

Intuitive Competition and Deliberative Regulation in Prosocial Decision-Making*

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Abstract

Dual-process theory is an important framework for understanding the cognitive mechanisms of prosocial decision-making. Regarding the relative roles of intuitive and deliberative processing in prosocial behavior, early research developed different theoretical orientations: the reflective model holds that prosocial behavior depends on deliberative processing to inhibit selfish intuition, whereas the prosocial intuition model argues that prosocial behavior mainly originates from intuitive processing, and that deliberative thinking may instead elicit self-interested calculation. Although the two models differ in their conclusions, both implicitly assume a basic process of “single intuitive activation—deliberative correction.” By conceptualizing intuition as the internalization of social rules of thumb derived from experience, the social heuristics hypothesis provides an important explanation for the origins of intuition and its contextual variability, but it has difficulty accounting for phenomena such as conflict experiences in decision-making and inconsistencies in the direction of the effects of deliberative processing. On this basis, the hybrid model proposes that multiple intuitive responses may be activated in parallel during decision-making, and that behavioral outcomes first depend on competition in the relative strength of different intuitions, while deliberative processing functions as a conflict-regulation system within a multifunctional system, flexibly exerting roles such as control, generation, rationalization, and regulation according to the degree of intuitive conflict. This article integrates the social heuristics hypothesis and the hybrid model, arguing that the former explains the experiential origins of intuition, while the latter characterizes the dynamic processing mechanisms of intuition, thereby constructing a cognitive framework that integrates “heuristic formation—multiple-intuition competition—deliberative regulation.” This framework shifts the research focus from “which processing mode dominates” to “how multiple intuitions are activated and compete, and how systems dynamically interact,” providing a more inclusive theoretical framework for integrating previous contradictory findings.

Full Text

Intuitive Competition and Deliberative Regulation in Prosocial Decision-Making*

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Abstract Dual-process theory is an important framework for understanding the cognitive mechanisms of prosocial decision-making. Regarding the relative roles of intuition and deliberative processing in prosocial behavior, early re-

search developed different theoretical orientations: the reflective model holds that prosocial behavior depends on deliberative processing inhibiting selfish intuitions, whereas the prosocial-intuition model argues that prosocial behavior mainly originates from intuitive processing, and that deliberative thinking may instead trigger self-interested calculation. Although the two models diverge in their conclusions, both implicitly assume a basic process of “single intuitive activation—deliberative correction.” By conceptualizing intuition as the internalization of social experiential rules, the social heuristics hypothesis provides an important account of the sources of intuition and its contextual variability, but it has difficulty explaining phenomena such as conflict experiences in decision-making and inconsistent directions in the effects of deliberative processing. On this basis, the hybrid model proposes that multiple intuitive responses may be activated in parallel during decision-making; behavioral outcomes first depend on competition in the relative strength of different intuitions, while deliberative processing functions as a conflict-regulation system within a multifunctional system, flexibly exerting effects such as control, generation, rationalization, and regulation according to the degree of intuitive conflict. This article integrates the social heuristics hypothesis and the hybrid model, arguing that the former explains the experiential origins of intuition, whereas the latter characterizes the dynamic processing mechanisms of intuition, thereby constructing a cognitive framework that integrates “heuristic formation—multiple-intuition competition—deliberative regulation.” This framework shifts the focus of research from “which processing mode predominates” to “how multiple intuitions are activated and compete, and how systems dynamically interact,” providing a more inclusive theoretical framework for integrating previously contradictory findings.

Keywords prosocial decision-making; reflective model; prosocial-intuition model; social heuristics hypothesis; hybrid model

1 Introduction

When we have the opportunity to help others in crisis, what is our first reaction? Do we act quickly and only afterward consider our own interests, or do we act only after overcoming an instinctive selfishness? On the evening of July 20, 2021, heavy rain in Zhengzhou left many people trapped. After 26-year-old Yu Yifei was rescued to a safe area, he returned without hesitation to save others. He recalled: “At the time, I had no time to react; I turned my head and saw a vast expanse of floodwater, and then I rushed in.” Narratives of heroic helping in real life often indicate that such behaviors occur very rapidly, almost without conscious, careful deliberation (Rand & Epstein,

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2014; Shi et al., 2026). Evolutionary biologists have described humans as self-ish and self-interested animals, yet humans often refute this view by displaying various forms of prosociality. This phenomenon raises a key question: must prosocial behaviors such as altruism, cooperation, sharing, and helping depend on reflective self-control, or can they arise from rapid, automatic intuitive processing?

Over the past two decades, researchers have tended to examine human prosociality from a dual-process perspective. This theory holds that decision-making originates in the interaction between two cognitive systems: one fast and intuitive, the other slow and deliberative (De Neys, 2021). By applying this perspective to research on human prosociality, researchers have begun to explore how prosocial behavior emerges. The reflective model argues that individuals' intuitive responses are by default biased toward selfishness, and that prosocial behavior depends on deliberative processing to inhibit selfish impulses (Rand et al., 2012). By contrast, the intuitive model of prosociality holds that intuition itself can be prosocial, whereas deliberative processing may instead elicit self-interested calculation (Zaki & Mitchell, 2013). Although these two models are opposed in their conclusions, they share an implicit assumption: at the initial stage of decision-making, only a single-direction intuitive response is activated, and deliberative processing subsequently corrects it in a one-way manner. However, this framework of "single intuitive activation—deliberative correction" has difficulty fully explaining mixed empirical findings; prosocial decision-making may involve more complex mechanisms of internal competition and regulation. To address these divergences, the social heuristics hypothesis (SHH) proposes that intuitive responses are not fixed, but are the result of individuals' internalization of experiences and strategies over long-term social interaction (Rand et al., 2014). Building on the social heuristics hypothesis, Capraro (2024) further proposed the theory of internalized heuristics for self-preservation (IHSP). This theory holds that, through long-term social experience, individuals internalize not only rules of cooperation but also multiple heuristic tendencies that serve self-preservation and social adaptation, thereby extending the cooperative heuristics emphasized by the classic social heuristics hypothesis into a broader system of adaptive heuristics. Such theories shift the research focus from "which processing mode is more prosocial" to "where the heuristics that shape intuitive responses come from," providing a key perspective for understanding the experiential origins of different intuitive responses. However, whether in the classic social heuristics hypothesis or in its expanded version, the internalized heuristics for self-preservation theory, the main focus is on the formative sources of intuitive content, with less explanation of how different heuristics are simultaneously activated, compete with one another, and ultimately influence behavioral choices in specific decision-making processes. The hybrid model proposed by Bago and De Neys (2019a) addresses this issue to some extent. They argue

that multiple intuitive responses may be activated in parallel during the initial stage of decision-making, and that behavioral outcomes are determined by competition in strength among different intuitions. Deliberative processing is not a preset corrector, but a flexible conflict-regulation system; whether it intervenes, and how it intervenes, depends on the degree of conflict among intuitions. In situations where intuitive conflict is weak or one response has a clear advantage, deliberative processing may even not participate in the decision-making process. By introducing a perspective of competition among multiple intuitions and dynamic interaction, the hybrid model shifts the research focus from the dominance of processing modes to how different motives and processing systems coordinate with and constrain one another in the decision-making process, thereby providing a more explanatory theoretical framework for integrating existing contradictory findings.

After the perspective of competition among multiple intuitions was proposed, researchers began to systematically investigate “whether, within the same social decision-making context, there may simult—

how multiple intuitive responses are activated simultaneously,” “how multiple intuitions compete with one another and determine initial behavioral tendencies,” and “under what conditions deliberative processing intervenes in the decision-making process.” This paper argues that the Social Heuristics Hypothesis and its expanded versions mainly answer, at the experiential and functional levels, the question of “how” the content of intuition is formed—that is, how different social experiences are internalized as multiple heuristic tendencies that serve social adaptation and self-preservation. By contrast, the hybrid model further characterizes the online processing mechanisms of these internalized heuristics in specific decision-making contexts: how multiple intuitions are activated in parallel, compete with one another, and jointly influence initial behavioral tendencies, as well as how deliberative processing dynamically integrates and regulates them. On this basis, this paper attempts to construct a hierarchical cognitive framework encompassing “heuristic formation—multiple-intuition competition—deliberative regulation,” in order to explain complex and contradictory phenomena in prosocial decision-making and to provide testable theoretical propositions for future empirical research. It should be noted that, because cooperative behavior is the most mature, most contested, and most evidentially complete research paradigm in dual-process research, this paper takes cooperative decision-making as its primary analytical entry point. However, this theoretical framework is not limited to cooperative contexts; it is also widely applicable to other prosocial behaviors such as helping and sharing, and even to related domains of moral research (Shi Rong et al., 2024; Bago & De Neys, 2019a, 2019b; Capraro, 2024).

2 Early Views: The Opposition between Intuition and Deliberation

The reflective model was an early theoretical perspective that occupied a dominant position. Rooted in the basic assumption of “human selfishness,” it holds

that before engaging in prosocial behavior, individuals must overcome selfish impulses that have an evolutionary advantage (Bago et al., 2021). According to this model, cooperation and altruism often require the support of higher-order cognitive capacities such as delaying gratification, weighing long-term benefits, and evaluating fairness norms (DeWall et al., 2008). This view is highly consistent with the limited-resource model of self-control (Baumeister et al., 2007; Huang & Fang, 2024). The model regards cognitive control as a limited psychological resource; when this resource is occupied or depleted, individuals have difficulty suppressing automatic selfish responses, thereby reducing prosocial behavior. Contrary to the predictions of the reflective model, a growing body of research has found that weakening deliberative processing does not necessarily reduce prosocial behavior and may even increase levels of cooperation in certain contexts. Specifically, in classic paradigms such as public-goods games and dictator games, time pressure, rapid responses, or other manipulations that increase intuitive processing are often associated with higher levels of cooperation and prosocial choice (Rand et al., 2012; Capraro, 2024). These findings indicate that prosocial behavior is not always built upon the suppression of selfish impulses, but may, under certain conditions, arise directly from rapid and automatic intuitive responses. On this basis, Zaki and Mitchell (2013) proposed the prosocial intuition model, arguing that prosocial tendencies can rapidly emerge as intuitive responses in the absence of sufficient reflection. Multiple lines of evidence from behavioral, neural, and developmental research show that prosocial behavior often exhibits rapid and automatic response characteristics, is accompanied by activation in reward-related brain regions, and already appears in early developmental stages when deliberative control abilities are not yet mature, thereby providing important empirical support for the prosocial intuition model (Shi Rong & Liu Chang, 2019). Although the two models described above are diametrically opposed in the assumed direction of intuition, they share the same underlying cognitive framework, namely the deliberation-correction framework (Hackel et al., 2020; Bago et al., 2021). This framework contains two core assumptions: (1) the intuitive system outputs a single, fixed default behavioral tendency; and (2) the core func-

may be to directionally correct or override this default tendency. If this framework holds, it implies a relatively direct logic for behavioral intervention: by manipulating the degree to which deliberative processing is engaged, one can guide the direction of behavior (Krajbich et al., 2015). The divergence between the two theories does not stem from different understandings of the deliberative system itself, but rather from different assumptions about which intuitive response the same limited cognitive resources are primarily used to inhibit.

As research methods and manipulation paradigms have continued to diversify, the deliberative-correction framework has gradually revealed limitations in explaining the accumulating empirical evidence. First, evidence for a potential causal link between intuition and prosocial behavior is ambiguous and confounded; second, individuals often experience a tension between prosocial and self-interested motives during decision-making, and the direction of the effect of

deliberative processing also shows contextual dependence. These signs suggest that prosocial decision-making may not arise from a process in which a single response is corrected, but instead involves more complex internal competition and regulatory mechanisms. Rand's (2016) meta-analysis, overall, supported the prosocial-intuition model, indicating that intuitive processing tends to promote cooperative behavior, whereas deliberative processing is more likely to reduce cooperative behavior. Kvarven et al. (2020), however, revised this conclusion in a meta-analysis using a larger sample size and broader inclusion criteria. Their results showed that the overall effect of intuitive processing on prosocial behavior was driven mainly by particular types of studies—especially experiments involving emotion-induction manipulations—rather than being a general result of intuitive-processing manipulations across different types of studies. Further, Fromell et al. (2020), in an analysis of 60 experiments, found that processing mode did not have a significant effect on altruistic behavior. In response to this theoretical dilemma, researchers began to shift their focus from “whether intuition or deliberation is more prosocial” to “how the specific content of intuitive responses is formed and how it depends on context.” Against this background, Rand et al. (2012, 2014) proposed the social heuristics hypothesis.

3 Social Heuristics Hypothesis: Theoretical Extensions and Limitations

3.1 Core Claims of the Social Heuristics Hypothesis

The social heuristics hypothesis holds that the content of intuitive responses is not innately fixed, but is instead the result of internalization through individuals' everyday life experiences. Because everyday social interaction is full of repeated interactions and reputation mechanisms, cooperation, owing to its long-term adaptive advantages, is readily internalized as the default intuitive response (Rand et al., 2014). The function of deliberative processing is to carry out cost-benefit calculations based on the current situation, in order to decide whether to implement or override the internalized intuition, thereby maximizing benefits in that context (Rand, 2016).

The social heuristics hypothesis makes clear context-dependent predictions: whether deliberative processing “corrects” or “implements” intuition depends on whether the current context matches the typical environment in which that intuition was internalized. Specifically: (1) In one-shot anonymous social dilemmas, where defection is the dominant strategy, for individuals who have internalized a cooperative heuristic, intuition will promote cooperation, whereas deliberative calculation will reveal that defection is the rationally optimal solution in the current context. Thus, promoting intuition should increase cooperation, whereas promoting deliberation should reduce cooperation. (2) In non-social-dilemma contexts where future interaction or incentives for cooperation exist, cooperation becomes the strategy for maximizing long-term benefits, and the function of deliberation shifts toward performing complex

calculations based on the individual's beliefs about others' behavior and future payoffs. Its output—cooperation or defection—is uncertain and may either align with or conflict with intuition. Rand's (2016) meta-analysis of 67 studies supported the above predictions: in one-shot

In typical social dilemmas such as anonymous interactions, promoting intuition (relative to deliberation) increased the average cooperation rate by 17.3%, whereas this effect was not significant in nonsocial contexts. Subsequently, Rand (2019), based on a meta-analytic replication of 91 experiments, further validated this model. These findings indicate that the influence of deliberative processing on prosocial behavior is markedly context-dependent: in social environments lacking incentives for cooperation, deliberative calculation often supports the instrumental rationality of noncooperation; whereas in contexts where cooperation can bring long-term returns or personal benefits, deliberative processing may be used to implement or maintain cooperative behavior. Beyond cooperative behavior, this context dependence also exists in other prosocial decisions. An EEG study by Shi et al. (2024) found that, in non-emergency donation contexts, reflective processing elicited a stronger P3 amplitude than intuitive processing, suggesting that individuals in such contexts may invest more cognitive resources to weigh conflicts between social norms and self-interest; this effect disappeared in emergency contexts.

Empirical research further supports the experiential internalization and malleability of social heuristics. Peysakhovich and Rand (2016), by manipulating opponents' strategies across multiple rounds of prisoner's dilemma contexts, constructed two interaction environments: "cooperation" and "betrayal." After participants interacted for approximately 20 minutes in the corresponding environment, they then participated in a new one-shot anonymous public goods game. The results showed that participants who had previously been in the cooperative environment exhibited higher levels of cooperation in the subsequent task. This indicates that social heuristics can be rapidly learned and internalized through short-term social experience, and can "transfer" or "spill over" into new decision-making contexts. More importantly, the internalization process emphasized by the social heuristics hypothesis is not limited in scope to specific cooperative behaviors, but may also shape more complex social cognition and behavioral strategies. Jordan and Rand's (2020) study on "reputation heuristics" found that even in fully anonymous, one-shot interactions in which punishment cannot bring actual reputational benefits, individuals' intuitive responses are still invisibly influenced by reputation: when people cannot establish a positive reputation by directly helping others, punishing selfish individuals becomes the primary way of transmitting reputational signals in latent consciousness, thereby eliciting stronger moral anger and willingness to punish. This means that people may already have internalized behavioral patterns that are always subject to social observation into an automatic response strategy. In addition, McAuliffe et al. (2018) further found that experiencing unrewarded cooperation in one-shot anonymous interactions significantly weakened subsequent cooperative tendencies, suggesting that internalization can be dynamically updated

with new experiences. Cross-cultural research has also demonstrated that intuitive responses are regulated by broader social and cultural environments. In Indian samples with weaker cooperative norms, time pressure did not promote cooperation, suggesting that their intuitive default values may have adapted to a noncooperative social environment (Capraro & Cococcioni, 2016). Together, these findings at both the individual and group levels indicate that the content of intuition is not fixed, but is significantly experience-dependent.

Although the social heuristics hypothesis suggests that individuals can internalize behavioral strategies such as cooperation into intuitive responses through everyday social experience, relatively little has been said about how culture systematically shapes this internalization process. In this regard, moral foundations theory (MFT; Haidt, 2007; Graham et al., 2013) provides an important complementary perspective. Both theories emphasize the basic view of “intuition first” : that is, moral judgments often begin with rapid, automatic intuitive responses, whereas rational reasoning usually occurs afterward. McHugh et al. (2023) found that, when facing contexts that violate moral intuitions, participants often exhibited the phenomenon of “moral dumbfounding,” specifically manifested as being able to make moral judgments rapidly while finding it difficult to provide further reasonable explanations. This phenomenon

provided support for the view that “intuition precedes rational justification.” On this basis, moral foundations theory further proposes that human moral intuitions are built upon several evolved foundations, including care versus harm, fairness versus cheating, loyalty versus betrayal, authority versus subversion, and sanctity versus degradation (Graham et al., 2013). Although these moral foundations possess a certain innateness, their specific forms of expression are shaped over the long term by cultural environments. Through customs, social norms, value narratives, and other pathways, culture continually strengthens certain moral tendencies, thereby gradually forming automatic response tendencies that conform to particular cultural patterns (Haidt & Joseph, 2004; Graham et al., 2013). Atari et al. (2023) found that the patterns of network connection among moral intuitions differ across societies, directly confirming the long-term shaping effect of culture on moral-cognitive systems. Based on these views, the internalization process emphasized by the social heuristics hypothesis can be further understood as follows: in a specific cultural environment, through long-term and repeated social interaction, individuals gradually learn the adaptive behavioral strategies emphasized by that culture and consolidate them into rapid, automatic intuitive responses.

3.2 Empirical Challenges and Theoretical Limitations of the Social Heuristics Hypothesis

As related research has continued to accumulate, the “single default intuition–deliberative correction” framework implied by the early social heuristics hypothesis has revealed limitations in explanatory scope. In response to this problem, Capraro (2024) proposed a theoretical framework based on “self-preservation

internalization heuristics.” Unlike the early social heuristics account, which regarded cooperation as the core intuitive content, the self-preservation internalization heuristic holds that what individuals internalize is not a single rule of cooperation, but rather a set of heuristic tendencies serving self-preservation and social adaptation, including avoiding harm to oneself, avoiding harm to others, maintaining reciprocal relationships, resisting disadvantageous inequality, and preserving social reputation. This revision not only expands the explanatory scope of social-heuristic theory for phenomena such as cooperation, honesty, reciprocity, and deontological judgment, but also indicates that the theoretical focus shifts from “why cooperation becomes intuitive” to “which adaptive behavioral tendencies are internalized as intuitions.” Nevertheless, even so, this theoretical framework still faces several important challenges.

First, the core empirical findings of the classic social heuristics hypothesis have been questioned in terms of replicability. Its key evidence—the “spontaneous cooperation effect” proposed by Rand et al. (2012)—has not been stably replicated in several subsequent studies (Bouwmeester et al., 2017; Tinghög et al., 2016; Verkoeijen & Bouwmeester, 2014). The study by Bouwmeester et al. (2017) showed that the spontaneous cooperation effect depends on specific data-analysis protocols. When the most lenient analytic protocol was used (retaining all participants), there was no difference in cooperation rates between time pressure and delayed decision-making; only after excluding participants who had not strictly followed the time instructions was a result observed that was consistent with the spontaneous cooperation effect, but with a small effect size. Meta-analyses also indicate that the effect size of the spontaneous cooperation effect is generally small and highly heterogeneous, and is very easily moderated by the mode of manipulation, task context, and individual differences (Rand, 2016; Kvarven et al., 2020). The study by Li Qiangqiang and Hu Gengdan (2025) confirmed that the influence of processing mode on prosocial behavior is interactively moderated by individuals’ cost and social-value orientations: under low costs, pro-self individuals are more prosocial under intuitive processing; under high costs, prosocial individuals are more prosocial under deliberative processing. Kvarven et al. (2020), in a meta-analysis of 82 experiments, found that although the overall effect of intuition on cooperation was significant, the effect size was small, and the effect depended mainly on a small number of studies using emotion induction; after excluding such studies, cognitive manipulations such as time pressure had no significant influence on cooperation. These results indicate that intuition

the empirical basis for stably promoting cooperation is not robust; it also provides indirect support for the self-preservation internalized-heuristics account—namely, that intuition is not a single cooperative tendency, but may contain multiple directional motivations.

Second, the classic social heuristics hypothesis entails a certain risk of circular reasoning. This hypothesis holds that people internalize socially advantageous behaviors in their environment as intuitive heuristics, but which behavior counts

as advantageous often has to be inferred backward from actual behavioral outcomes. When intuitive cooperation is observed, it is retrospectively inferred that cooperation had an adaptive advantage in the individual's environment; when intuitive cooperation is not observed, the reverse explanation is that the social environment failed to shape a cooperative heuristic. Although such post hoc explanations increase the theory's explanatory power, they weaken its predictive power and falsifiability (Capraro, 2024). Within the framework of self-preservation internalized heuristics, this problem is somewhat alleviated: the content of intuition is no longer restricted to cooperation alone, but is redefined as a collection of multiple heuristics serving self-preservation and social adaptation. As a result, a single behavioral outcome no longer uniquely implies a specific heuristic, thereby breaking the one-to-one mapping between behavior and explanation. However, a new problem arises: the theory still lacks a mechanistic account of how different heuristics are activated in specific contexts. For example, systematic predictions remain lacking regarding the conditions under which individuals preferentially activate fairness rather than reciprocity, or self-protection rather than prosocial tendencies.

Third, the classic social heuristics hypothesis and related dual-process explanations usually imply a linear assumption: that greater deliberation leads to a linear change toward either more cooperation or more selfish behavior. However, this linear assumption cannot adequately describe the complexity of decision-making under conditions of limited cognitive resources. Capraro and Cococcioni (2016) found that the relationship between cognitive resources and cooperative behavior may be more complex and nonlinear: when cognitive resources are extremely scarce, individuals tend toward selfishness; when cognitive resources are moderate, internalized heuristics can be implemented and individuals behave cooperatively; when cognitive resources are abundant and fine-grained situational calculations with uncertain outcomes can be performed, behavioral outcomes no longer show consistency—cooperation is highly possible, but selfishness is also possible. This result suggests that cognitive resources do not unidirectionally correct or strengthen a fixed behavioral tendency; rather, they are more likely to indirectly regulate final behavioral output by influencing the accessibility of heuristics and the competitive weights among them. Therefore, the role of cognitive processing should be understood as a dynamic regulatory process involving multiple motivational tendencies, rather than as a simple linear correction mechanism.

Fourth, there is skepticism about the inferential logic of the “reaction time-processing mode” account, which is also a common challenge facing the entire dual-process research paradigm. Krajbich et al. (2015) pointed out that reaction time mainly reflects decision difficulty or preference strength, rather than whether intuitive or deliberative processing has been activated. For example, by manipulating the payoff structure of cooperative and non-cooperative options in a public-goods game, merely changing the relative attractiveness of the options can significantly alter the relationship between reaction time and cooperative behavior, without needing to assume that the processing mode has changed. This

means that inferring cognitive-processing processes backward solely on the basis of reaction time or behavioral outcomes can easily conflate value preferences with processing mechanisms.

These challenges indicate that neither the cooperative heuristic emphasized by the classic social heuristics hypothesis nor the “single default intuition-deliberative correction” model in traditional dual-process theory can fully explain the high degree of heterogeneity and instability shown by prosocial decision-making across different tasks, contexts, and individuals. A growing body of evidence shows that, when decision-makers face social situations, they are not

only activates a single default response, but may be influenced simultaneously by multiple intuitive tendencies (Capraro, 2024). Against this background, the hybrid model proposed by Bago and De Neys (2019a) provides a new theoretical perspective for understanding prosocial decision-making. Unlike the traditional correction model, which assumes that “System 1 generates a single default answer and System 2 is responsible for correcting it,” the hybrid model holds that multiple intuitive responses can be activated simultaneously at the initial stage of decision-making and can enter into potential competition. The function of deliberative processing is no longer regarded as the simple correction of a single default response; rather, it plays the role of integrating, weighing, arbitrating among, and even retrospectively rationalizing multiple intuitive inputs. From this perspective, Capraro’s (2024) self-preservation internalized heuristic is highly compatible with the hybrid model. The self-preservation internalized heuristic mainly answers the question of “where intuitive content comes from,” emphasizing that various forms of social experience are internalized through long-term learning as heuristic rules that serve self-preservation and social adaptation; the hybrid model further explains how these internalized heuristics are activated in parallel at the moment of decision-making, how they compete with one another, and how they are regulated by deliberative processing. Together, the two approaches move beyond the classic social heuristics hypothesis and its assumption of a “single cooperative heuristic,” while also weakening the traditional dual-process view that “deliberation corrects intuition.”

4 Hybrid Model: Parallel Multiple Intuitions and Dynamic Interaction

The hybrid model characterizes the decision-making process as follows: multiple intuitive responses, formed on the basis of different motivations and experiences, are activated in parallel at the early stage of decision-making and compete with one another, while deliberative processing intervenes in a more flexible manner to evaluate, integrate, or arbitrate among these potential responses. Understanding the theoretical significance of the hybrid model depends on systematically tracing how cognitive process models concerning the interaction between the two systems within dual-process theory have gradually evolved; this also

provides a key perspective for reinterpreting conflict, hesitation, and contextual sensitivity in prosocial decision-making.

4.1 The Theoretical Framework and Basic Assumptions of the Hybrid Model

To account for the cognitive processing involved in decision-making, a variety of process models have been developed within the dual-process theoretical framework. Their central divergence lies in how intuition and deliberation cooperate or compete in decision-making to produce final behavior. Traditional models mostly imply an assumption of “single intuitive activation,” that is, they hold that at the initial stage of decision-making, the intuitive system outputs only one dominant default response. However, this view is now being challenged. De Neys (2012) summarized existing models into three categories: the serial model, the parallel model, and the logical intuition model. As shown in Figure 1, the serial model is represented by the default-interventionist model (DI), which holds that intuition first generates a default response, and deliberation intervenes to revise it after conflict occurs; the parallel-competitive model (PC), by contrast, argues that the two systems operate in parallel from the outset and compete to determine behavior. Although their temporal sequences differ, both imply that conflict monitoring depends on System 2, thereby leading to the circular argument problem of “who monitors conflict first.” In response, De Neys (2012) proposed the logical intuition model, which moves conflict monitoring forward to the intuitive stage: intuition can generate and evaluate multiple responses in parallel, triggering deliberative intervention only when significant conflict arises, thereby forming a hybrid architecture that integrates serial and parallel features (Handley & Trippas, 2015). The evolution of this family of models reflects a gradual shift in theoretical attention from “dominance between systems” ...

toward “intra-system competition.”

Figure labels:

- a. Sequential model
 - Intuition; Deliberation
 - Start; Conflict; End
- b. Parallel model
 - Deliberation; Intuition
 - Start; End

- c. Logical-intuition model
 - Intuitive heuristics; Intuitive logic; Deliberation
 - Start; Conflict; End

Figure 1. Three different theoretical models of the interaction between intuition and deliberation (translated from De Neys, 2012)

Note: Gray bars represent deliberative processing (System 2), white bars represent intuitive processing (System 1), and the horizontal axis represents the flow of time. In the sequential model (a), deliberation is activated only after a conflict arises with intuition. In the parallel model (b), intuition and deliberation are activated simultaneously from the outset. In the logical-intuition model (c), the deliberative processing process is triggered by the conflict between intuitive heuristic processing and intuitive logical processing. Dashed lines indicate that, in the sequential model and the logical-intuition model, the triggered deliberative processing process is optional.

The view of competition among multiple intuitions in the logical-intuition model directly promoted the construction of the hybrid model: the intuition-competition framework in Figure 2 transfers the above principles to moral and social contexts, treating selfishness and prosociality as parallel intuitive responses. The core theoretical contributions of the hybrid model are mainly reflected in three aspects (Bago & De Neys, 2019a). First, it shifts from “single-intuition activation” to “parallel competition among multiple intuitions.” The model no longer assumes the existence of a universally applicable default intuition; rather, it holds that multiple potential intuitive responses can be rapidly and simultaneously activated in the early stage of decision-making, and that ultimate behavior depends on the absolute strength of these intuitive responses and on differences in their relative strength. From the perspective of the hybrid model, the initial direction of prosocial decision-making is not, in essence, a preset “intuition-deliberation” confrontation, but a dynamic competition among different intuitions. This view is supported by research in moral psychology. The moral foundations theory proposed by Haidt and Joseph (2004) explicitly indicates that human moral intuitions are themselves pluralistic. This means that, in prosocial decision-making, the intuitions activated in parallel are not limited to the binary opposition between “prosociality” and “selfishness,” but may further involve more specific moral intuitive tendencies such as care, fairness, loyalty, and authority. Cross-cultural research by Atari et al. (2023) also provides direct evidence for “parallel competition among multiple intuitions.” The study found that even within the dimension of fairness, it is possible to further distinguish an “equality” intuition, which focuses on equal outcomes, from a “proportionality” intuition, which focuses on allocation according to contribution. More importantly, their network analysis showed that the patterns of connections among different moral foundations exhibit significant cultural differences, with different moral network structures

appearing in Western, educated, industrialized, rich, and democratic (WEIRD) societies and in non-WEIRD societies. This indicates that, under different cultural backgrounds, the preferentially activated moral

moral intuitions and their interrelations are not consistent, thereby further supporting the mixed model's core claim that multiple intuitions can be activated simultaneously and enter into competition, with final behavior depending on their relative strength. Second, the account shifts from "correction between systems" to "competition within the system." Deliberative processing is no longer regarded as a one-way corrective mechanism applied to a particular default intuition; rather, it is triggered when conflict among intuitive responses is salient, and is used to regulate, integrate, or rationalize the currently dominant intuitive output. Third, the research focus shifts from "which processing mode dominates behavior" to "how different intuitions are activated and how they compete," emphasizing the regulatory role of specific contexts in shaping the activation patterns and strength distributions of intuitions.

Figure text

- **Decision mode: PP**
Vertical axis: **Strength**
Horizontal labels: **Selfish intuition; Prosocial intuition**
- **Decision mode: PS**
Vertical axis: **Strength**
Horizontal labels: **Selfish intuition; Prosocial intuition**
- **Decision mode: SS**
Vertical axis: **Strength**
Horizontal labels: **Selfish intuition; Prosocial intuition**
- **Decision mode: SP**
Vertical axis: **Strength**
Horizontal labels: **Selfish intuition; Prosocial intuition**

Figure 2. Schematic diagram of mixed-model theory in prosocial decision-making (adapted from Bago & De Neys, 2019a)

Note: This is a theoretical schematic. It uses the mixed model to explain four response patterns between the initial response and the final response. Taking the competition between prosocial intuition and selfish intuition as an example, the absolute strength of the two intuitions and the difference in their relative strength jointly determine behavioral output. In the two-response paradigm, an individual's behavioral pattern can be defined according to the combination of decisions made at the intuitive and deliberative stages: if prosocial behavior is chosen at both stages, this is the "PP mode"; if selfish behavior is chosen at both stages, this is the "SS mode"; if the response shifts from intuitive selfishness to deliberative prosociality, this is the "SP mode"; if the response shifts from intuitive prosociality to deliberative selfishness, this is the "PS mode." When the strength of one intuition is markedly dominant (as in the PP and SS

modes in the figure), that intuition will directly dominate behavior, and the likelihood of deliberative intervention is relatively low; when the two intuitions are similar in strength and the conflict is salient (as in the SP and PS modes in the figure), deliberative processing is more likely to be triggered, leading to a reversal of the response. The figure intuitively reveals how behavioral patterns and the dynamic process of cognitive processing change as a function of intuitive strength. P = prosocial; S = selfish.

In addition, the mixed model reconstructs the functions of the deliberative system. De Neys (2025) further proposed a multifunctional framework of deliberation, explicitly pointing out that deliberative processing (System 2) does not merely bear the single function of “correction,” but is instead a multifunctional system serving multiple and complementary goals. This framework systematically delineates four core functions of deliberative processing: (1) response control, that is, inhibiting or suppressing salient but potentially inappropriate intuitive responses; (2) response generation, in which, when intuition fails to provide a clear answer, new responses are actively constructed through effortful processing such as mental simulation and algorithmic computation; (3) response rationalization, providing clear

judgments, defensible reasons, or arguments, thereby making them viable for social communication and self-explanation; (4) a regulatory function, namely monitoring and regulating the cognitive processing process itself, including uncertainty assessment, allocation of cognitive resources, and trade-offs among multiple response options. It should be emphasized that these four functions are not mutually exclusive, independent modules, but rather a highly complementary and dynamically combinable set of functions (De Neys, 2025). In a single decision-making process, individuals are not limited to invoking one single function; instead, they can flexibly switch among or iterate multiple functions over time according to situational demands. For example, an individual may first inhibit an inappropriate intuitive response, then generate new alternative options, and finally provide a rationalizing explanation for the selected response.

This framework explicitly proposes a principle of non-exclusivity: some of the functions involved in the deliberative system are not unique to that system. Under specific conditions, the intuitive system can likewise rapidly perform operations such as simple response control or preliminary rationalization. The key theoretical basis is that all deliberative functions depend on a set of shared, lower-level cognitive subprocesses, such as attentional control and the storage and retrieval of working memory. It is precisely these shared underlying cognitive resources that enable multiple functions to be coordinated, combined, and flexibly deployed. Within the theoretical framework of the hybrid model, the deliberative system is more like a context-sensitive cognitive “toolbox”: its specific functional configuration—which functions are invoked and how they are combined—is not preset, but is dynamically determined by the state of competition among intuitions, such as the level of conflict, the relative strength of the dominant intuition, and its correctness. This perspective marks a key shift

in the understanding of the deliberative system: from a traditional, one-way “corrector” to a dynamic cognitive regulatory system that serves the control of complex decision-making.

4.2 Key Empirical Support for the Hybrid Model

Although the hybrid model was initially systematically tested in the domain of logical reasoning, the research in that domain will not be discussed in detail here. Instead, the focus of the discussion is placed on moral cognition and prosocial decision-making, two domains more directly related to social behavior.

The proposal of the hybrid model has been accompanied by a series of important innovations in research paradigms. Isler and Yilmaz (2023) examined more than ten commonly used techniques for activating intuition and reflection, and found that methods such as emotion induction and cognitive load can effectively activate intuition, whereas methods such as debiasing training and decision justification can effectively activate reflection. This provides a methodological basis for selecting experimental manipulations within the framework of the hybrid model.

On this basis, the most representative paradigm innovation is the combined use of intuition-strength manipulation and the two-response paradigm. The former uses experimental design to selectively regulate the activation strength of different intuitive responses—for example, by manipulating the extremity of information (such as contrasting base rates of “997:3” and “700:300”), the emotional salience of contextual cues (such as using highly emotional faces), or the degree of closeness in social relationships (such as whether the recipient of help is a relative or a stranger)—in order to alter the relative advantage of different intuitions in competition. The latter divides the decision-making process into two stages so as to distinguish initial intuitive responses from subsequent deliberative processing: in the first stage, time pressure and/or cognitive load are imposed to capture intuitive responses to the greatest extent possible; in the second stage, the constraints are removed, allowing participants to engage in relatively sufficient deliberative thinking and give their final response. The study by Bago and De Neys (2019b) found a stable “non-corrective” pattern: regardless of whether the final choice was prosocial or selfish, that choice had already been determined at the intuitive stage of rapid response. This indicates that prosociality and selfishness themselves can both exist in parallel as intuitive responses, rather than there being a single default intuition. The primary function of deliberative processing is not to correct some preset intuition, but is more likely to coordinate, arbitrate, or

rationalization. Compared with the traditional single-response paradigm, this method can directly trace the process of change from initial intuition to final response, thereby providing a more fine-grained tool for testing different models of cognitive processes.

In the domain of moral cognition (Figure 3a), Bago and De Neys (2019a) intro-

duced the dual-response paradigm into classic moral-dilemma tasks to examine whether utilitarian judgments necessarily arise from the deliberative correction of deontological intuitions. By manipulating the type of sacrificial target, they systematically varied the relative strength between deontological intuition (opposition to direct harm) and utilitarian intuition (maximizing overall welfare). The results showed that when the sacrificial target was a family member, deontological intuition was significantly strengthened, whereas utilitarian intuition was relatively weakened. Under this condition, individuals who initially made utilitarian choices showed a significant decrease in confidence in their own judgments, whereas individuals who initially made deontological choices showed a significant increase in confidence. This pattern of confidence levels varying with the situation reflects changes in the relative strength of the two intuitions and is consistent with the core assumption of the hybrid model that “intuitive strength determines responses and subjective certainty.” This study indicates that moral judgment is not simply a process of “intuition–deliberative correction,” but rather the result of parallel competition among multiple moral intuitions and the dynamic involvement of deliberation. In the domain of prosocial decision-making (Figure 3b), Bago et al. (2021) further applied the dual-response paradigm to multiple economic-game contexts, such as public-goods games and dictator games, to examine the dynamic roles of intuition and deliberation in prosocial behavior. The results were highly consistent with findings in the domain of moral cognition: regardless of whether the final choice was prosocial or selfish, in the vast majority of cases the choice had already been formed at the initial intuitive stage, and the proportion of reversals after subsequent deliberative thinking was extremely low. This stable “non-corrective” pattern suggests that prosocial and selfish responses themselves can both exist as intuitions that are activated in parallel and compete with one another, and that the primary function of deliberative processing is not to systematically correct a particular default response, but rather to coordinate, arbitrate, or provide post hoc rationalization when intuitive conflict is salient.

In summary, whether in moral judgment or prosocial decision-making, existing evidence supports the core view of the hybrid model: decisions do not originate from a single, fixed default intuition, nor are they produced by a unidirectional correction of that intuition through deliberative processing. Instead, they arise from dynamic competition among multiple intuitive responses activated by contextual cues, with deliberative processing intervening as a flexible, conditionally triggered mechanism for conflict resolution and regulation. It should be noted that the key evidence currently supporting the hybrid model comes mainly from the domains of logical reasoning and moral judgment (Bago & De Neys, 2019a, 2019b). Although Bago et al. (2021) have extended the relevant paradigm to prosocial decision-making and have preliminarily identified a “non-corrective” pattern, the empirical foundation of the hybrid model in the prosocial domain is still at the stage of accumulation and validation. For example, whether the phenomenon of an “extremely low reversal rate” shown in Figure 3b can be stably replicated across different cost structures, social distances, and even cultural

backgrounds still lacks systematic verification. Therefore, at present, caution is still needed in generalizing conclusions obtained from specific task paradigms. For this reason as well, the significance of introducing the hybrid model into research on prosocial decision-making does not lie in immediately replacing existing theories, but rather in providing an analytical framework that pays greater attention to cognitive processing, thereby offering a new theoretical perspective for understanding the real-time competition among multiple motives, value conflicts, and the dynamic regulatory mechanisms of deliberative processing.

Figure text (left panel a): “intuitive deontology,” “intuitive utilitarianism,” “deliberation” ; axis labels: “start,” “conflict,” “end” ; “cognitive process in the moral domain.”

Figure text (right panel b): “intuitive prosociality,” “intuitive self-interest,” “deliberation” ; axis labels: “start,” “conflict,” “end” ; “cognitive process in the prosocial domain.”

Figure 3. Schematic diagram of the cognitive processes of the hybrid model in the moral domain and the prosocial domain (adapted from De Neys, 2012)

Note: Figure 3 illustrates the application of the hybrid model in specific decision-making domains. During decision-making, multiple intuitions are activated in parallel and compete. The outcome of this competition—determined by absolute strength and differences in relative strength—directly guides behavioral output; deliberative processing (System 2) is triggered only when conflict between intuitions is pronounced. Figure 3a shows the application of the hybrid model in the domain of moral decision-making.

4.3 Integrative Advantages and Explanatory Power of the Hybrid Model

The classical social heuristics hypothesis emphasizes the formation of cooperative heuristics and their default activation mechanism, while self-preservation internalized heuristic theory extends this framework into an internalization model of multiple adaptive heuristics. The hybrid model further reveals the dynamic competition among multiple intuitive responses and the coordinating function of deliberative processing. On this basis, the present article constructs a hierarchical theoretical framework encompassing “heuristic formation—multiple intuitive competition—deliberative regulation,” so as to more comprehensively understand the cognitive mechanisms of prosocial decision-making. At the theoretical level, the classical social heuristics hypothesis and self-preservation internalized heuristic theory mainly answer the question of “where intuition comes from,” whereas the hybrid model mainly answers the question of “how intuition operates in the decision-making process.”

The key to theoretical integration lies in constructing a complete explanatory chain from “intuition shaping” (source) to “intuition competition” (processing). Specifically, social experience does not directly determine cooperative behavior;

rather, by shaping the baseline strength of different intuitive responses, it forms an intuition repertoire unique to the individual. The classical social heuristics hypothesis emphasizes the formation process of cooperative heuristics, while self-preservation internalized heuristic theory further extends this to the formation mechanism of multiple adaptive heuristics. When an individual enters a specific social decision-making context, these long-internalized heuristics are simultaneously activated under the influence of environmental cues and enter a process of dynamic competition; the outcome of this competition is then integrated and regulated by deliberative processing, ultimately manifesting as a specific behavioral choice. Therefore, the social heuristics hypothesis and self-preservation internalized heuristic theory provide the source basis for multiple intuitive competition in the hybrid model, while the hybrid model further explains how these internalized heuristics are activated, compete, are coordinated, and ultimately influence behavioral outcomes in real-time decision-making processes (see Table 1).

Table 1. Comparison of the social heuristics hypothesis, the hybrid model, and their integrative framework

Dimension	Social Heuristics Hypothesis	Hybrid Model	Integrative Framework
Core question	Where does intuition come from?	The processing process of intuition	How intuition forms and plays a role in decision-making
Explanatory level	Source level	Processing level	Combination of source level and processing level
Analytical focus	Long-term internalization of social experience	Immediate competition among multiple intuitions	How the intuition repertoire shaped by experience engages in competition
Typical prediction	The richer the cooperative experience,	Different structures of intuitive strength determine behavioral output	Under different experiential backgrounds, the same situational manipulation can
	The stronger the cooperative intuition		can produce different outcomes

Limitations	Difficult to explain the mechanism of immediate processing	Difficult to explain the origin of the competitive structure	The formation of the structure of the intuition repertoire still requires empirical testing
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This integrative framework achieves an explanatory power that is difficult for any single theory to attain. First, it explains the sources of individual differences in intuitive conflict. The hybrid model emphasizes competition among multiple intuitions, but it focuses primarily on the competitive process itself and has difficulty explaining why different individuals exhibit different competitive patterns. The social heuristics hypothesis can explain the experiential origins of cooperative tendencies, but it pays relatively little attention to the dynamic role these tendencies play in real-time decision making. The integrative framework connects the two, proposing that the cooperative, reciprocal, or competitive rules formed through individuals' long-term social experience jointly constitute an intuition repertoire with different baseline strengths. Thus, even when facing the same decision situation, individuals may differ systematically in the types of intuitions activated and in their relative strengths. Accordingly, the integrative framework explains not only how intuitions compete, but also why individuals experience different degrees of intuitive conflict. Second, the framework reveals the mechanism of interaction between experience and context. The social heuristics hypothesis emphasizes the cross-situational stability of intuition, whereas the hybrid model emphasizes the sensitivity of decisions to contextual cues. The integrative framework further points out that social experience not only shapes the content of intuitions, but also influences individuals' sensitivity to contextual cues. Individuals with different experiential backgrounds may assign different weights to the same cue, thereby causing different intuitions to be preferentially activated. Therefore, contextual effects do not exist independently; rather, they are moderated by experiential background. This "experience-context interaction" mechanism can explain why different individuals show different responses in the same decision environment.

This also provides a new framework for understanding the long-standing contradictory findings in the field of prosocial decision making. For example, proponents of the social heuristics hypothesis have found that time pressure can promote cooperation (Rand, 2016), whereas other studies have found that the effect of time pressure is nonsignificant, or even that it promotes self-interested behavior (Kvarven et al., 2020). Similarly, deliberative processing promotes cooperation in some studies, but inhibits cooperation or produces no significant effect in others (Fromell et al., 2020; Rand, 2019). The integrative framework holds that these differences do not imply the failure of the relevant theories; instead, they reflect differences, across samples, social-experience backgrounds, and contextual conditions, in the structure of individuals' intuition repertoires

and in the patterns of competition among those intuitions. When cooperative intuition has an advantage over self-interested intuition, constraining deliberative processing is more likely to manifest as increased cooperation; whereas when self-interested intuition has an advantage, or when multiple intuitions are in a state of intense competition, the deliberative system may serve functions of arbitration, control, or rationalization, thereby producing different or even opposite behavioral outcomes. Thus, differences in cooperative behavior can be traced not only to processes of immediate cognitive processing, but also further back to the intuitive structures shaped over the long term by social experience, thereby achieving a cross-level explanation from the source layer to the processing layer.

It can therefore be seen that the relationship between the social heuristics hypothesis and the hybrid model is not one of simple juxtaposition; rather, they correspond respectively to the source layer and the processing layer in prosocial decision making. By incorporating both “where intuition comes from” and “how intuition operates” into a unified analytic system, the integrative framework can not only explain the formation mechanism of prosocial behavior, but also predict behavioral performance under the interactive influence of experiential background and decision context. This cross-level explanation, which simultaneously accounts for sources and processing, individual differences and contextual influences, is precisely the important theoretical value by which the integrative framework surpasses any single theory.

5 Future Research Directions and Theoretical Implications

This paper proposes an integrative framework, arguing that prosocial decision-making is a dynamic process in which multiple heuristics shaped by long-term experience interact with deliberative processing. In this framework, the social heuristics hypothesis and its subsequent development—the self-preservation internalized heuristic theory—primarily explain the origins of heuristic formation, whereas the hybrid model mainly explains the activation, competition, and integration of multiple heuristics in specific decision-making contexts. By integrating the formation mechanisms and operating mechanisms of heuristics, this framework not only helps reconcile divergences among existing theories but also provides a more systematic explanatory perspective for understanding contextual and individual differences in prosocial behavior. Future research can further test and refine this framework on this basis, thereby deepening our understanding of the cognitive mechanisms underlying prosocial decision-making.

5.1 Manipulating Intuitive Strength and Process-Tracing Measurement

Traditional studies infer the contributions of intuition and deliberation by manipulating processing modes, such as time pressure and cognitive load. However, such approaches cannot directly quantify the relative activation strength of different intuitions in a given context. Research in logical reasoning and moral judgment provides useful experimental logic for manipulating intuitive strength:

the core idea is to increase or weaken the strength of a particular intuition by manipulating the salience or affective value of decision cues, and then observe how this changes decision outputs and subjective experiences, such as decision confidence and perceived conflict. Bago and De Neys (2019b, 2020) manipulated the extremity of base rates, such as 997:3 vs. 700:300, thereby changing the relative strength of “logical intuition” compared with “heuristic intuition” and directly influencing the accuracy of initial responses. In the domain of moral cognition, Bago and De Neys (2019a) manipulated the relative strength of deontological and utilitarian intuitions by changing the identity of the person to be sacrificed in moral dilemmas, such as a stranger vs. a family member. Sacrificing a loved one significantly strengthened deontological intuition, and changes in this strength were directly reflected in individuals’ decision confidence. These studies offer valuable references for systematically manipulating prosocial and selfish intuitions in prosocial decision-making research.

Future research should focus on constructing experimental paradigms capable of manipulating the relative strength of prosocial and selfish intuitions, so as to test the hybrid model’s core predictions regarding competition among multiple intuitions. The key is to design specific contexts that alter the baseline strength and activation advantage of the two types of intuition. One relatively direct approach is to use social distance, such as family members, friends, and strangers, and personal cost, low vs. high, as manipulated variables in tasks such as resource allocation. According to the predictions of the hybrid model, when the decision target is a family member and the cost is low, prosocial intuition should be significantly dominant, resulting in a stable “prosocial-prosocial” (PP) pattern, accompanied by faster decision speed, higher decision confidence, and lower perceived conflict. When the target is a stranger or the cost is relatively high, the strength difference between prosocial and selfish intuitions should narrow, making individuals more likely to show a response “reversal” (PS pattern), accompanied by longer response times, lower confidence, and stronger conflict experience.

In addition, studies may manipulate affective and empathic cues to change the activation strength of different intuitions. For example, operations such as presenting identifiable recipient information and inducing emotions may enhance affect-driven altruistic responses (Gärtner et al., 2022). Constructing a continuum of contexts ranging from “high threat—immediate consequences” to “low threat—delayed benefits” would also help test whether high-arousal states preferentially trigger intuitive altruistic responses. Furthermore, future research may draw on moral foundations theory by separately highlighting different moral cues, such as fairness, care, and loyalty, to examine different types of

activation of intuitions and the mechanisms of competition. Through such designs, researchers can more systematically reveal how multiple intuitions are activated in specific contexts, compete with one another, and ultimately become integrated into behavioral output.

In addition, while manipulating the strength of intuitions, it is necessary to

incorporate measurement techniques capable of capturing real-time cognitive processes. Among these, the dual-response paradigm provides a key methodological foundation for distinguishing intuitive processing from deliberative processing; on this basis, combining multiple process-tracing techniques can further reveal the competition and integration of different intuitions along the temporal dimension. Specifically, at the behavioral level, mouse-trajectory analysis—by characterizing the curvature of movement paths, changes in speed, and the direction of the endpoint—can dynamically reflect the degree to which different options attract the individual during decision-making, thereby providing continuous indicators for assessing the intensity of intuitive competition. Eye-tracking, by recording gaze duration and switching patterns for each option and its key information, reveals the allocation trajectory of attentional resources and provides an important window for understanding how different intuitions compete for limited cognitive resources. At the neurophysiological level, electroencephalography (EEG), with its high temporal resolution, is especially suitable for capturing the rapid activation of intuitions and their competitive processes. Researchers can focus on neural oscillatory activity related to conflict monitoring (e.g., the N2 component), cognitive control (e.g., the P3 component), and value evaluation, and examine how these signals are systematically modulated by changes in key contextual variables such as social distance and personal cost. These neural indicators may serve as objective physiological representations of the activation strength of different intuitions. Finally, by integrating multiple sources of information—including behavioral indicators, eye-movement data, neural activity, post-decision confidence ratings, and subjective reports of conflict—it may be possible to reconstruct, within a single analytic framework, the complete cognitive process through which intuitions are initially activated, dynamically compete, and finally give rise to choice.

5.2 Exploring the Factors Influencing Intuitive Competition and the Regulatory Mechanisms of Deliberative Function

According to the perspective of the hybrid model, whether behavioral output patterns and deliberative processing become involved, as well as their specific functions, depends on the absolute strength of parallel intuitions and the relative difference in their strength. Accordingly, one key research direction is to explore the core variables that affect the strength of intuitions and to examine their interactive influence on cooperative decision-making. For example, when cooperation requires high personal cost, can prosocial intuition still override selfish intuition? Does this effect vary with the social attributes of the target object (ingroup vs. outgroup)? Examining such questions can help reveal the strength boundaries of prosocial intuition. If it is found that, even under high cost, individuals show stable intuitive cooperation toward ingroup members, this would indicate that the intuitive system may contain motivational units organized on the basis of social relationships and characterized by hierarchical structure and differential stability. Moreover, factors influencing the strength of intuition may come not only from the situation itself, but also from individuals' interpretations

of the meaning of the situation. In helping contexts, the source of the helper's motivation (autonomous vs. controlled) affects the strength of the recipient's "gratitude-reciprocity" intuition (Yang et al., 2024). Future research could combine the dual-response paradigm to further test how this variable changes the competitive pattern between "reciprocity" and "self-interest" intuitions, as well as the mode of involvement of deliberative processing. Similarly, cognitive reconstruction may also influence the role of experience in shaping intuitions. Existing research has found that, after experiencing unfair treatment, individuals are more likely to show a transmission effect of "unfairness-self-interest"; however, reinterpreting unfair experiences as growth experiences can weaken this effect (Shi et al., 2023). This indicates that the process of internalizing experience is itself malleable.

At the same time, the functions of the deliberative system in the hybrid model require further refinement. Deliberation has control, generation, rationalization, and

multiple functions, including regulation. A key question is under what circumstances these functions are invoked, and how they affect the final decision.

Future research can distinguish among these possibilities through different experimental designs. For example, one could infer the rationalization process by analyzing participants' reasons for their decisions; examine the generative function by creating novel dilemmas that lack ready-made intuitive answers; and test the control function by comparing differences between intuitive responses and final choices under high-conflict conditions. In addition, future work should attend to how individual differences influence the invocation of deliberative functions. For example, when facing intuitive conflict, are individuals high in cognitive reflection more inclined to activate generative functions to seek new options, whereas individuals low in reflection rely more on control or rationalization? Future research needs to integrate behavioral choice, reason reporting, process-tracing indices, and individual-difference variables within a unified experimental framework, so as to reveal more systematically the rules governing the invocation of deliberative functions.

5.3 Formation and Dynamic Evolution of Intuitive Content

The explanatory scope of the hybrid model should not be limited to the momentary processing that occurs when a decision is made; it should also extend to the formation and dynamic evolution of intuitive content itself. First, with respect to the formation of intuitive content, cross-cultural comparisons and longitudinal research designs can be combined to systematically examine how macro-level sociocultural environments, through accumulated experience, shape individuals' prosocial and self-interested tendencies, which in turn constitute the latent content of intuitive responses in decision-making. One question worthy of further investigation is whether, in social environments with strong cooperative norms, individuals generally develop stronger cooperative tendencies, and

how intuitive differences internalized through culture influence the interaction pattern between intuition and deliberation in laboratory decision-making. Furthermore, cultural background not only shapes the specific content of intuition, but may also influence the competitive structure among different intuitions. Existing research has found that the psychological network structures of intuition in different cultures (Atari et al., 2023) and the content that triggers strong intuitions (McHugh et al., 2023) both differ, suggesting that competition among multiple intuitions may itself be a dynamic process regulated by culture. Notably, this shaping effect comes not only from sociocultural environments but is also influenced by physical ecological environments. For example, contact with natural environments has been shown to effectively enhance individuals' willingness to be prosocial by increasing self-transcendence and connectedness to nature (Mei et al., 2024). Future cross-cultural research could incorporate physical ecological factors in order to more comprehensively understand the foundations on which intuitive content is formed. Second, with respect to the dynamic evolution of intuition, laboratory situational simulations can be used to directly manipulate the micro-level interaction experiences that shape social intuitions. For example, a brief positive or negative interaction can be introduced to test the immediate regulatory effect of interaction experience on prosocial behavior. Such research would help transform variables such as social distance from static categories into dynamic process variables that can be updated by social experience, thereby revealing the contextual sensitivity and plasticity of the intuitive system.

5.4 From Theory to Application: Immediate Nudges and Long-Term Architectures

An important implication of the hybrid model for applied practice is that, if prosocial behavior arises from intuitive responses that gain an advantage in competition, while the deliberative system has diverse and flexible functions, then intervention strategies should shift away from the traditional approach of “training individuals to overcome selfish tendencies through deliberative processing” and toward “shaping environments that facilitate the generation of prosocial intuitions, and optimizing the interactive conditions between intuition and deliberation.” Accordingly, practice can proceed at two levels: (1) at the level of immediate intervention, from the perspective that “decisions are the outcome of competition among intuitions,” the weight of particular prosocial intuitions can be temporarily increased at key decision points through “choice architecture.” For example, in charitable fundraising contexts,

By highlighting the recipient's face to activate empathic intuition, or by using descriptive norms to evoke conformist intuition. Based on the finding that intuition is shaped by interactive experience, narrative strategies can be used to “simulate” positive social connections between donors and unfamiliar recipients, thereby providing individuals with positive interactive experiences and enhancing their prosocial willingness (Shi et al., 2026). In addition, delibera-

tive processing can be guided to play its constructive function. For example, in team decision-making, the discussion framework can be shifted from “balancing individual interests” to “achieving the collective optimum,” so that the “generative function” of the deliberative system serves cooperative thinking. (2) At the level of long-term structure, the coordinated effects of policy systems, educational systems, cultural construction, and social norms can create an environment in which behaviors such as cooperation and fairness can continuously receive positive feedback. Examples include improving the social credit system, constructing incentive mechanisms that encourage collaboration, and developing cultural products rich in altruistic narratives. The core goal is to internalize prosociality as a stable and strong default intuition in individuals, thereby fundamentally enhancing its baseline advantage in participating in “intuitive competition” across different social contexts.

In summary, advancing the development of the hybrid model in the field of prosocial decision-making is valuable not only for deepening theoretical construction, but also for providing a practice pathway based on cognitive mechanisms to promote social cooperation and collective well-being—a pathway that combines the efficacy of immediate intervention with the foundational significance of long-term institutional shaping.

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Intuitive competition and deliberative regulation in prosocial decision-making

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Abstract: Dual-process theory provides an important framework for understanding the cognitive mechanisms underlying prosocial decision-making. Early research on the relative roles of intuitive and deliberative processing in prosocial behavior has generated two major theoretical accounts. The reflective model posits that prosocial behavior requires deliberative control to override selfish intuitions. In contrast, the intuitive model of prosociality proposes that prosocial tendencies

primarily stem from intuitive processing, with deliberation potentially prompting more self-interested calculations. Despite their opposing conclusions, both models are built upon the same assumption of single-intuition activation followed by deliberative correction. The Social Heuristics Hypothesis (SHH) advanced this debate by reconceptualizing intuition as the internalization of socially acquired rules, thereby explaining the experiential origins of intuition and its contextual variability. However, SHH has difficulty explaining conflict experiences during decision-making and the inconsistent effects of deliberative processing. Based on this, the Hybrid Model proposes that multiple intuitive responses can be activated in parallel, with behavior initially determined by the competition among them based on their relative strength. Deliberative processing is thus reconceptualized as a multifunctional conflict-regulation system that flexibly exerts control, generates alternatives, provides justification, or regulates ongoing processing depending on the degree of intuitive conflict. This review integrates the SHH and the Hybrid Model, arguing that whereas the former explains the experiential origins of intuitions, the latter characterizes their dynamic processing, thereby proposing an integrative cognitive framework of “Heuristic Formation – Multi-Intuition Competition – Deliberative Regulation”. This framework shifts the research focus from “which processing mode dominates” to “how multiple intuitions are activated, compete, and dynamically interact with the deliberative system”, offering a more inclusive theoretical framework for reconciling previously inconsistent findings.

Keywords: Prosocial decision-making, reflective model, intuitive model of prosociality, Social Heuristics Hypothesis, Hybrid Model

Note: Figure translations are in progress. See original paper for figures.

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