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Research Statement

I am a social cognition researcher that uses cognitive modeling to understand important social psychological phenomena, such as race bias in decision-making and fundamental questions of self-control. I do this by employing cutting-edge mathematical models that provide insights into our underlying psychological processes. In addition, my methodological and analytic approaches are guided by the goal of improving psychological research standards, while being sensitive to the tradeoffs those reforms impose. Finally, my training in frequentist and Bayesian statistics provides me with the flexibility to approach analytic problems in multiple ways.

### **Cognitive Models as Tools to Better Understand Psychological Processes**

Cognitive models are used to uncover the psychological processes that underlie behavior. Many traditional models—such as common dual-process models—are descriptive, relying on verbal descriptions that are tested indirectly through behavioral proxies (e.g., measuring inhibition through self-report). However, it is difficult to falsify these models, because their predictions depend on how propositions are interpreted and whether the proxy is a valid measure of the process. In contrast, my work uses formal cognitive models that build relationships between cognitive processes and behavior in mathematical terms. These models have clear tests of falsifiability and can simultaneously estimate how multiple processes contribute to behavior. This allows quantitative comparisons between different process level accounts of behavior.

Much of my research uses the *drift diffusion model* (DDM). The DDM describes decisions as a single process where people start with some prior bias and then repeatedly sample information from the environment until a threshold is met, triggering the decision. The model simultaneously explains both decisions and their speed. Importantly, it quantifies the different components of the decision process and the effects of different variables on these components. This dynamic focus separates the DDM from static decision models more commonly known to social psychologists (e.g., process dissociation models), and makes the DDM better aligned with many real-world decisions (e.g., shooting decisions). With proper validation, it can be used to test hypotheses about psychological processes that mediate behavior. Below, I describe how I have applied the DDM to understand the processes underlying the decision to shoot and successful self-control.

Recent shootings of unarmed Black men have thrust into the national spotlight the issue of police use of lethal force. Research using laboratory shooting tasks has generally found that civilians 1) shoot unarmed Black men at higher rates than unarmed White men, and 2) are faster to correctly shoot armed Black men than armed White men. My colleagues and I (Pleskac, Cesario, & Johnson, *invited resubmission, Journal of Personality and Social Psychology*) used the DDM to understand how target race biases these decisions. This innovative approach to modeling decisions and their speed revealed no evidence of prior biases to shoot Black men, but instead found that target race influences information quality; guns and objects look *more like a gun* in the hands of Black men. This effect explains both bias in decisions and their speed. Interestingly, we also found a counter-stereotypic effect of target race on thresholds; participants were more cautious when making decisions for Black men, *reducing* errors. Thus, the DDM revealed a novel insight—the race of a target may have opposing effects on the decision process.

Building on this research, my dissertation investigates whether dispatch information (prior information given about a suspect by police dispatch) influences the decision to shoot in police officers. In several high-profile shootings of unarmed Black men (e.g., Tamir Rice, Alton Sterling), officers were given dispatch information that the individuals were armed. While these shootings may represent evidence for racial bias in police use of lethal force, they also raise the possibility that dispatch information might contribute to why officers used lethal force. I am currently collecting data for this project, but pilot results using the DDM show that providing information that a target is armed influences how information is accumulated. This suggests that dispatch information may change visual search strategies from exploratory to confirmatory. This produces faster and more accurate decisions when correct, but slower and less accurate decisions when wrong. Thus, decisions to shoot may be influenced to some degree by race but more closely by confirmatory search strategies.

The benefits of this process-level analysis are not just theoretical. Knowing *how* race impacts shooting decisions is crucial for designing effective training programs. A program to reduce prior biases to shoot Black men would be structured very differently than a program to reduce bias in how objects are interpreted. Similarly, if dispatch information changes how officers search for objects, training them to quickly identify weapons is likely to reduce the negative effects that arise when that information is wrong and no weapon is present. Another potential avenue is to explore differences in decision thresholds that reduce race bias. In the future I will test whether reduced race bias in shooting tasks is linked with increased caution, and whether this caution is mediated by concerns about appearing prejudiced.

In a separate line of research, I have used modeling to better understand the processes leading to successful self-control. Construal level theory proposes that high-level (versus low-level) mental construals facilitate self-control because temptations are evaluated in relation to goals. Fujita and Han (2009) induced high-level construals in dieters and found that this changed evaluations of goal relevant stimuli (apples) and temptations (candy) in an Implicit Association Test. This suggests that high-level construals can alter representations of temptations but does not explain the processes by which this change occurs. For example, does construal level change the strength of positive evaluations for goal relevant stimuli (e.g., apples are good to eat) or the strength of negative evaluations for temptations (e.g., candy will ruin my diet)? The DDM provides a way to disentangle these hypotheses. I reexamined this data with the DDM (Johnson, Fujita, & Han, *in prep*) and found evidence for both accounts: high-level construal increased associations between goal relevant stimuli and positivity *and* between temptations and negativity.

In addition to using cognitive models to in my research, I have encouraged others to use them by creating accessible introductions to these models. I recently submitted a paper that describes the benefits of cognitive modeling generally while focusing on how the DDM has provided insight into phenomena relevant to both social and personality researchers (Johnson, Hopwood, Cesario, & Pleskac, *under review, Social Psychological and Personality Science*). In this paper, I describe how advances in Bayesian modeling make it easy to implement the DDM in many social and personality tasks. In a similar vein, I have directly compared the DDM to a well-known formal dual process model, the process dissociation procedure (Johnson, Cesario, & Pleskac, *in prep*). Using data from the IAT and shooter tasks, I demonstrate that the DDM can answer questions difficult to tackle from a dual process approach.

## Improving Research Standards and Meta-Science

Given recent concerns about the veracity of psychological research and scientific work more generally, I am committed to aligning my experimental methods and statistical training with best research practices. One way I do this is through formal modeling. Unlike informal models, the models I rely on have a mathematical structure that can be directly tested in order to determine how well they describe behavior. This provides a safeguard to ensure that the models accurately describe the underlying psychological phenomena. I have also shown serious commitment to statistics by completing a concentration in quantitative methods. For this, I took classes in multivariate analysis, structural equations modeling, computational modeling, and wrote a manuscript that features these advanced methods. In addition, I traveled to the Max Planck Institute in Berlin in order to receive cognitive modeling training.

I am committed to increasing reproducibility in psychological science. I make my materials and data publically available, conduct high-powered studies, and replicate my own work. I also have contributed to the discipline by replicating well-known studies. For example, recent embodiment work has proposed that states like cleanliness might unintentionally influence moral judgments. However, there is debate about whether these states exacerbate the severity of moral judgments (Zhong, Strejcek, & Sivanathan, 2010) or attenuate them (Schnall, Benton, & Harvey, 2008). To test these accounts, I conducted a high-powered pre-registered direct replication of the latter study for a special issue on replication in *Social Psychology* (Johnson, Cheung, & Donnellan, 2014). Our results did not support either account and generated considerable discussion about how to interpret replication studies and psychological evidence. Based on this discussion, I conducted a direct replication of a similar study and tested several moderators (Johnson et al., 2016, *Social Psychological and Personality Science*). I believe that conducting high quality replications while also examining the conditions under which effects replicate is crucial for increasing the reproducibility of psychological science.

Another area where I have made contributions to reproducibility is work on power poses. Past work has shown that expansive “power” poses make individuals feel more powerful and act in ways consistent with possessing power (e.g., taking risky gambles). However, this work suffers from two critical issues. First, in studies individuals are not made aware of the true function of the power pose, whereas in the real world they *must* know the function of the pose in order to deliberately use it to yield better outcomes for themselves—a practical application suggested by pose researchers. Second, power pose studies typically measure power through contrived in-lab tasks rather than realistic tasks like interviews. My colleagues and I tested these questions in a direct replication and extension of the seminal power pose study (Carney, Cuddy, & Yap, 2010) for a special issue on power poses (Victor, Johnson, & Harder, *in principle acceptance, Comprehensive Results in Social Psychology*). Following best practices, this study was pre-registered, highly powered, and underwent review before and after data collection. Our results did not support the premise that power poses increase feelings of power or improve performance in a mock interview, and point to a need to refine existing theories on power poses.

Finally, I am committed to pursuing meta-scientific research. I collected data for the Reproducibility Project, a large-scale effort to estimate the reproducibility of psychological science (Open Science Collaboration, 2015, *Science*). I collected data for the Many Labs 3

project, which replicated and extended ten psychological effects by considering the role of semester timing and individual differences (Ebersole et al., in press, *Journal of Experimental Psychology*). I am also an author on a large-scale hypothesis crowdsourcing project. In this project, I and several other researchers independently generated materials to test six hypotheses. We are testing the extent to which results depend on subjective choices made when constructing materials—a simulation for how different researchers studying the same phenomenon often operate. In sum, the main reason I devote part of my time to meta-scientific research is because I believe that improving our research standards will allow us to be more confident in our science and improve our ability to use this work to solve real world problems.

### **Summary**

I use cutting-edge formal cognitive models to better understand social psychological phenomena. This research advances basic science by providing a better understanding of the psychological processes underlying behavior. It also has practical implications for designing effective training programs to reduce racial bias in shooting decisions and improving self-control. I compliment this substantive interest by contributing to meta-scientific work. I see all of this work as a service to the discipline, with the goal being to further the research standards of psychology.