The prototypes fulfill the scope of testing which is the last stage of the process. This stage involves gathering feedback from the users for further improvement of the solution. Even though each stage logically follows the next one, in
practice the order of the stages happens in a non-linear fashion. UX practitioners may conduct concurrently more stages of the process, going back and forth from testing to ideation (Dam & Siang, 2020). This means that through collaborative work, UX practitioners deliver suitable solutions to the defined problem. Moreover, reaching the ultimate goal requires UX practitioners to collaborate also with teams from different departments, such as developers, engineers, business analysts, and project managers (Laubheimer, 2016). It is important to mention that there is no universal job description for each UX role and that the background of UX practitioners varies substantially. Ultimately, UX practitioners are users’ advocates and their goals are to solve problems and create purposeful experiences through their design choices.

**Bias blind spot**

**Cognitive biases**

It can be understood based on the UX process detailed previously, that there are many occasions in which different type of errors in judgment could arise in each stage of the process. Errors in judgment are scientifically called cognitive biases; systematic errors that occur when people are processing information. The most predominant information processing theory in the literature of cognitive biases is the dual process theory. This theory differentiates between two modes of information processing: intuition or intuitive (system 1) and reasoning or analytical (system 2). On one hand, people can process the information in an automatic, unconscious manner which is reflected by the fast system 1. On the other hand, people can deliberately reflect on the available information, and this refers to the slow system 2 (Kahneman, 2003). Nonetheless, a debate on rethinking the dual-process model is open due to its limitations. Researchers’ discussions typically regard how these two distinct models interact with one another or whether they can work simultaneously (Pennycook, Fugelsang, & Thompson, 2016).
Regardless of that, the dual-process theory is being used for the current paper merely as a framework to explain the nature of these systematic errors rather than when and how they co-occur.

It is known that the intuitive system 1 is fast because it adaptively relies on shortcuts (also called heuristics) to preserve energy. Heuristics are considered mental rules of thumb and they support thinking to reach a good enough outcome. Unfortunately, this does not mean that the outcome is always the right one. When heuristics lead to errors in thinking, this results in what is known as cognitive bias (Evans, 2008). They can occur naturally but there are several factors which encourage reliance on heuristics; for example, working under constraints such as, time pressure and cognitive load, makes one more likely to rely on mental rules of thumb and thus, more likely to be prone to errors (Fennis, Janssen, & Vohs, 2009). In brief, there are external factors that simply reinforce reliance on heuristics but do not guarantee it. Furthermore, reliance on heuristics makes one more prone to cognitive errors but does not always lead to it.

Within the UX field, the strain may be caused by business stakeholders for financial gains, by users who constantly demand and expect more, and by the company the UX practitioners work for to deliver extra (Teixeira & Braga, 2019). These external factors could create a high cognitive load (Vardhan, 2018) and drive UX practitioners towards using their intuitive thinking (system 1) and hence, make them more susceptible to errors in their judgment. As already noted, UX practitioners are aware of the existence of such cognitive biases as online sources show yet, overcoming them may be difficult when one is blind to their own susceptibility.
Blind spot bias

Bias blind represents the tendency to recognize the impact of cognitive biases on other’s judgment but fails to see it on one’s own judgment (Pronin, Lin, & Ross, 2002). A common real-world example of bias blind spot is the conflict of interests in the medical and health care field, in which physicians view themselves unsusceptible to the impact of gifts from the pharmaceutical industry over their judgment while considering that their peers are strongly influenced by it (Dana & Loewenstein, 2003). In other words, bias blind spot manifests as an asymmetry in the perception between self-other with the belief that the self is less biased than the other. Whether this is a failure of system 1 or system 2 it is unclear as both systems can make mistakes (Kahneman, 2003). UX practitioners may know of the existence of bias blind spot and enough time for conscious deliberation to accurately assess the self and others, but still, be blind to their own susceptibility (Pronin, Berger, & Molouki, 2007).

To better understand the nature of bias blind spot it is important to look into the underlying mechanisms of it. Previous findings show that bias blind spot may be a cause of other cognitive biases (introspection illusion, naïve realism) enhanced by self-deceit (self-enhancement motives) (Pronin, 2009; Pronin & Kugler, 2007).

Self-enhancement can be defined as the motivation of people to maintain, pursue, or intensify one’s positive self-image, even when there is an indication pointing otherwise (e.g. performance, others’ opinions) (Sedikides & Alicke, 2018). The reason to do so is to attain or maintain self-esteem and feel good about oneself. There are different strategies that people can use to endorse a positive self-image such as, disregarding the evidence or overestimating one’s skills and abilities by downward social comparison. These strategies become particularly prominent in situations of threat to one’s freedom or self-esteem (Sedikides & Gregg, 2008).
Self-enhancement drives a variety of other self-related superiority biases in social comparison literature. One of the most robust phenomena motivated by self-enhancement is the better-than-average effect which represents the tendency of people to rate themselves higher than the average person (Alicke, Vredenburg, Hiatt, & Govorun, 2001; Hoorens, 1993). Another well-known example is self-serving bias in which people attribute success to their own abilities and failures to external factors (Pronin, 2007; Hoorens, 1993; Sedikides & Alicke, 2018). There is supporting evidence that bias blind spot might be able to predict other cognitive biases which result in self-assessment, better-than-average, and ignorance of others’ advice (Scopelliti et al., 2015).

The other cognitive bias as an underlying mechanism for bias blind spot is introspection illusion. Introspection refers to the act of looking inward to assess inner states; and through introspection, people seek to understand and explain their own behavior by accessing their emotions, thoughts, and motives. The illusion reflects the tendency people have to overweight and overvalue the information acquired through introspection (Pronin, 2009; Nisbett & Wilson, 1977). Studies show that people are inclined to use internal information to infer about their own behavior and future actions (Epley & Dunning, 2000), but when aiming to understand others’ behavior, inner states are not accessible and inferences are considered unreliable (Monson & Snyder, 1977). Simply put, introspection illusion makes people give more weight to their internal states (as compared to behavior) due to high value, reliance, and easy accessibility of it (Pronin, Berger, & Molouki, 2007). It may be stated that those who rely more on their intuition have higher chances to be biased and less likely to correct their initial self-assessment based on introspection. This might represent an issue when experts are using their intuition more often than their less experienced peers due to their years of experience (Salas, Rosen, &
DiazGranados, 2010). Along their years of experience, much of the knowledge could have been internalized and thus, increased reliance on their fast judgment might have become the norm. In the end, intuition could be considered as recognition (Ericsson, 1996). This could result in a counterintuitive situation where experts are more vulnerable to fall for cognitive biases compared to non-experts. That is why the current study aims at addressing years of experience in the UX field as an essential factor in the role of bias blind spot reduction. It is expected that the group with the most years of experience will benefit the most from the debiasing intervention as they are more likely than the less experienced ones to display a high bias blind spot.

The last underlying mechanism of bias blind spot is naïve realism; which comprises of three main assumptions that people have about social understanding: 1) people have the naïve belief that they perceive the world objectively in an unbiased manner, 2) they also believe that others will share their view as they have access to the same objective information to form their view, and finally, 3) when others do not share their view there are three possible reasons for it and those are: a) others were not exposed to the same information, b) others are lazy, unable, or unwilling to process the information, or c) others are biased, so they cannot interpret the evidence in the right way to reach the same conclusions (Pronin, Gilovich, & Ross, 2004; Ross, Ward, Reed, Turiel, & Brown, 1997). These assumptions were supported by a study in which participants rated others’ opinions as less objective when incongruent with their own. Moreover, they were less likely to engage in a conversation with those who did not share their own view (Yan, Abril, Kyoung, & Jing, 2016). Translated into the real world, there is a high likelihood that working in a team with people that have different perspectives can lead to misunderstanding and conflict.
Furthermore, it seems to be the case the bias blind spot is a distinct concept and it is unrelated to any demographic variables (e.g. age, gender) nor any measure of intelligence, cognitive ability, decision-making ability, self-esteem or other personality traits. The only significant correlation found was with the educational level; bias blind spot decreases with the increase of education.

It is worth to be mentioned, however, that there is relatively limited research on the topic of the bias blind spot. Pronin and colleagues (2002) provided the first evidence to support this effect, showing that people can detect a wide range of biases in others while denying such biases in themselves. Their work impacted the literature with over one thousand citations, however, despite being considered a robust occurrence, there has been a lack of study replication until recently. A preprint was published two months ago about a study that replicated the findings of Pronin and colleagues (2002) supporting the phenomenon (Chandrashekar et al., 2020).

To conclude, it could be said that acknowledging the universal susceptibility to cognitive biases, with no exception, might be easier and might make one more receptive to overcoming them than approaching each cognitive bias. Bias blind spot was associated with increased susceptibility to other cognitive biases based on similar mechanisms and it was correlated with reduced responsiveness to debiasing trainings (Scopelliti et al., 2015). This is why it is crucial to address this type of bias as a first step to improve human judgment.

**Implementation intention**

Due to the complexity of the bias blind spot and its possible negative impact on the UX practitioners’ judgment, it is fundamental to investigate a method that might have the potential of lasting effects. The current paper proposes the use of an implementation intention to reduce bias blind spot in UX practitioners which will be elaborated in this section of the paper. As already
noted, the current study does not examine the lasting effects of implementation intention but the short-term effects in order to provide insights for further research on the topic.

Bias blind spot is an overlooked bias by the researchers as information about it is relatively scarce. There is one particular study that aimed at reducing several cognitive biases, including bias blind spot, through learning by playing video games which showed to be effective (Morewedge et al., 2015). Nonetheless, a dose of skepticism may be appropriate for the effectiveness of such a method as the paper refrains from discussing further the effects and the limitations of the study. It can be argued that the answers were influenced by the desire of the participants to show that they gained knowledge through the training and give less biased answers. Being knowledgeable and less biased could be considered a socially valued characteristic. In addition, the current debiasing literature presents other encouraging evidence for effective methods such as trainings or considering the opposite (Almashat, Ayotte, & Margrett, 2008; Ludolph, 2018). Surprisingly, there are cases in which being warned about one’s biases and explicitly being told to avoid them shows “backfire” effects (Payne, Lambert, & Jacoby, 2002). This might mean that behavioral change is more likely to be seen when the motivation comes from within rather than from external pressure as this could show opposite desired effects. A solution may be setting a personal intention to be less biased. Being reminded of this personal intention would ideally work if it would happen in an automatic manner, just like a habit, so it requires no effort from the individual. Following, more information on the conceptualization of implementation intention and its potential for automation are described.

Implementation intentions (“If I encounter situation X, then I will perform behavior Y”) are self-regulatory strategies proposed usually in human goal striving. They are built on a theoretical framework postulating that goal striving consists of two cognitive tasks: identification
of an opportunity (cue) to act, and the desired action as a response to that opportunity (behavior). The “if” part of the process is meant to heighten the accessibility of anticipated opportunities (cues), thus deciding in advance which of the possible upcoming situations to be used in achieving one’s goal. The “then” part of the process facilities the automation of the behavioral response to the cue. In this way, a mental link is being created between a cue and an intended behavioral response in the form of an “if-then” plan. When one encounters the cue, an automatic pre-determined behavioral response will be performed without conscious thought (Parks-Stamm, Gollwitzer, & Oettingen, 2007; Aarts & Dijsterhuis, 2000). For example, if one’s goal is to start exercising a possible helpful implementation intention would link a cue (e.g. waking up every morning) to appropriate goal-directed behavior (e.g. dressing up for gym). By repeating the behavior when the cue is accessible, this is more likely to become automatic and may be performed at an unconscious level (Gollwitzer P. M., 1999; Gollwitzer & Bargh, 2005).

Achtizger, Gollwitzer, and Sheeran (2008) looked for novel manners in which implementation intentions might have been overlooked and could be tested, so they examined whether implementation intentions are efficient in goal shielding; this refers to the process of protecting one’s focus on the desired goal by inhibiting alternative goals. This study sheds light on the effectiveness of implementation intentions when one deals with strong inner states (e.g. cravings, fears, ego depletion, temptations). For example, one of their studies used implementation intention to control cravings and thus reduce the amount of unhealthy snacking behavior. Participants in the implementation intention condition had to say three times “If I think about my chosen food, then I will ignore that thought” reduced their intake of unhealthy foods one week later after the experiment. This is one example in which implementation intentions have been shown to be effective in avoiding or overcoming automatic thinking. Interestingly, the
effectiveness of strategy has been studied not only within dieting contexts but also in relation to racial biases. In a study by Stewart and Payne (2008) racial bias was reduced in a task similar to IAT (Implicit Association Test) within the condition in which participants were previously instructed to say, “Whenever I see a Black face on the screen, I will think the word, safe”. Support for this method comes also from the stereotyping and prejudice research in which implementation intentions have been shown effective (Stewart & Payne, 2008; Mendoza, Gollwitzer, & Amodio, 2010; Devine et al., 2012).

Concluding, the present study examines first whether UX practitioners display bias blind spot (H1) and aims to use implementation intention to reduce bias blind spot in UX practitioners (H2). In addition, it is important to check whether debiasing through an implementation intention might be moderated by the years of experience in the UX field (H3). The conceptual model of research can be seen in Figure 1. The assumptions are that UX practitioners display a bias blind spot and this will be reduced through the implementation intention. Furthermore, the more experience one has within the UX industry the higher the bias blind spot might display, so the assumption is that UX practitioners who have more experience will experience a bigger bias blind spot reduction (see Figure 1).

Figure 1. Conceptual model of research
Method

To test the hypotheses a between-subject experimental design online study with random allocation was conducted.

Participants

Through purposive sampling, 208 participants were recruited via social media channels. LinkedIn was primarily used in recruiting participants by searching profiles that have in their headline UX designer, UX researcher, or UX strategist and privately contacted them to participate in the study. An advertisement together with a message (see Appendix A) was posted on the LinkedIn personal profile of the student researcher which was subsequently shared by several other people. The advertisement was also forwarded to three Slack¹ UX groups (MediaMonks², UX Goodies, BetterUX Community) and one LinkedIn group (UX Professionals).

Due to substantially incomplete answers, seventy-six participants were excluded. The high amount of dropout could be explained by the fact that participants were approached during their work time when any distraction (e.g. notification, video call) could have interfered with their attention to get back to the study and complete it. However, as participants were approached privately, this allowed for the advantage of receiving feedback. Many participants who withdraw from the study reported the reason for doing so in the private chat. Some participants either felt that the scale did not fit their job role (e.g. “I didn’t fill in the survey since I’ve already come across a couple of questions that didn’t apply to me”), or they indicated difficulty with the scale

¹ Slack is a workplace communication tool designed to replace email as primary method of communication and sharing information.
² Media Monks is a creative digital production company producing websites, games, and films, often to serve the needs of advertising agencies.
which asked for assessing other fellow UX practitioners (e.g. “I find it a bit hard to answer these questions about others so I broke it off”). More information about the scale is presented in the next section of the paper. One participant was excluded as their reported profession was not in the UX field (Economist). One more participant reported having no profession was also excluded as it was unclear whether this was a temporary situation and whether her or his profession was from the UX field.

The remaining sample ($N = 130$) consisted of 89 UX designers, 22 UX researchers, 10 UX strategists, 6 others (UX Team Lead, UX Manager, SEO), and 3 missing with 67 female-identified, 58 male-identified, 1 preferred not to share their gender, and 4 missing. The sample aged between 21-50 ($M_{age} = 29.88$, $SD_{age} = 5.47$), 41% Dutch, 19% Romanian, and the rest of 40% represented 30 other different nationalities. Participants had different levels of experience in the UX field (16% less than one year experience within the field, 28% had between 1-3 years of experience, 18% 3-5 years of experience, and 36% more than five years of experience, and 2% did not mention). All the UX practitioners participated voluntarily in the study and did not receive any compensation for their participation.

**Ethics statement.** This research was approved by the Research Ethics and Data Management Committee of the Tilburg School of Humanities and Digital Sciences, Tilburg University with the identification code REDC #2020/094 (see Appendix B). Written consent was obtained from all participants (see Appendix C).
Materials

The advertisement used in the recruitment of participants which was posted publicly on the social media channels was created in Sketch\(^3\). The advertisement illustrated a prototype of a messaging mobile app with a bogus conversation between the student researcher who asked for help with the survey and a fictitious UX practitioner who would happily agree to take part in the study and share it with other UX colleagues. The visual was intended to draw the attention of UX practitioners by communicating the message in a similar fashion they are used to from their professional life, making them more likely to take part in the study rather than by posting a simple text message.

Sketch was used again to create a mobile-friendly visual which can be seen in Appendix D for the bias blind spot scale. More information about the scale can be found in the measurement section. Every visual presented the information together with related icons\(^4\). All the participants were exposed to the same visuals and the same amount. According to the learning theories from visual literacy, people process information better and faster when visuals accompany textual information (Aisami, 2015; Chen, 2004) which is a common practice used by teachers to help students to learn and remember more easily the information. This justifies the reason for delivering the content of the study in a more eye-catching manner. A lean method was needed to increase the likelihood of a big sample of UX practitioners to voluntarily participate in the study. Moreover, given the sample consisting of creative people from the UX field, there is a higher likelihood that their communication preference to be visual.

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\(^3\) Sketch is a software primarily used for user interface and user experience design of websites and mobile apps.

\(^4\) Icons used were downloaded from the platform TheNounProject.
Measurements

Bias Blind Spot. Bias blind spot was measured with a self-reported 10-item scale on a 7-point Likert scale anchored at 1 = highly unlikely, 4 = neither likely nor unlikely, 7 = highly likely. All items required a score; thus, they could not be skipped by the participants. The scale was adapted from Scopelliti and colleagues (2015) and tailored to the sample based on the cognitive biases which were most likely to arise in the UX process. In this way, internal reliability and construct validity were ensured. The scale consisted of five different cognitive biases (confirmation bias, anchoring effect, status quo bias, sunk cost fallacy, and framing effect) presented in random order. The choice of these particular five cognitive biases is supported by anecdotal evidence which indicates that these are among the most common cognitive biases which might arise in the UX process (NNgroup, 2019; Subramanian, 2018; Justinmind, 2017). Since there is no scientific support for which cognitive biases are most likely to arise among UX practitioners, thus after careful consideration, it was assumed that the current sample has a high likelihood to relate to the work experiences found online of other UX practitioners. Each cognitive bias was explained as a general tendency that people have while avoiding as much as possible the words “bias” or “error”. In this way, the association with anything negative was prevented as much as possible as it could have had an influence on the self-assessment of participants. It is expected, however, that most participants would recognize that the study is about cognitive biases as it is such a popular topic in psychology. Nevertheless, this should not have had a significant impact on the answers because the core assumption of the paper was that they would blind to their own susceptibility even when they had the knowledge about cognitive biases. The explanation of each cognitive bias was then followed by a relevant example from the UX context to describe how this tendency might be experienced during the UX process. These
examples were constructed based on both scientific and anecdotal evidence as the information was scarce. Each cognitive bias was presented individually, followed by the same two items with answers on a 7-point Likert scale (1 = *highly unlikely*, 4 = *neither likely nor unlikely*, 7 = *highly likely*): 1) How likely is that you would exhibit this tendency? 2) How likely is that the average UX practitioner would exhibit this tendency? It can be argued that when measuring the bias blind spot, it is important to customize the scale for the chosen sample with the most relevant cognitive biases. The perceived difference between the self and other (average UX practitioner) is of relevance not the measurement of the given tendencies; the bigger asymmetry between the self-other score at the expense of other the higher bias blind spot. A complete list of the five cognitive biases together with the explanation and example given can be found in Table 1 below.

To prepare the data for the analysis, five new variables were computed for each of the five cognitive biases ($\Delta = \text{other score} - \text{self score}$). This allowed for computing the scores for the bias blind spot which represented the average of the five newly computed variables; a big score represented a bigger perception difference between the self-other, thus a greater bias blind spot. A score equal or close to the value of 0 represented a small difference in perception between self-other, thus no or small bias blind spot.

Table 1

*Cognitive biases with explanation and example*

<table>
<thead>
<tr>
<th>Bias</th>
<th>Explanation</th>
<th>UX related example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Confirmation bias</td>
<td>Research shows that people have the tendency to favor information that confirms one’s previously existing beliefs (Tversky &amp; Kahneman, 1981).</td>
<td>For example, UX practitioners might run A/B tests until they show the impact they hoped for. If the tests aren’t showing the desired result, they might make up stories for why it did not work and why the original theory still stands true.</td>
</tr>
</tbody>
</table>
### Framing effect
Research shows that people decide on options based on whether the options are presented with positive or negative connotations (Tversky & Kahneman, 1981).

For example, a study showed that designers rated the importance of a redesign based on how the information was presented. When the information was presented 20% of the users couldn’t find the function on the website, 51% of designers voted for a redesign. When the same information was presented as 80% of the users could find the function on the website 39% of designers voted for a redesign.

### Anchoring effect
Research indicates that people tend to rely too heavily on the first piece of information they see (Sugden, Zheng, & Zizzo, 2013).

For example, a UX practitioner presents first a hi-fi prototype. After some improvements, the UX practitioner presents the team a new version to get feedback. People judgments might be influenced by the 1st prototype and give feedback through comparison which is not useful as the current version is the improved version.

### Status quo bias
Psychologists found that people have a preference for the current state of affairs (Samuelson & Zeckhauser, 1988; Kahneman, Knetsch, & Thaler, 1991).

For example, a UX practitioner might resist to reconsider design choices in their prototypes. They focus more on what they could lose by abandoning their current design choices, rather than what they could gain by trying something new.

### Sunk cost fallacy
Research shows that decisions are influenced by the emotional investment into something. The more resources you invested into a project, the harder it becomes to abandon it (Arkes & Ayton, 1999).

For example, a UX practitioner might have spent several days into polishing prototypes and prepare for user testing. Unfortunately, user tests might reveal a lot of negative feedback. It could be the case that the UX practitioner ignores the feedback and go further to development with their prototypes as they spent so much effort into those it must be good.

**Note:** The citations were not included in the survey as the names of the researchers might be easily recognized by the participants and associated it with the concept of cognitive bias, such as Daniel Kahneman’s best-selling book “Thinking Fast and Slow”.
Implementation intention. The manipulation of the study consisted of an implementation intention. Participants in the experimental condition were asked at the beginning of the study to silently say to themselves “If I need to evaluate myself then I will consider how other UX practitioners would evaluate me” and tick the box that they would commit to act on it. This is an adaptation of the (Achtziger, Gollwitzer, & Sheeran, 2008) used in a dieting study. The implementation intention linked the situation or cue (self-assessment) with the desired behavior (considering how another UX practitioner would evaluate me) to accomplish the goal (debiasing). In this way, the participants who are in the situation in which they need to assess their susceptibility to cognitive biases and of others would engage in perspective-taking. Perspective-taking has been found effective in decreasing stereotyping and ingroup favoritism (Gallinsky & Ku, 2004; Gutierrez et al., 2014). The implementation intention was intended to reduce the introspection illusion by making UX practitioners to also consider the information (e.g. beliefs, perspective) of others rather than only the information acquired through introspection. In this way, hopefully, it would make them feel more empathetic and similar to other UX practitioners.

Socio-demographics. Socio-demographical questions were not mandatory and included gender (female/male/prefer not to say/other), age, years of experience (less than 1 year, 1-3 years, 3-5 years, +5 years), and nationality.

Purpose of the study. At the end of the study, participants were asked about the intent of the study. This question was meant to exclude those who were familiar with implementation intentions or debiasing methods.

Manipulation check. In order to check whether participants paid attention to the manipulation of the study (implementation intention), they were asked what the sentence they
read at the beginning of the study was. Two implementation intentions were provided, one was the correct one (If I need to evaluate myself then I will consider how other UX practitioners would evaluate me) and the second one was a reversed option (If I need to evaluate another UX practitioner then I will consider how I would evaluate myself).

**Procedure**

Participants opened the Qualtrics survey link via a private chat on LinkedIn or in one of the online groups mentioned previously. Once the informed consent was signed (see Appendix C), participants were randomly allocated to one of the two conditions (control or experimental). Both conditions read briefly the instructions of the study. The experimental condition was asked to read the implementation intention (If I need to evaluate myself then I will consider how other UX practitioners would evaluate me”) and silently say it to themselves. After this, they had to tick the box promising that they would commit to act upon it. The implementation intention was not shown to the control condition. Next, all the participants completed the bias blind spot scale (see Appendix D), several socio-demographical questions, and the question about the purpose of the study (see Appendix E). The experimental condition had an extra question as a manipulation check (see Appendix F) to make sure they paid attention to the manipulation. The survey ended with a debriefing and a note of thanks for time and participation (see Appendix G). The experimental procedure is illustrated in Figure 2 below.
Before spreading the survey online, a small pilot study ($n = 5$) was conducted to check whether the instructions of the study were clear and whether the UX examples applied to the UX practitioners. The feedback was incredibly positive as the UX practitioners reported that the five tendencies (cognitive biases) were highly likely to arise in their work (e.g. “I think that the questions are tailored very well and that they are relevant to UX process.”). The five UX practitioners from the pilot study were included in the final sample.

**Results**

**Manipulation check**

The data was examined in SPSS. Regarding the conditions of the study, 65 participants were in the control condition while 65 were in the experimental condition. Six participants failed the manipulation check. This could be attributed to a lack of attention at the beginning of the study. Because this might interfere with the effect of manipulation on the dependent variable, they were excluded from the analysis. Thus, the main analysis is run with the omission of six participants who failed the manipulation check. After the exclusion, there were 64 participants in the control condition and 60 participants in the experimental condition.
Purpose of the study

There was no answer which indicated that the study was about debiasing UX practitioners, so no participants were excluded from the data based on this criterion.

Bias Blind Spot

The internal consistency of the newly constructed scale was checked before interpreting the results. The bias blind spot scale showed a Cronbach’s alpha of .76 which can be generally considered an acceptable value for reliability (Taber, 2017).

Before testing the effects of implementation intention on bias blind spot, it is important to check the core assumption of UX practitioners displaying this cognitive bias in the current sample. To examine the first hypothesis, whether UX practitioners exhibit the bias blind spot, a one-sample t-test was conducted with the control condition ($n = 64$). The skewness is 1.20 and the Kurtosis shows a value of 3.78 which indicates that the distribution is highly skewed. The skewness of the data was expected prior to the analysis, as the bias blind spot was estimated to be low to moderate among UX practitioners for both conditions. This means that the assumption of normality is violated, so a bootstrapped one-sample t-test was conducted. The bias blind spot scores of the control condition ($M = 1.03, SD = .85, SE = .10$) differ significantly from the 0 value; the difference, 1.02, BCa 95% CI [.82, 1.23] was significant $t(63) = 9.66, p < .01$. This self-other asymmetry is apparent in the scores of each of the five cognitive biases (see Table 2); The means and standard deviations for the perceived susceptibility of the self and other on each cognitive bias ($n = 64$) can be seen in Table 3.
Table 2

One-sample t-test with each of the five bias blind spot items as the dependent variable; n = 64, test value = 0

<table>
<thead>
<tr>
<th>Bias Blind Spot Scale items</th>
<th>M</th>
<th>SD</th>
<th>Mean difference</th>
<th>SE</th>
<th>t</th>
<th>p</th>
<th>BCa 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Δ Framing effect</td>
<td>.43</td>
<td>.97</td>
<td>.43</td>
<td>.12</td>
<td>3.59</td>
<td>.00*</td>
<td>[.21, .66]</td>
</tr>
<tr>
<td>Δ Confirmation bias</td>
<td>1.23</td>
<td>1.31</td>
<td>1.23</td>
<td>.16</td>
<td>7.56</td>
<td>.00*</td>
<td>[.93, 1.54]</td>
</tr>
<tr>
<td>Δ Status quo bias</td>
<td>1.14</td>
<td>1.69</td>
<td>1.14</td>
<td>.21</td>
<td>5.40</td>
<td>.00*</td>
<td>[.75, 1.53]</td>
</tr>
<tr>
<td>Δ Sunk cost fallacy</td>
<td>1.60</td>
<td>1.42</td>
<td>1.60</td>
<td>.18</td>
<td>9.06</td>
<td>.00*</td>
<td>[1.24, 1.98]</td>
</tr>
<tr>
<td>Δ Anchoring effect</td>
<td>.71</td>
<td>1.24</td>
<td>.71</td>
<td>.15</td>
<td>4.63</td>
<td>.00*</td>
<td>[.44, 1.01]</td>
</tr>
</tbody>
</table>

Note: bootstrap results are based on 1000 bootstrap samples, *p < .01

Table 3

Descriptive statistics for the bias blind spot items (n = 64)

<table>
<thead>
<tr>
<th>Bias Blind Spot Scale items</th>
<th>M self</th>
<th>SD self</th>
<th>M other</th>
<th>SD other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Framing effect</td>
<td>4.66</td>
<td>1.46</td>
<td>5.09</td>
<td>1.24</td>
</tr>
<tr>
<td>Confirmation bias</td>
<td>2.63</td>
<td>1.56</td>
<td>3.86</td>
<td>1.60</td>
</tr>
<tr>
<td>Status quo bias</td>
<td>3.00</td>
<td>1.59</td>
<td>4.14</td>
<td>1.50</td>
</tr>
<tr>
<td>Sunk cost fallacy</td>
<td>2.22</td>
<td>1.42</td>
<td>3.83</td>
<td>1.77</td>
</tr>
<tr>
<td>Anchoring effect</td>
<td>3.98</td>
<td>1.56</td>
<td>4.70</td>
<td>1.32</td>
</tr>
</tbody>
</table>

Note: Participants' perceptions of their own and the "average UX practitioner's" susceptibility to each of the five tendencies (cognitive biases) in their work based on the online survey.

In order to test the short-term effects of the implementation intention as a debiasing tool for bias blind spot, an independent samples t-test was conducted. Before doing so, the assumption of normality was checked. The results showed that the data was highly skewed in the
control condition, and as mentioned previously for the control condition, the Kurtosis showed a value of 3.78. The experimental condition data was moderately skewed (.77) and the Kurtosis value was .25. Because the assumption of normality was not met, a bootstrapped independent-sample t-test was conducted. These results indicate that the experimental condition ($M = .70$, $SD = .72$, $SE = .09$) experienced a reduction of bias blind spot after reading the implementation intention as compared to the control condition ($M = 1.02$, $SD = .85$, $SE = .10$). The difference, $32$ ($SE = .13$), BCa 95% CI [.05, .60] was statistically significant $t(122) = 2.29, p = .02; d = .40$ with equal variances assumed.

Finally, to test whether years of experience moderate the relationship between implementation intention and bias blind spot, a multiple linear regression analysis was conducted with bias blind spot as the dependent variable and condition and years of experience as independent variables. Before the moderation analysis was performed, the assumptions of outliers, homoscedasticity, and linearity were checked. SPSS detected three outliers. One of the outliers was in the control condition and two in the experimental condition. The outliers represented several extreme scores as participants rated themselves as highly immune to cognitive biases while rating the average UX practitioner as highly susceptible. For the control condition, the answer was in line with the expectations thus, it was not removed from the data set. The extreme answers from the experimental conditions were also included indicating that the effects of the debiasing method might not have worked on each participant. For this analysis, the PROCESS procedure (model 1) created by Andrew Hayes was used (Hayes, 2018) as it provides better estimations of the true population through bootstrapping. This using bootstrapping, the assumption of normality was met. The number of bootstrap samples for this analysis was 5000. In addition, PROCESS was used to
meet the assumption of homoscedasticity automatically. Finally, the assumption of linearity is met by using dummy coding for the two independent variables.

The first group (up to one year of experience) was used as the reference group. The results indicated that the model was a significant predictor of bias blind spot, explaining 13.72% variance, $F(7, 113) = 2.56, p = .01$. Next, the interaction term between condition and years of experience was added to the regression model, however, the added proportion of the variance explained was not significant, $R^2 = .04, F(3, 113) = 2.13, p = .09$. In addition, there was no main effect of condition ($p = .14$) nor any statistical interaction effect at any of the four levels of experience. The results of the linear regression analysis can be found in Table 4 below and the descriptive statistics in Table 5.

Table 4

*Regression Analysis Summary for Condition and Experience Predicting Bias Blind Spot ($n = 121$)*

<table>
<thead>
<tr>
<th>Predictor</th>
<th>B</th>
<th>SE(B)</th>
<th>95% CI</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Constant)</td>
<td>.85</td>
<td>.29</td>
<td>[.27 – 1.43]</td>
<td>72.93</td>
<td>.00</td>
</tr>
<tr>
<td>Condition</td>
<td>-.53</td>
<td>.36</td>
<td>[-1.25 – .18]</td>
<td>22</td>
<td>.14</td>
</tr>
<tr>
<td>Less than 1 year</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>1 – 3 years</td>
<td>.34</td>
<td>.33</td>
<td>[-.32 – 1.00]</td>
<td>1.00</td>
<td>.30</td>
</tr>
<tr>
<td>3 – 5 years</td>
<td>-.40</td>
<td>.41</td>
<td>[-1.21 – .41]</td>
<td>-.96</td>
<td>.33</td>
</tr>
<tr>
<td>More than 5 years</td>
<td>.26</td>
<td>.32</td>
<td>[-.38 – .91]</td>
<td>.79</td>
<td>.42</td>
</tr>
<tr>
<td>Condition* 1-3 years</td>
<td>-.11</td>
<td>.45</td>
<td>[-1.00 – .78]</td>
<td>-.24</td>
<td>.80</td>
</tr>
<tr>
<td>Condition* 3-5 years</td>
<td>.93</td>
<td>.50</td>
<td>[-.07 – 1.93]</td>
<td>1.83</td>
<td>.06</td>
</tr>
<tr>
<td>Condition* + 5 years</td>
<td>.41</td>
<td>.43</td>
<td>[-.44 – 1.27]</td>
<td>.95</td>
<td>.34</td>
</tr>
</tbody>
</table>

*Note.* B represents unstandardized regression weights. CI = confidence interval for B; LL and UL indicate the lower and upper limits of a confidence interval.
Table 5

*Descriptive statistics for the bias blind spot across all levels of experience (n = 121)*

<table>
<thead>
<tr>
<th>Years of experience</th>
<th>n</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 1 year</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>control</td>
<td>7</td>
<td>.85</td>
<td>1.15</td>
</tr>
<tr>
<td>experimental</td>
<td>13</td>
<td>.32</td>
<td>.50</td>
</tr>
<tr>
<td>1 – 3 years</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>control</td>
<td>22</td>
<td>1.20</td>
<td>.93</td>
</tr>
<tr>
<td>experimental</td>
<td>13</td>
<td>.55</td>
<td>.65</td>
</tr>
<tr>
<td>3-5 years</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>control</td>
<td>7</td>
<td>.46</td>
<td>.43</td>
</tr>
<tr>
<td>experimental</td>
<td>15</td>
<td>.85</td>
<td>.74</td>
</tr>
<tr>
<td>More than 5 years</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>control</td>
<td>27</td>
<td>1.12</td>
<td>.74</td>
</tr>
<tr>
<td>experimental</td>
<td>17</td>
<td>1.00</td>
<td>.80</td>
</tr>
</tbody>
</table>

As mentioned previously in the participants section, those who abandoned the survey after filling in one or two items of the scale were excluded from the data set. This could generate some criticism as the strict choice of five items measuring bias blind spot is not scientifically grounded. Rating oneself higher than the average UX practitioner on any of five items could already indicate the presence of the bias blind spot. Thus, a separate analysis was conducted with the inclusion of incomplete answers. The inclusion represented all participants who filled in at least two items (one cognitive bias). Because participants did not reach the sociodemographic questions, only the first two hypotheses could be tested which did not involve the years of experience. The hypotheses tested checked whether UX practitioners display the bias blind spot and whether implementation intention reduced the bias blind spot in the experimental condition. The analysis with the inclusion of the incomplete answers showed no difference in results.
compared to the analysis with the exclusion of the incomplete answers. These separate findings can be found in Appendix H.

**Discussion**

The current study started with the assumption that UX practitioners display a bias blind spot which was further statistically examined (H1). It was subsequently hypothesized that the bias blind spot could be reduced with the help of an implementation intention (H2) and that this relationship would be moderated by the years of experience (H3). The findings partially support these hypotheses.

Namely, the current sample of UX practitioners did display a bias blind spot \((p < .01)\) which is in line with previous findings of the existence of the phenomenon (Pronin, 2008; Pronin, 2007; Scopelliti et al., 2015). Secondly, the implementation intention showed a significant short-term medium debiasing effect \((d = .40)\) among UX practitioners \((p = .02)\). The finding that implementation intention might be useful in reducing biases is in line with by previous research on racial biases and implicit stereotypes (Stewart and Payne, 2008; Mendoza, Gollwitzer, & Amodio, 2010; Devine, Forscher, Austin, & Cox, 2012). However, the third hypothesis that the years of experience would moderate the relationship between implementation intention and bias blind spot was not supported by the findings \((p = .09)\). The results support the short-term effects of implementation intention as a tool for debiasing bias blind spot but only when checked in isolation. When adding years of experience to the model, the effect of condition (control vs. experimental) was not significant anymore \((p = .14)\). This indicates that using an implementation intention to debias bias blind spot among UX practitioners might have not been strong enough.
An odd finding was that the mean of the group with 3-5 years of experience displayed a non-significant higher bias blind spot in the experimental condition than in the control group. There might be no appropriate explanation for this finding rather than the fact that there were only seven participants in the control group as compared to fifteen in the experimental group. The sample size was too small and individual differences could have played a major role in these results.

Next, the finding that years of experience did not moderate the relationship between implementation intention and bias blind spot may be explained by several considerations that might be also a limitation of the study - creating an ordinal variable for years of experience. In hindsight, this variable should have been continuous, as differences between only four levels of experience do not fairly compare UX practitioners. For example, there might be substantial differences between UX practitioners with five years of experience and those with fifteen years of experience. Moreover, measuring bias blind spot may have been unfavored the group with the highest level of experience. Perhaps, asking UX practitioners to rate a UX practitioner with the same level of experience could have been a better measurement question as compared to rating the average UX practitioner. The seniors (+5 years of experience) may have displayed the highest score on bias blind spot and also the smallest reduction of bias blind spot simply because they are somehow justified to rate themselves higher than the average UX practitioner. As they have more experience in the field, they may indeed be learned from mistakes and become more familiar with the cognitive biases which arise in the UX process. Following the same reasoning, one might expect juniors (up to 3 years of experience) to score themselves lower than the average UX practitioner as they might feel insecure being at the beginning of their career, but scores showed the opposite. On one hand, it was hypothesized that the more experienced the UX practitioners are the higher the bias blind spot. On the other hand, the opposite might hold. The
means of each group are in line with the Dunning-Kruger effect which is a type of cognitive bias in which those who are less skilled overestimate their abilities while those who are the more skilled underestimate their abilities. The Dunning-Kruger effect represents a U-shaped between the confidence in one’s skills and the level of expertise (Dunning, 2011). In the current study, the middle group (3-5 years) showed the lowest bias blind spot score as compared to the other groups.

Another alternative explanation for the nonsignificant moderation might be the false assumption that years of experience would imply expertise. Retrospectively, the experience variable should have been represented by the titles held by the UX practitioners (e.g. junior, senior). Years of experience do not equal expertise, as UX practitioners are advancing in their careers at different speeds depending on their abilities. Thus, the position of the UX practitioners within a company might have been a better indication for their level of expertise as compared to years of experience.

No covariates were included in the analysis as research does not show any correlates of bias blind spot except the level of education. Previous research shows that bias blind spot decreases with the level of education (Scopelliti et al., 2015) but we assume our sample is highly educated as all participants are practitioners in the field. Still, there are some important limitations of the study which need to be discussed.

Limitations

One of the most important limitations of this study is the use of observed difference scores when computing bias blind spot scores; it can be seen as the differences between two components (the self score and the other score). Using difference scores is usually less reliable than using their component variables as they are treated as indicators of the “true score” which
can be a threat to the construct validity. This is still a common practice in research, despite generating several issues which are well-known in the psychometric literature (Peter, Gilbert, Churchill, & Brown, 1993). In addition, this is particularly problematic when examining predictors (Furr, 2011). In hindsight, an alternative to analyze the difference scores might have been more appropriate. For example, Furr (2011) suggests that a potential way to do it is to avoid difference scores altogether and to focus on two separate analyses (ANOVA or regression) of the components as dependent variables.

Another possible shortcoming of the study is that the participants might have filled in the bias blind spot scale judging solely on the examples given rather than the general tendencies presented. This could be a threat to the construct validity of the research. The intended scope of the UX examples was to facilitate understanding about how those five tendencies (cognitive biases) relate to their work but it could be the case that the examples were not understood and/or treated as intended. In this case, it is possible that the scale measured the perceived susceptibility to the UX examples given rather than the general cognitive biases.

Lastly, another limitation of this study could be the cultural background of the participants. More than half of the UX practitioners come from or live in WEIRD societies (Western, Educated, Industrialized, Rich, Democratic) (Henrich, Heine, & Norenzayan, 2010). Culture can greatly influence the way people perceive themselves compared to others. A meta-analysis found that Westerners are more likely than Easterners to self-enhance one’s qualities (Heine, Kitayama, & Hamamura, 2007). The concept of individualism can explain this tendency in the Western world. Individualistic societies seek independence and uniqueness, thus there is a high likelihood that individuals would enhance their self to stand out. The opposite is happening in collectivistic societies which value harmony and group well-being.
Interestingly, there are also rather contradictory findings in which self-enhancement is predicted by the income inequality within a country. The findings indicate that societies with income inequality tend to see themselves as superior to others while societies with income equality tend to perceive themselves as more similar to their peers. It seems to be the case income inequality may nurture competition between individuals which fosters a greater level of self-enhancement (Loughnan et al., 2011). Thus, it can be concluded that culture and income inequality may explain some variance in the self-enhancement motives, possibility reflected in bias blind scores.

**Implications and further research**

Concerning theoretical implications, this study provides support for the bias blind spot phenomenon and the short-term effects of implementation intention as a debiasing tool. First and foremost, there is a need for a better understanding of the bias blind spot phenomenon and the factors which could have an impact on it. Focusing on this particular type of bias might be the key to overcoming other cognitive biases in judgment across other professional domains. Further research could investigate bias blind spot in relation to other factors that have not been investigated yet, such as culture and income equality within their country.

The current findings support the short-term effect of implementation intention, thus further research should investigate the long-term effects of implementation intention as a debiasing tool. It can be argued that a debiasing tool that works at the unconscious level has more chances to be effective (Aczel et al., 2015) compared to other methods that have been previously tested (e.g. trainings, video games, and warnings) as cognitive biases arise without one’s awareness. In addition, the significant short-term debiasing effect of this study may indicate the debiasing effects of perspective-taking on bias blind spot framed as an
implementation intention. As implementation intention can be seen more as a flexible template that allows for various links between situations and desired behavior than a standalone debiasing tool, further research could investigate different implementation intentions for various UX scenarios. It may be that the more specific a situation is, the stronger mental link to activate the desired behavior.

The practical implications that debiasing bias blind spot has, relate to three main areas: judgment, decision-making, and collaboration. There may be undeniably obvious benefits of improved judgment (e.g. organizational skills, healthy interpersonal relations) and these are linked to improved decision-making (Balazs, 2015). Decision-making affects our daily life and it is considered a crucial determinant of quality of life and societal well-being (Sellier, Scopelliti, & Morewedge, 2019), thus the advantages of debiasing can transfer to both professional and private life. It is apparent that better judgment and decision-making are important for UX practitioners when they inform the design choices that affect the lives of millions of people. Perhaps, a less obvious implication of debiasing bias blind spot is ethical decision-making. It seems to be the case that bias blind spot effects may undermine behavioral ethics. Research shows that people have an ethical blind spot, making them behave in unethical ways without awareness of the negative contribution (Sezer, Gino, & Bazerman, 2015). A study by Tomlin, Metzger, Bradley-Geist, and Padron (2017) addressed the importance of self-perception biases (bias blind spot) on ethics education stating that traditional ethics education is not enough to achieve its purpose as student fail to recognize their proneness to ethics blind spot. Their findings supported the assumption as students were able to recognize real-world ethical dilemmas after acknowledging their own susceptibility to biases.
The other area relates to collaboration. As UX practitioners usually work as a team to solve a problem, collaboration is one of the most important determinants of success; collaboration among UX practitioners and between UX practitioners and other disciplines (e.g. designers, software developers) (Jones & Thoma, 2019; Kuusinen, 2014; Yiu, 2013). The implications for UX collaboration are especially relevant nowadays given the current global pandemic (COVID-19) which rapidly has been shifted the world to the new normal: remote work and online collaboration. While sharing knowledge and expertise are important for success, they may not be not enough for effective collaborative work. The social skills of the team members are essential - knowing how to effectively deliver and receive knowledge (Notari, Baumgartner, & Herzog, 2013). As earlier indicated, bias blind spot was associated with resistance to advice taking (Scopelliti et al., 2015); people who score high on this bias tend to believe that their view or opinion is superior compared to others, thus they are more likely to reject advice and feedback which is very important when collaborating. The belief superiority concept could explain the tendency to reject advice or feedback. This manifest when people are strongly confident that their opinion is correct. Unfortunately, a set of experiments showed that those who believed that their opinion was superior were the least informed, while those with lowest belief superiority underestimated how much they knew (Hall & Raimi, 2018). Their findings are in line with the Dunning-Kruger effect mentioned previously in the paper (Dunning, 2011). The same study by Hall and Raimi (2018) revealed also that those with high belief superiority were more likely to neglect the incongruent information and reject any chance to enhance their knowledge as compared to those with low belief superiority. Hence, there might be an indication that bias blind spot may is linked to belief superiority which is detrimental to successful collaboration.
Conclusion

The current study evaluated the short-term effects of implementation intention as a debiasing tool among UX practitioners. Overall, the results convey that UX practitioners do display a bias blind spot by rating themselves as less susceptible to cognitive biases than the average UX practitioner. These findings provide support for the existence of the bias blind spot phenomenon. In addition, the significant medium effect size of the short-term impact of the implementation intention contributes to the existing debiasing literature. Years of experience in the UX field may play a role in the magnitude of perceived susceptibility to cognitive biases. However, the current study did not provide support for this. The findings can be generalized to a population of W.E.I.R.D. UX practitioners with different levels of experience. Suggestions for further research were provided as there is a need to examine further the concept bias blind spot in order to contribute to improving human judgment by considering other possible factors that could explain the variance in bias blind spot, such as culture, income inequality, and UX position. This has important practical and theoretical implications for the professional and private life of UX practitioners and beyond.
References


O'Brien, R. (2018, August 1). *5 reasons why UX design is important for your business*. Retrieved April 2020, from NewIcon: https://www.newicon.net/5-reasons-why-ux-design-is-important-for-business/

Oliver, G., Oliver, G., & Body, R. (2017). Poor evidence on whether teaching cognitive debiasing or cognitive forcing strategies, lead to a reduction in errors attributable to cognition in emergency medicine students or doctors. *Emergency Medicine Journal, 34*(8), 34, 553–554. doi:10.1136/emermed-2017-206976.2


### Tables

**Table 2**

*One-sample t-test with each of the five bias blind spot items as dependent variable; n = 64, test value = 0*

<table>
<thead>
<tr>
<th>Bias Blind Spot Scale items</th>
<th>M</th>
<th>SD</th>
<th>Mean difference</th>
<th>SE</th>
<th>t</th>
<th>p</th>
<th>BCa 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Δ Framing effect</td>
<td>.43</td>
<td>.97</td>
<td>.43</td>
<td>.12</td>
<td>3.59</td>
<td>.00*</td>
<td>[.21, .66]</td>
</tr>
<tr>
<td>Δ Confirmation bias</td>
<td>1.23</td>
<td>1.31</td>
<td>1.23</td>
<td>.16</td>
<td>7.56</td>
<td>.00*</td>
<td>[.93, 1.54]</td>
</tr>
<tr>
<td>Δ Status quo bias</td>
<td>1.14</td>
<td>1.69</td>
<td>1.14</td>
<td>.21</td>
<td>5.40</td>
<td>.00*</td>
<td>[.75, 1.53]</td>
</tr>
<tr>
<td>Δ Sunk cost fallacy</td>
<td>1.60</td>
<td>1.42</td>
<td>1.60</td>
<td>.18</td>
<td>9.06</td>
<td>.00*</td>
<td>[1.24, 1.98]</td>
</tr>
<tr>
<td>Δ Anchoring effect</td>
<td>.71</td>
<td>1.24</td>
<td>.71</td>
<td>.15</td>
<td>4.63</td>
<td>.00*</td>
<td>[.44, 1.01]</td>
</tr>
</tbody>
</table>

*Note: bootstrap results are based on 1000 bootstrap samples, *p < .01
Table 3

*Descriptive statistics for the bias blind spot items (n = 64)*

<table>
<thead>
<tr>
<th>Bias Blind Spot Scale items</th>
<th>M self</th>
<th>SD self</th>
<th>M other</th>
<th>SD other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Framing effect</td>
<td>4.66</td>
<td>1.46</td>
<td>5.09</td>
<td>1.24</td>
</tr>
<tr>
<td>Confirmation bias</td>
<td>2.63</td>
<td>1.56</td>
<td>3.86</td>
<td>1.60</td>
</tr>
<tr>
<td>Status quo bias</td>
<td>3.00</td>
<td>1.59</td>
<td>4.14</td>
<td>1.50</td>
</tr>
<tr>
<td>Sunk cost fallacy</td>
<td>2.22</td>
<td>1.42</td>
<td>3.83</td>
<td>1.77</td>
</tr>
<tr>
<td>Anchoring effect</td>
<td>3.98</td>
<td>1.56</td>
<td>4.70</td>
<td>1.32</td>
</tr>
</tbody>
</table>

*Note: Participants' perceptions of their own and the "average UX practitioner's" susceptibility to each of the five tendencies (cognitive biases) in their work based on the online survey*
Table 4

Regression Analysis Summary for Condition and Experience Predicting Bias Blind Spot (n = 121)

<table>
<thead>
<tr>
<th>Predictor</th>
<th>B</th>
<th>SE(B)</th>
<th>95% CI [LL, UL]</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Constant)</td>
<td>.85</td>
<td>.29</td>
<td>[.27 – 1.43]</td>
<td>72.93</td>
<td>.00</td>
</tr>
<tr>
<td>condition &gt;1 year</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>1 – 3 years</td>
<td>.34</td>
<td>.33</td>
<td>[.32 – 1.00]</td>
<td>1.00</td>
<td>.30</td>
</tr>
<tr>
<td>3 – 5 years</td>
<td>-.40</td>
<td>.41</td>
<td>[-1.21 -.41]</td>
<td>-.96</td>
<td>.33</td>
</tr>
<tr>
<td>+ 5 years</td>
<td>.26</td>
<td>.32</td>
<td>[-.38 -.91]</td>
<td>.79</td>
<td>.42</td>
</tr>
<tr>
<td>Condition* 1-3 years</td>
<td>-.11</td>
<td>.45</td>
<td>[-1.00 -.78]</td>
<td>-.24</td>
<td>.80</td>
</tr>
<tr>
<td>Condition* 3-5 years</td>
<td>.93</td>
<td>.50</td>
<td>[-.07 – 1.93]</td>
<td>1.83</td>
<td>.06</td>
</tr>
<tr>
<td>Condition* + 5 years</td>
<td>.41</td>
<td>.43</td>
<td>[-.44 – 1.27]</td>
<td>.95</td>
<td>.34</td>
</tr>
</tbody>
</table>

Note. B represents unstandardized regression weights. CI = confidence interval for B; LL and UL indicate the lower and upper limits of a confidence interval.
Table 5

*Descriptive statistics for the bias blind spot across all levels of experience (n = 121)*

<table>
<thead>
<tr>
<th>Years of experience</th>
<th>n</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 1 year</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>control</td>
<td>7</td>
<td>.85</td>
<td>1.15</td>
</tr>
<tr>
<td>experimental</td>
<td>13</td>
<td>.32</td>
<td>.50</td>
</tr>
<tr>
<td>1 – 3 years</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>control</td>
<td>22</td>
<td>1.20</td>
<td>.93</td>
</tr>
<tr>
<td>experimental</td>
<td>13</td>
<td>.55</td>
<td>.65</td>
</tr>
<tr>
<td>3-5 years</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>control</td>
<td>7</td>
<td>.46</td>
<td>.43</td>
</tr>
<tr>
<td>experimental</td>
<td>15</td>
<td>.85</td>
<td>.74</td>
</tr>
<tr>
<td>+ 5 years</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>control</td>
<td>27</td>
<td>1.12</td>
<td>.74</td>
</tr>
<tr>
<td>experimental</td>
<td>17</td>
<td>1.00</td>
<td>.80</td>
</tr>
</tbody>
</table>
Appendix A

Advertisement message for social media channels

Hi everyone! 😊 I am conducting a research about UX practitioners for my master thesis 🧑‍💻. If you would like to help me out (_faces) and contribute to science ( documento) click the link:

https://lnkd.in/gbgEaHi Sharing is caring. #UX #thesis #psychology
Appendix B

Ethical approval of the research

To whom it may concern

Declaration of Ethical Clearance

Date
04 May 2020

Identification code: REDC # 2020/094

Subject
Ethical clearance
research project by
Alwin de Rooij (PI) and Oana Bogdescu
REDC # 2020/094

Telephone
+31 13 466 25 95

E-mail
jan.jans@uvt.nl
tabd.redc@uvt.nl

This is to certify on behalf of the Research Ethics and Data Management Committee of Tilburg School of Humanities and Digital Sciences that Alwin de Rooij (PI) and Oana Marilena Bogdescu received ethical clearance for the research “Using implementation intention as a debiasing tool for UX practitioners’ bias blind spot” as outlined in the Application Form version 2 which was submitted on 02 May 2020. This ethical clearance is valid from 04 May 2020 until 31 July 2020 and according to the criteria of Tilburg University and the applicable Dutch regulations.

Yours sincerely,

[Signature]

Prof. dr. J. Schaafsma
Chair REDC

[Signature]

Dr. J.M.N.E. Jans
Secretary REDC
Appendix C

Informed consent

Welcome

Thank you for participating in this study by Tilburg University! Below you can find the information you need to know before you can start, *so please read it carefully.*

With this research, we want to gain more insight into the cognitive processes of UX practitioners. You will be asked to self-assess on five different tendencies which people have. Next, you need to do the same for the average UX practitioner. In this way, we can gain a better understanding of the perceptions of UX practitioners of each other. Studying their cognitive processes may, therefore, provide insights into how UX practitioners creatively work and collaborate efficiently.

There are no risks associated with participating in this study. All data collection is in accordance with the AVG (General Data Protection Regulation) law. The Research Ethics and Data Management Committee of Tilburg School of Humanities and Digital Sciences has reviewed and given permission to conduct this study. Data will be processed completely anonymously and treated with the utmost confidentiality. Under no circumstance will your name be linked to the results. The anonymized data from this study will be kept for 10 years, and data can only be shared with other researchers upon request.

Participation is entirely voluntary and during this study, you have the right to withdraw at any time, for any reason, and without any adverse consequences. If you have questions about this study, you may contact Oana Bogdescu (o.m.bogdescu@tilburguniversity.edu). If you have any remarks or complaints regarding this research, you may also contact the “Research Ethics and
When you agree to participate in this study, you confirm that you:

- ✓ have carefully read the information given above;
- ✓ are older than 18 years;
- ✓ know that you can withdraw at any time and without giving any reason;
- ✓ agree that your anonymized data will be stored for ten years;
- ✓ agree that the anonymized data can be used for possible follow-up research or scientific publications;
- ✓ agree that the anonymized data can be shared with other researchers;
- ✓ agree not to share the set-up and purpose of this experiment with others.

- O I agree and want to start with this study
- O I do not agree to participate in this study
Appendix D

Bias Blind Spot scale

1) Sunk cost fallacy

Research shows that decisions are influenced by the emotional investment into something.

The more resources you invested into a project, the harder it becomes to abandon it.

For example, a UX practitioner might have spent several days into polishing prototypes and prepare for user testing.

Unfortunately, the user tests might reveal a lot of negative feedback.

It could be the case that the UX practitioner ignores the feedback and go further to development with their prototypes as they spent so much effort into those it must be good.

- To what extent are you likely to exhibit this tendency?
- To what extent is the average UX practitioner likely to exhibit this tendency?
2) Framing effect

Research shows that people decide on options based on whether the options are presented with positive or negative connotations.

For example, a study showed that designers rated the importance of a redesign based on how the information was presented:

- **20% users couldn't find the function on the website**
  - 51% voted for redesign

- **80% users found the function on the website**
  - 39% voted for redesign

- To what extent are you likely to exhibit this tendency?
- To what extent is the average UX practitioner likely to exhibit this tendency?
3) Confirmation bias

Research shows that people have the tendency to favour information that confirms one's previously existing beliefs.

For example, UX practitioners might run A/B tests until they show the impact they hoped for.

If the tests aren't showing the desired result...

they might make up stories for why it did not work and why the original theory still stands true.

- To what extent are you likely to exhibit this tendency?
- To what extent is the average UX practitioner likely to exhibit this tendency?
4) Anchoring effect

Research indicates that people tend to rely too heavily on the first piece of information they see.

For example, a UX practitioner presents first a hi-fi prototype... after some improvements, the UX practitioner presents the team a new version to get feedback

People judgments might be influenced by the 1st prototype and give feedback through comparison which is not useful as the current version is the improved version

- To what extent are you likely to exhibit this tendency?
- To what extent is the average UX practitioner likely to exhibit this tendency?
5) Status quo bias

Psychologists found that people have a preference for the current state of affairs.

For example, a UX practitioner might resist to reconsider design choices in their prototypes.

- To what extent are you likely to exhibit this tendency?
- To what extent is the average UX practitioner likely to exhibit this tendency?
Appendix E

Socio-demographics and purpose of the study

Please fill in the following information:

1. Age
2. Gender (F/M/Prefer not to say/Other, namely)
3. Nationality
4. Profession (e.g. UX designer, UX researcher, UI specialist)
5. Years of experience in the field of UX
6. What do you think the study was about?
Appendix F

Manipulation check

At the beginning of the study, you were asked to read and commit to a statement.

What was that sentence?

1. If I need to evaluate myself then I will consider how other UX practitioners would evaluate me.
2. If I need to evaluate someone else, then I will consider how I would evaluate myself.
Debriefing and thank you message

You have now finished the experiment. Thank you for participating!

The purpose of this study was to examine the cognitive biases of UX practitioners. If you thought you may be biased, don’t worry, everyone is. This is something each one of us evolutionary inherited. Because of that, the aim of this study is to find a solution to reduce them.

If you have any questions or further remarks, please contact the principal investigator Oana Bogdescu (o.m.bogdescu@tilburguniversity.edu). For complaints about this study, you can also contact the Research Ethics and Data Management Committee of the Tilburg Schools of Humanities and Digital Sciences (tshd.redc@tilburguniversity.edu).

Thank you again for contributing to science! 😊
Appendix H

Analysis with the inclusion of all incomplete answers

The bias blind spot scores of the control condition \((n = 74, M = .98, SD = .86, SE = .10)\) differ significantly from the 0 value; the difference, \(.98, BCa 95\% CI [.77, 1.19]\) was significant \(t(73) = 9.73, p < .01\). This self-other asymmetry is apparent in the scores of each of the five cognitive biases (see Table 1); The means and standard deviations for the perceived susceptibility of the self and other on each cognitive bias \((n = 74)\) can be seen in Table 2.

Table 1

<table>
<thead>
<tr>
<th>Bias Blind Spot Scale items</th>
<th>M</th>
<th>SD</th>
<th>Mean difference</th>
<th>SE</th>
<th>t</th>
<th>p</th>
<th>BCa 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Δ Framing effect</td>
<td>.43</td>
<td>.97</td>
<td>.43</td>
<td>.12</td>
<td>3.59</td>
<td>.00*</td>
<td>[.21, .66]</td>
</tr>
<tr>
<td>Δ Confirmation bias</td>
<td>1.23</td>
<td>1.31</td>
<td>1.23</td>
<td>.17</td>
<td>7.56</td>
<td>.00*</td>
<td>[.90, 1.56]</td>
</tr>
<tr>
<td>Δ Status quo bias</td>
<td>1.14</td>
<td>1.69</td>
<td>1.14</td>
<td>.21</td>
<td>5.40</td>
<td>.00*</td>
<td>[.72, 1.57]</td>
</tr>
<tr>
<td>Δ Sunk cost fallacy</td>
<td>1.60</td>
<td>1.42</td>
<td>1.60</td>
<td>.17</td>
<td>9.06</td>
<td>.00*</td>
<td>[1.29, 1.89]</td>
</tr>
<tr>
<td>Δ Anchoring effect</td>
<td>.71</td>
<td>1.24</td>
<td>.71</td>
<td>.16</td>
<td>4.63</td>
<td>.00*</td>
<td>[.43, 1.04]</td>
</tr>
</tbody>
</table>

*Note: bootstrap results are based on 1000 bootstrap samples, *p < .01
Table 2

*Descriptive statistics for the bias blind spot items (n = 6=74)*

<table>
<thead>
<tr>
<th>Bias Blind Spot Scale items</th>
<th>M self</th>
<th>SD self</th>
<th>M other</th>
<th>SD other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Framing effect</td>
<td>4.66</td>
<td>1.46</td>
<td>5.09</td>
<td>1.24</td>
</tr>
<tr>
<td>Confirmation bias</td>
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<td>1.56</td>
<td>3.86</td>
<td>1.60</td>
</tr>
<tr>
<td>Status quo bias</td>
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<td>1.59</td>
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<td>1.50</td>
</tr>
<tr>
<td>Sunk cost fallacy</td>
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<td>1.42</td>
<td>3.83</td>
<td>1.77</td>
</tr>
<tr>
<td>Anchoring effect</td>
<td>3.98</td>
<td>1.56</td>
<td>4.70</td>
<td>1.32</td>
</tr>
</tbody>
</table>

*Note:* Participants' perceptions of their own and the "average UX practitioner's" susceptibility to each of the five tendencies (cognitive biases) in their work based on the online survey.

To test the second hypotheses a bootstrapped independent-samples t-test was conducted. The results indicated that the experimental condition (n = 71, M = .62, SD = .79, SE = .09) experienced a reduction of bias blind spot after reading the implementation intention as compared to the control condition (n = 74, M = .98, SD = .86, SE = .10). The difference, .35 (SE = .14), BCa 95% CI [.09, .62] was statistically significant t(143) = 2.58, p = .01; d = .43 with equal variances assumed.