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Research Dialogue

Refining the dual-process theory of preference construction: A reply to Gawronski, Martin and Sloman, Stanovich, and Wegener and Chien

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Abstract: Our target article proposed a dual-system framework for understanding context and task effects in choice. In this summary, we address the major points made by each set of commentators and, building on their suggestions, define a more precise dual-system theory of preference construction. We also propose some avenues for future research on a broader dual-system approach to understanding choice.

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Introduction

The primary purpose of our target article in this research dialogue was to foster a conversation among researchers in cognition, reasoning, heuristics, attitudes, and behavioral decision theory. We wrote the dialogue with the goal of noting that there remain many important missing links in our understanding of the processes that underlie preference construction in choice, which require further theory building and empirical support. We are delighted that four excellent commentaries have generated useful suggestions for refining our theory and have enhanced it by integrating the theory with other dual-process theories. In this response, we discuss the key observations raised by each set of commentators, clarify some misconceptions, and build on the commentators' suggestions to more precisely define the dual-system theory of choice. We also propose some future research directions for the study of choice. Our main objective in this research dialogue was to convey our enthusiasm for the important questions that remain unanswered in the study of choice, and we feel that the four commentaries echo this sentiment.

Gawronski

While Gawronski acknowledges that our dual-system framework of choice has integrative value due to the way it encompasses many preference construction effects, he identifies some conceptual concerns and suggests how they can be resolved by more precise theorizing about the mental processes involved. Gawronski argues that the framework fails to specify the operating principles, or mental operations, involved in preference construction. This limitation, he argues, makes the model less useful as a way of categorizing choice effects. He proposes processes from the associative-propositional evaluation (APE) model as a way to specify operating principles and make the model more complete.

We agree with Gawronski that it is useful to understand the mental processes underlying each system in order to make the framework more precise. Gawronski draws a distinction between operating principles (distinct processes underlying System I and System II) and operating conditions (conditions under which the two distinct processes operate) and states that our framework is imprecise about operating principles. While describing the operating principles of System I and System II was not the primary focus of the article, we did briefly define the mental processes by drawing on [Evans & Stanovich, 2013](#). We argued that System I processes are the workings of associative memory, which automatically happen to the decision maker and do not tax working memory. System II,

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on the other hand, comprises all thoughtful, deliberate, and willful processing, and its hallmark is the engagement of working memory. However, the exact mental processes for two systems are difficult to specify precisely because the two systems likely encompass many different cognitive processes. We agree that we could have emphasized operating principles more in the target article and that it would be useful in the future to closely consider the mental processes involved in choice.

We also agree with Gawronski that associative and propositional processes from the APE model are good candidates for operating principles because they are well-aligned with our conceptualization of the processes underlying System I and System II. In the APE model, affective reactions and evaluative judgments are the outcomes of two distinct processes: affective reactions are the output of associative processes, which are defined as the activation of associations in memory on the basis of feature similarity, whereas evaluative judgments are the outcomes of propositional processes, which are defined as the validation of momentarily activated information on the basis of logical consistency (Gawronski & Bodenhausen, 2011). One refinement we now introduce to System I is acknowledging that affective reactions are the output of System I processing. We therefore believe that associative processes from the APE model map on well to System I processes. Similarly, propositional processes map on to System II processes because both evaluate and validate inputs from associative processes.

However, there are a few key differences between the models. In the APE model, propositional processes not only evaluate activated associations, but may also create new associations, thereby changing the nature of affective processes. Second, there is no one-to-one mapping between the two kinds of processes and automaticity. Gawronski and Bodenhausen (2011) argue that associative processes can sometimes be intended and controlled, while propositional processes can be uncontrollable and can operate unintentionally, outside of awareness, and even without taxing cognitive resources. These differences motivate important future directions for the refinement of our model: further exploring the nature of the relationship between System I and II — specifically, considering whether the relationship may be bidirectional — and considering how the principles of automaticity map on to the two systems.

Gawronski notes that “choice decisions are never the product of a single process,” but always involve both intuitive and deliberate processes which “do not operate in isolation, but mutually interact with each other,” whereas he perceives our dual-system theory to allow for only one of the systems to act at a time to create an effect. Although we classified certain effects as being rooted primarily in System I or System II processing, we agree that choice decisions are always the product of both processes and did not mean that they operate in isolation. System II processing is always active to some extent, although decision makers can exert more or less effort in processing information. When we say that an effect is primarily “due to System I” that means that the intuitive system generated a strong preference from one of the options because the affective response to that option was stronger than to the others, making

it stand out, and that System II approved the response. It does not mean that decision makers are not engaging in System II processing. On the other hand, when we say an effect is “due to System II” that means that the pattern of responding occurred consciously and taxed working memory such that conscious, deliberate processing played a larger role in generating that response because none of the activated associations generated a strong preference in favor of one of the options.

In our target article, we did purposefully focus on examples of choice effects where either System I or System II has a disproportionate influence on the resulting preference in order to illustrate the extreme cases where System I or System II is primarily responsible for generating a preference. While we focus on these extreme examples, we recognize that both systems are always active and that most choices involve the interplay of the two systems.

Finally, we respectfully disagree with Gawronski’s points that a) operating conditions are not useful for defining System I and System II and merely make our theory circular and that b) “if any predictions about moderating effects of elaboration were disconfirmed, the consequence would be a simple recategorization of the effect.” We believe that operating conditions are useful for defining System I and System II because they provide insight into the mechanism, or operating principles, underlying the systems. Understanding operating conditions is useful because often we cannot directly observe mental processes that generate a decision. However, we can make falsifiable predictions about how a decision may change under different operating conditions (e.g. time pressure or load), and we can conduct experiments to test those predictions. This way, we can make inferences about the underlying process based on the observed outputs.

We argue that a recategorization of an effect based on a time pressure or load finding would be useful and would not be merely circular because the System I and II labels are shorthand for both the kind of processing in which the decision maker is engaging and the conditions under which we should see different patterns of choices. If a pattern of choice that was previously thought to require concentration and deliberation turns out to increase under load or depleted resources, that would provide evidence that in fact that pattern is likely operating at the level of activated associations in working memory with little effort.

Overall, we agree with Gawronski that there are clear parallels between our dual-system model of choice and the APE model. We also agree that thinking about the mental operations involved in preference construction is an important pursuit that would allow us to develop a more comprehensive theory capable of making more powerful predictions. Next, we consider Wegener and Chien, who took a similar approach and also drew parallels between our dual-process theory of choice and the Elaboration Likelihood Model (ELM).

Wegener and Chien

Wegener and Chien correctly point out that the literature on evaluative processes in social psychology is highly relevant to theories of choice because evaluating each option in a choice set plays a key role in making a choice. We agree with Wegener

and Chien and welcome the application of that literature to further refine the dual-system framework of choice.

Wegener and Chien write that social psychology research on attitudes and persuasion saw the development of some of the earliest dual-process models of judgment and point out that those theories were constructed on dimensions that are well-aligned with the System I/System II distinction from the cognition literature. We agree with Wegener and Chien's observation that early multi-process theories in social psychology, such as the ELM, parallel the dual-system models from the cognition literature, undoubtedly because researchers from different areas in psychology were tapping into the same ideas. While there are some clear similarities, there are also some distinctions among the models, as Wegener and Chien point out. We elaborate on some of the similarities and differences that Wegener and Chien discussed, adding some qualifications, and discuss two additional differences we observed between the two models.

We agree with the four main similarities that Wegener and Chien discussed between the ELM and dual-process models from choice: 1) that the differential need for working memory in order to engage System II processing is consistent with the requirements for elaboration in the ELM, namely motivation and ability, 2) that high levels of processing do not necessarily make the resulting judgment more rational, 3) that intuitive processes can result in the same choice outcomes as deliberate processes, which has also been a central focus of ELM research and 4) that changes in the mode of stimulus presentation can affect whether a preference is determined more by intuitive or deliberate processes. As we discuss in the article, presenting the same information pictorially may elicit a stronger intuitive response and lead to a different preference than presenting the same information verbally.

We also agree with many of the differences that Wegener and Chien discussed, and point out two more key differences between the two models. Wegener and Chien mention that the ELM focuses more on motivating factors that fall outside of the message or target object itself, such as the decision maker's ability and motivation to exert effort in processing. The judgment and decision making literature, on the other hand, has focused more on aspects of the choice set itself that influence the amount of processing that decision makers engage in. We agree with Wegener and Chien that both kinds of influence are important to consider and discuss in our article how factors external to the choice set (e.g. accountability) can also affect the amount of deliberation. We agree that both influences outside the choice set and elements of the choice environment should be considered in a dual-process theory of choice.

Second Wegener and Chien mention that the ELM is generally thought to be multi-process and suggest that, while the dual-process theory of choice is considered to be comprised of two systems, that we may also be happy with a multi-process recasting. Indeed, we agree that there are many specific, separate mental operations that can be categorized as intuitive or deliberate.

We would like to point out a third difference between the ELM and dual-process models from the judgment literature. While Wegener and Chien draw a parallel between System I processing in the dual-process theory and the reliance on peripheral features under low elaboration, we would like to

point out that System I processing is not limited solely to peripheral features, but may also encompass central features. Decision makers may have affective reactions to central features of a message without the need for elaboration.

Finally, a fourth difference between the ELM and the dual-process model of choice is that in the ELM, attitudes that are based on high levels of elaboration are held more strongly and are more resistant to change than attitudes based on low levels of elaboration. While the choice literature has not systematically examined the strength of more intuitive versus deliberate preferences, the relationship is likely more nuanced. Intuitive choice patterns may be stronger and more resistant to change because they are often associated with higher confidence in one's preferences.

Overall, we agree with Wegener and Chien that there is much that we can learn from the ELM and other multi-process models of judgment from the attitudes and persuasion literature in psychology. Given that many theories tap into the same ideas, thinking more broadly and considering similarities and differences among these theories — such as ELM and APE — is useful towards furthering our understanding of the distinction between intuitive and deliberative processes and building a more nuanced and complete dual-system model of choice.

Martin and Sloman

Martin and Sloman overall feel that developing a dual-system theory of choice is a substantive contribution. However, they outline three main additions that they would like to see to clarify the proposed framework: 1) a clarification of the parallel versus sequential nature of the System I and System II interaction, 2) a specification of the relationship between intuitive processing and affective processing, and 3) refinement of what it means for SI to be “perceptual.” We address each of these points below.

Martin and Sloman believe that the parallel-competitive view of the interaction between System I and System II is the clear winner over the default-interventionist view. Rather than taking a definitive stand on the parallel-competitive versus default-interventionist debate, we agree with Martin and Sloman's point that the systems necessarily interact in complicated ways. Given this complex interaction, we believe that neither the parallel-competitive, nor the default-interventionist view is accurate or captures the nuance of the true relationship. In line with this view, we believe that System II is always engaged, but to varying degrees. To the extent that people are engaged in conscious thought about a choice, System II processing is happening. In addition, we do not “subscribe to the view that SII processing only occurs under certain conditions,” just that less deliberate, thoughtful processing occurs under conditions such as load and distraction, meaning System II is less likely to determine the response in these situations.

Despite the interaction being necessarily more complex, we use the default-interventionist language as a useful metaphor because it captures two important ideas: 1) that System I most often generates an answer more quickly because associative reasoning tends to occur more rapidly than deliberate conscious thought and 2) that when System II is more engaged, the final answer is likely to come from System II, which tends to

override the System I response, unless System I generates a strong preference. However, as Martin and Sloman point out, there are exceptions to both of these general notions. Sometimes intuition dominates when the two systems conflict, as in base-rate neglect tasks (De Neys & Glumicic, 2008) and in the ratio bias effect, (Denes-Raj & Epstein, 1994).

Martin and Sloman raise a question about the relationship between intuitive processing and affective processing. We agree that affect does play an important role in System I judgments. An affective reaction, or a feeling that a certain option is better, is the output of nonconscious processing — it surfaces in consciousness as the summary of System I's evaluation. Therefore, drawing on Gawronski and Bodenhausen (2011), we think of the affective reaction as the output of associative, System I processing. However, we would like to clear up the misconception that only perceptual stimuli can elicit intuitive reactions. Martin and Sloman may have misunderstood our point about certain formats of presenting information (e.g. visual) to be more likely to elicit an intuitive preference than others (e.g. numerical) to mean that attributes described numerically or verbally do not elicit intuitive preferences. We clarify that decision makers can have intuitive reactions to not only visual, but also to verbal and numerical stimuli, provided that the numerical stimuli elicit differential affective reactions to options in the choice set, allowing System I to generate a preference for the option that elicits the most positive reaction.

Besides defining the role of affect in System I judgments, we agree with Martin and Sloman that we also need to define more precisely what it means for System I to be perceptual. We mainly use “perceptual” as a metaphor to mean that an option generates an impression of being the best choice without the decision maker knowing where that feeling is coming from. We agree with Martin and Sloman's characterization of how the attraction effect arises — the decision maker generates supportive pieces of evidence for each of the options — but believe that these simple calculations can occur outside of awareness. The main distinction we would like to draw from what Martin and Sloman propose is that their description of the “numerical evaluation” sounds thought-out and intentional, whereas we suggest that these calculations happen outside of awareness, such that decision makers cannot report why they prefer a particular option.

In conclusion, we appreciate Martin and Sloman's call for greater clarity in our dual-process theory of choice, echoing Gawronski's sentiment. We agree that precision in our use of terminology is important, in terms of the role of affective processing, the processes underlying System I, and an understanding of whether the two Systems interact in parallel or in a default-interventionist way. Given the complex nature of the interaction of the two systems, we call for more research and refinement of the theory as to when System II dominates the System I response and vice versa, as well as more theorizing about the role of affective responses in the two systems.

Stanovich

Stanovich discusses two important points about the dual-process theory in the domain of choice. First, Stanovich states

that the dual-process theory's extension into other areas including choice will have more impact if it makes falsifiable predictions. Second, Stanovich builds on our dual-process account of choice, and specifically, our point that cognitive biases can also originate from deliberate, effortful processing, to explore why humans may in some ways be more susceptible to context effects and reasoning biases than non-human animals.

We agree that the hallmark of any theory is the ability to make falsifiable predictions. In the target article we make some falsifiable predictions about how different effects would change under different availability of time and mental resources, although we welcome more predictions and tests based on our theory. We second Stanovich's call for “further empirical tests of dual-process predictions regarding many of the choice tasks” that we discussed, and agree that, if our predictions are confirmed, these empirical tests would provide important evidence for the dual-process theory of choice.

Stanovich agrees with our point that some cognitive biases originate from System II, rather than System I, and builds on this point to explore why humans may in some ways be more susceptible to reasoning biases than non-human animals. He discusses three reasons: contextual complexity, symbolic complexity, and the strong evaluator struggle. Contextual complexity is the notion that humans may exhibit more inconsistency in their choices from one situation to another than non-human animals because their decisions are more affected by the context of the choice. Humans tend to code more of the contextual features into their evaluation of the options, changing their preferences over those options. In our dual-process model of choice, we argued that System II biases often arise based on a reliance on relative comparisons and justification processes, factors that would fall under Stanovich's concept of “contextual sensitivity.”

Stanovich discusses two additional reasons why human choices may display less coherence than those of non-human animals. Symbolic intensity is the notion that humans do not always choose in a way that maximizes their tangible utility, but take into account other less tangible superordinate considerations, such as feelings about fairness, morality, altruism, or other symbolic forms of utility, such as social and self-signaling. Strong evaluator struggle is a notion that encompasses the conflict between first-order and higher-order preferences, capturing people's struggles with self-control and temptation.

We agree that symbolic utility and meta-preferences are important elements to consider and can often lead to preferences that appear inconsistent. However, we hesitate to state whether System II, System I, or both systems are implicated in considering these cues. Some forms of symbolic utility can no doubt be attributed to thoughtful, deliberate processing, while others may happen automatically and outside of the decision maker's awareness. While thinking about one's meta-preferences and resisting temptation are often System II processes, over time and with practice, these processes can also become automatic and unconscious.

We thank Stanovich for unpacking the reasons why reliance on deliberate System II processing may lead to cognitive biases. It is important to consider in more detail the kinds of

considerations that people have under System II and use those to further enrich the dual-process theory of choice.

Conclusion

In conclusion, we appreciate the useful ideas expressed in the four commentaries. We agree that greater precision in specifying the underlying mental processes is important in order to refine our model and increase its predictive value. We like Gawronski's approach and agree that the APE model may provide a useful structure to map out the mental operations involved in choice. Both Gawronski's and Wegener and Chien's commentaries highlighted the value of looking beyond the judgment and decision making literature to other literatures in psychology to generate insights that help refine the model. Martin and Sloman also echoed the call for greater precision in the model by urging us to consider the relationship between intuitive and affective responses and the nature of the interaction between the two systems. Finally, Stanovich introduced some important considerations about factors that make choices inconsistent from one situation to another, which would be useful to integrate into the dual-system framework. Considering all of these ideas in the future will be valuable towards developing a more complete theory.

We strongly believe that the interplay of System I and II is the right model to understand choice, a sentiment that most of the commentators expressed. While we focused on context effects from the literature where one of the two systems is predominantly responsible for determining a preference, we focused on these examples in order to illustrate the extreme cases in our theory. We recognize that in most instances of choice, preferences are determined in a complex interplay of both systems. Looking ahead, we recognize the challenges of understanding the interaction of the two systems, which are closely intertwined. We hope that our approach will motivate other researchers to conduct empirical work to test some of our hypotheses of the dual-system model of choice.

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