Journal of Experimental Social Psychology 68 (2017) 50–59

Contents lists available at ScienceDirect

Journal of Experimental Social Psychology

journal homepage: www.elsevier.com/locate/jesp

The effects of observed decision time on expectations of extremity and cooperation

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HIGHLIGHTS

- People use observed decision time to form expectations of extremity and cooperation in social dilemmas.
- Fast decisions are seen as less conflicted and more extreme than slow decisions.
- Decision times only influence expectations when they are attributable to self-paced reaction times.
- Trustworthiness cues have stronger effects on expectations of cooperation when they are paired with fast decisions.
- People choose more extreme responses when interacting with fast deciders.

ARTICLE INFO

Article history:
Received 16 March 2016
Revised 12 May 2016
Accepted 12 May 2016
Available online 16 June 2016

ABSTRACT

The present research investigates how people use observed decision time to form expectations of others' behavior in social dilemmas. In four studies, participants received information about others' decision times (fast or slow) and were asked to estimate how much they contributed to a common pool. People believe fast decisions are more extreme than slow decisions; in other words, they assume that fast decisions are either extremely selfish *or* extremely cooperative. People also believe that fast deciders are less moral (Studies 1 and 2) and less conflicted (Study 2) than slow deciders. Beliefs about decision time depend on whether time can be attributed to self-paced reaction times or external time constraints. When decisions are made under external time constraints, time has inconsistent or heterogeneous effects on behavioral expectations (Study 2). Decision time also moderates the effects of other informational cues: Positive facial expressions and perceptions of trustworthiness have stronger effects on expectations when paired with fast decisions (Study 3). Finally, observed decision time also has behavioral consequences – people make more extreme decisions when interacting with a partner who decided quickly (Study 4). Observed decision time plays a crucial role in how expectations of others' behavior are formed.

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1. Introduction

Successful social decision-making depends on the ability to identify trustworthy interaction partners (Bonnefon, Hopfensitz, & De Neys, 2013, 2015; Todorov, Olivola, Dotsch, & Mende-Siedlecki, 2015). To accomplish this task, people rely on an array of personal and situational cues to form expectations of how others will behave (Evans & Krueger, 2016; Thielmann & Hilbig, 2015). We introduce the idea that people also attend to cues in the process of decision-making, and ask how people use the time that others take to reach a decision to form behavioral expectations.

Previous research has investigated whether cooperative decisions are faster or slower than selfish decisions (Evans, Dillon, & Rand, 2015; Rand, Greene, & Nowak, 2012), and how observed decision times influence the perceived motives underlying cooperative and selfish choices (Critcher, Inbar, & Pizarro, 2013; Jordan, Hoffman, Nowak, & Rand, 2016; Van de Calseyde, Keren, & Zeelenberg, 2014). Our work builds on these findings by examining how people use observed decision time to *predict* others' decisions, testing if people believe that fast decisions are more extreme than slow decisions. In turn, we ask how decision time amplifies (or attenuates) the effects of other informational cues, and whether people behave differently when interacting with fast (vs slow) decision-makers. The present research offers new insights into the cues people use to form behavioral expectations, and illuminates metacognitive beliefs about the mental processes underlying social decision-making.

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http://dx.doi.org/10.1016/j.jesp.2016.05.009
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2. Expectations of cooperation in social dilemmas

Social dilemmas are defined by the conflict between individual self-interest and the collective good (Dawes, 1980). In social dilemmas, cooperative behavior is beneficial for the group but costly for the individual. These dilemmas can occur in close relationships (Van Lange, Agnew, Harinck, & Steemers, 1997), organizations (Van Lange, Joireman, Parks, & Van Dijk, 2013), and in society at large (Hauser, Rand, Peysakhovich, & Nowak, 2014). Decision-making in social dilemmas involves two related cognitive challenges: people must 1) form expectations of how others will act and 2) resolve the conflict between self-interested and prosocial motives. Note that the willingness to pursue prosocial motives is contingent on the expectation that others will do the same – some individuals are unconditionally selfish, but most cooperative behavior is conditional on the belief that others will reciprocate (Axelrod & Hamilton, 1981; Capraro, 2013; Krueger, DiDonato, & Freestone, 2012; Van Lange, 1999).

Researchers have investigated the different types of informational cues that people use to form expectations of cooperation (Evans & Krueger, 2016; Thielmann & Hilbig, 2015). People are particularly sensitive to personal cues observed in interaction partners' static physical appearances (Andreoni & Petrie, 2008; Bonnefon et al., 2013; Little, Jones, DeBruine, & Dunbar, 2013; Wilson & Eckel, 2006) and nonverbal behavior (DeSteno et al., 2012; Van den Brule, Dotsch, Bijlstra, Wigboldus, & Haselager, 2014). Decision-makers also attend to situational cues, such as the other party's financial incentive to act selfishly (Evans, Athenstaedt, & Krueger, 2013; Evans & Krueger, 2011, 2014) and whether there is the possibility of repeated interactions (Bó, 2005; Sebastián-Enesco & Warneken, 2015).

There is still some debate as to whether people use informational cues to form *accurate* expectations, or if they hold biased beliefs about who will cooperate (Bonnefon et al., 2015; Kausel & Connolly, 2014; Rule, Krendl, Ivcevic, & Ambady, 2013; Todorov et al., 2015). For example, people believe that positive emotions are associated with trustworthiness (Krumhuber et al., 2007; Oosterhof & Todorov, 2009) and that specific negative emotions, such as anger, predict untrustworthy behavior (Cooper, Connolly, & Kugler, 2015; Kausel & Connolly, 2014). Naive beliefs, however, are not always aligned with reality – prosociality sometimes increases with negative mood states (Cialdini & Kenrick, 1976) and feelings of anger (Van Doorn, Zeelenberg, & Breugelmans, 2014).

The present research introduces the idea that people use observed decision times as a cue to form behavioral expectations. Observed decision time may play a particularly important role when the underlying intentions of the decision-maker are not transparent. For example, in social dilemmas with random noise, people lack the ability to judge with certainty if others intended to cooperate or defect (Klapwijk & Van Lange, 2009; Van Lange, Ouwerkerk, & Tazelaar, 2002). In other situations, the consequences of a decision may involve a temporal delay and may not be immediately realized (Hauser et al., 2014; Milinski, Sommerfeld, Krambeck, Reed, & Marotzke, 2008). Under these conditions, people may observe that a decision was made quickly (or slowly), but lack information about whether the decision-maker intended to cooperate. Time, then, can provide some insight into how the decision was made and the motives of the decision-maker (Mata & Almeida, 2014; Mata, Ferreira, & Sherman, 2013). In the following section, we review research examining the relationship between decision time and cooperation.

3. Decision time in social decision-making

In recent years, researchers in psychology and economics have investigated the relationship between decision time and behavior in social dilemmas (Krajbich, Bartling, Hare, & Fehr, 2015; Rand et al., 2012). In particular, studies focusing on the correlation between reaction times and cooperation have found evidence of an inverted-U relationship: both extremely cooperative and extremely selfish decisions are faster than intermediate decisions (Evans et al., 2015). Beyond the domain of social dilemmas, this inverted-U pattern of reaction times has been observed in a range of social-cognitive (Akrami, Hedlund, & Ekehammar, 2007; Austin, 2009; Kuiper, 1981; Markus, 1977) and psychophysical tasks (Brown, Marley, Donkin, & Heathcote, 2008; Mignault, Bhaumik, & Chaudhuri, 2009; Mignault, Marley, & Chaudhuri, 2008; Monahan & Lockhead, 1977). Fast decisions and judgments are often more extreme than slow ones.

To explain why fast decisions are more extreme than slow decisions, evidence accumulation models of decision-making (Baron, Gürçay, Moore, & Starcke, 2012; Klauer, 2014) posit that individuals with conflicting goals need more time to reach a decision and, in turn, are more likely to select an intermediate response. On the other hand, unconflicted individuals – those with a strong preference unambiguously favoring one course of action – are more likely to reach a decision quickly and select an extreme response. This perspective thus suggests that slow decision times reflect the decision-maker's tendency to consider conflicting or contradictory pieces of evidence before reaching a final decision (Fiedler, Glöckner, Nicklisch, & Dickert, 2013; Klauer, 2014; Krajbich et al., 2015; Ratcliff & Smith, 2004).

In addition to studying the *intrapersonal* effects of decision time, recent research has also asked how observed decision time influences *interpersonal* judgments and choices. When judging an actor's behavior, people use time to infer whether the actor felt conflicted about her ultimate choice (Critcher et al., 2013; Van de Calseyde et al., 2014). For example, an actor is judged more extremely for committing moral (or immoral) acts when she decides to commit the act quickly. Fast moral decisions are believed to be more indicative of the actor's true character, while slow decisions are seen to reveal feelings of reluctance or hesitation (Critcher et al., 2013). Importantly, people adjust their future behavior based on inferences about whether the actor experiences doubt (or not). For example, job seekers prefer to work for a company that quickly offers them a job over one that requires more time to reach a final decision (Van de Calseyde et al., 2014). In addition, observed time also plays a role in dilemmas of trust and cooperation – people prefer to interact with those who show trust quickly (Van de Calseyde et al., 2014) and those who are willing to cooperate without taking time to calculate the costs and benefits (Jordan et al., 2016).

4. Overview of present studies

Previous research on decision time has primarily focused on how it is used to judge the motives of actors who commit cooperative or selfish acts. The present studies build on these prior findings and extend them in several ways: First, we ask whether people use observed time to *predict* others' behavior in social dilemmas. When forming expectations of others' behavior, do people anticipate that fast decisions are more extreme than slow decisions? Second, we investigate when people use time to form behavioral expectations. To accomplish this goal, we examine whether people have different beliefs about the effects of time when it is attributable to self-paced reaction time *or* an external constraint (Study 2). We ask if the effects of time are related to inferences about the decision-maker's underlying preferences, or if they are related to beliefs about the consequences of fast (vs slow) cognitive processes. If the effects of time are due to inferences about the decision-maker's feelings of internal conflict (Evans et al., 2015), then time should lose its diagnostic value when it is attributable to an external source.

Building on these initial studies, we address the broader implications of observed decision time: Study 3 tests how people integrate time with other types of informational cues. We test the hypothesis that people have more heterogeneous beliefs about fast decisions, and thus trustworthiness cues have stronger effects on expectations of cooperation for fast (vs slow) decisions. Finally, Study 4 tests the behavioral consequences of observed decision time. We test if people are more extreme

(and selfish) when interacting with a partner who decides quickly. Together, the present studies suggest that decision time plays an important role in the process of trustworthiness detection in social dilemmas. We report all measures, manipulations, and exclusions in the following studies.

5. Study 1: Observed decision time and expectations

Our first study tested the effects of decision time on expectations of extremity and cooperation. Previous studies found that people perceive fast decisions as being less conflicted (and more certain) than slow decisions (Critcher et al., 2013; Van de Calseyde et al., 2014), leading to the prediction that people may anticipate that fast decisions are associated with low-conflict responses – namely, extremely selfish or extremely cooperative decisions (Evans et al., 2015; Krajbich et al., 2015). In contrast, individuals who decide slowly may be seen as lacking a clear preference for self-interest or prosociality. Therefore, observers may believe that slow deciders are more attracted to intermediate responses.

We also conducted exploratory tests of the effects of decision time on perceptions of morality and rationality. The effects of decision time on expectations of extremity and cooperation may be related to general inferences about the decision-maker's cognitive abilities (Mata & Almeida, 2014; Mata et al., 2013) and moral character (Goodwin, Piazza, & Rozin, 2014; Uhlmann, Pizarro, & Diermeier, 2015). Yet, previous research does not lead to clear predictions about how decision time will affect judgments of morality and rationality. For example, people believe that slow decisions are more rational, but only when the decision at hand is sufficiently complex (Kupor, Tormala, Norton, & Rucker, 2014).

5.1. Method

Psychology students from Tilburg University completed this study in exchange for course credit, $N = 125$. There were 25 men and 100 women, and the average age was 19.2 ($SD = 1.57$). Sample size was based on the number of participants that we were able to recruit over a one-week period. This experiment was presented to participants as part of a series of unrelated studies.

At the beginning of the experiment, participants read a brief description of the Public Goods Game (PGG). Participants were told that the experimenters had recently conducted a decision-making study. At the beginning of this study, students were randomly assigned to groups of four. Each group member began the game with an €8 endowment. Students could keep this money or contribute some (or all) of it to the group. Contributions were doubled by the experimenter and then distributed equally among the four group members. Hence, if all four students contributed the full €8, then they would each receive €16 in return. However, each individual student could potentially earn more money by contributing nothing. Students made their decisions at the same time without being able to communicate.

After learning about the rules of the PGG, participants were told about Job, a student who had taken either 5- or 15 s to make a decision. This measurement referred to the time Job spent at the decision screen and did not include the time he spent reading the game's instructions. To provide a frame of reference, participants were also told that the average response time was 10 s, a value close to the average decision times reported for the similar PGG studies conducted by Rand et al. (2012). After learning about Job's decision time, participants were asked to estimate the amount of money that he contributed to the group. On the following screen, participants judged Job's perceived morality (kind, generous, and honest, $\alpha = 0.61$) and rationality (rational, intelligent, and reliable, $\alpha = 0.63$).[1] Ratings were made on a scale from 1 (very inaccurate) to 9 (very accurate). At the end of the survey, participants provided basic demographic information.

5.2. Results and discussion

5.2.1. Expectations of extremity and cooperation

Expectations of cooperation were scaled from 0 (contributing nothing) to 1 (contributing everything), $M = 0.44$, $SD = 0.35$. Extremity was defined as the absolute distance between the estimate of expected cooperation and the midpoint response, contributing half of the endowment to the group (similar to the procedure for measuring extremity in Evans et al., 2015). Extremity scores ranged from 0 (contributing half of the endowment) to 1 (contributing either the full endowment or nothing at all), $M = 0.59$, $SD = 0.40$.

The frequencies of participants' expectations are illustrated in Fig. 1. Participants estimated that 5-s-decisions were significantly more extreme ($N_{fast} = 65$, $M = 0.78$, $SD = 0.34$) than 15-s-decisions ($N_{slow} = 60$, $M = 0.38$, $SD = 0.36$), $t(123) = 6.0$, $p \leq 0.001$, $d = 1.08$. We also tested whether participants believed that fast decisions were also less cooperative than slow decisions. Expectations of cooperation were similar for 5-s-decisions ($M = 0.40$, $SD = 0.18$) and 15-s-decisions ($M = 0.47$, $SD = 0.26$), $t(123) = 1.06$, $p = 0.29$, $d = 0.19$.

5.2.2. Perceptions of morality and rationality

To conclude, we looked at the effects of decision time on perceptions of morality and rationality. Participants believed that the fast decision-maker was significantly less moral ($M = 5.01$, $SD = 1.44$) than the slow decision-maker ($M = 5.52$, $SD = 1.04$), $t(123) = 2.26$, $p = 0.026$, $d = 0.40$. Participants also believed that the fast decision-maker was significantly less rational ($M = 5.43$, $SD = 1.49$) than the slow decision-maker ($M = 6.07$, $SD = 1.02$), $t(123) = 2.80$, $p = 0.006$, $d = 0.50$.

Expectations of extremity were *not* significantly correlated with perceptions of morality, $r(123) = -0.10$, $p = 0.25$, or rationality, $r(123) = -0.07$, $p = 0.42$. On the other hand, expectations of cooperation were positively correlated with perceptions of both morality, $r(123) = 0.47$, $p < 0.001$, and rationality, $r(123) = 0.30$, $p = 0.001$.

5.3. Summary

The central result of our first study was that decision time influenced expectations of extremity in social dilemmas – participants believed that fast decision-makers were more likely to select extremely selfish *or* extremely cooperative responses. These beliefs are consistent with the actual relationship between reaction times and cooperation; fast decisions are indeed more extreme than slow decisions (Evans et al., 2015; Krajbich et al., 2015). Additionally, fast decision-makers were seen as both less moral and less rational than slow decision-makers. Yet, perceptions of morality and rationality were not associated with

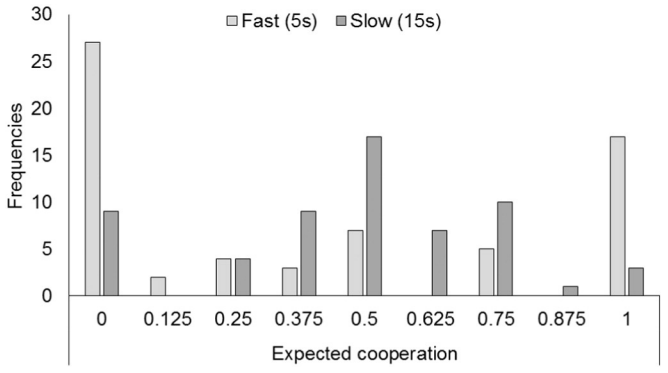

Fig. 1. The effects of decision time (5- vs 15-s) on expectations of cooperation in the Public Goods Game (Study 1).

[1] In Study 1, we used ad hoc measures of perceived morality and rationality. Principle Component Analyses suggested that the items corresponded with a two-component solution (morality $\lambda = 2.98$; rationality $\lambda = 1.43$).

expectations of extremity, raising questions about the specific inferences that lead participants to conclude that fast decisions are associated with extreme behavior.

6. Study 2: Reaction times and external time constraints

Are the effects of decision time on behavioral expectations related to inferences about the preferences of the decision-maker (Critcher et al., 2013; Van de Calseyde et al., 2014) or beliefs about the nature of fast (vs slow) cognitive processes (Bear & Rand, 2016; Rand et al., 2012)? To answer this question, our second study investigated whether people held different beliefs about decision times that were attributable to self-paced reaction times versus external time constraints. If people use time to form beliefs about the underlying preferences of the decision-maker, then time should only influence behavioral expectations when it is attributable to self-paced reaction times. This perspective posits that time loses its diagnostic value when it is attributable to an external source (e.g., when the actor is forced to respond quickly or slowly). In contrast, if people have different beliefs about the nature of fast (vs slow) mental processes, then it should not matter if the decision-maker's speed is attributable to self-paced reaction times or external time constraints. People may believe that the available decision time shapes the outcome of the decision process, and that people are more likely to choose extreme responses when they are forced to decide quickly.

Study 2 also measured the effects of time on perceived decision conflict. Previous work found that slow decisions are seen as more conflicted than fast decisions (Van de Calseyde et al., 2014; Van de Ven, Gilovich, & Zeelenberg, 2010), suggesting that perceived conflict may mediate the effects of observed decision time on behavioral expectations. If the effects of time are due to inferences about the preferences of the decision-maker, then conflict should only mediate the effects of time on behavioral expectations when time is attributable to self-paced reaction times. On the other hand, if people believe that the effects of time are due to the difference between fast (vs slow) decision processes, then conflict should mediate the effects of time in both the self-paced reaction times and external time pressure conditions.

6.1. Method

We recruited 588 American participants using MTurk. The average age was 31.1 years ($SD = 10.2$), 39% were women, and all but one were native English speakers. Participants were paid 40 cents for their time. Data collection occurred in two stages: Stage 1 $N = 280$; Stage 2 $N = 308$. The sample size for Stage 1 was based on the number of participants needed to detect a small-to-medium sized effect ($f = 0.175$) with 80% power: minimum $N = 259$. Data were analyzed after Stage 1 and the primary test was marginally significant. Therefore, the sample size was doubled. There were no repeat participants and controlling for stage of data collection did not affect our results.

Participants began by reading a brief description of the PGG. The instructions were similar to Study 1, except that players in the game began with initial endowments of 100 cents each. On the following pages, participants learned about a worker named Mark. Two factors were manipulated in the description of Mark's decision: decision time (less-than-ten seconds vs more-than-ten seconds) and the attribution of his decision time (self-paced reaction time vs. external time pressure).

In the *reaction time* condition, participants were told that Mark took less-than-ten (or more-than-ten) seconds to make a decision. In the *external time pressure* condition, participants were told that workers in the PGG were randomly assigned to Condition 1 (time pressure) or 2 (time delay): In Condition 1, workers had to make a decision in <10 s. In Condition 2, workers had to wait at least 10 s to make a decision. On the following screen, participants were told that Mark was randomly assigned to Condition 1 (time pressure) or 2 (time delay).

After learning about Mark's decision time and predicting his decision, participants were asked to judge Mark's decision conflict (conflicted, uncertain, and doubtful, $\alpha = 0.89$). The measure of conflict was a combination of the two-item measure of doubt (uncertain and doubtful) used in Van de Calseyde et al. (2014) and the one-item measure of conflict (conflicted) used in Evans et al. (2015). We also measured Mark's perceived morality (honest, sincere, and trustworthy, $\alpha = 0.84$) and rationality (competent, intelligent, and skilled, $\alpha = 0.80$). The measures of morality and rationality (competence) were taken from Leach, Ellemers, and Barreto (2007). Ratings were made on a scale from 1 (not at all accurate) to 7 (very accurate). Demographics were measured at the end of the experiment.

6.2. Results and discussion

6.2.1. Expectations of extremity and cooperation

Our first set of analyses focused on the effects of decision time and attribution on behavioral expectations. Expectations of extremity and cooperation were scaled from 0 to 1. The average level of extremity was 0.55 ($SD = 0.44$) and the average level of cooperation was 0.55 ($SD = 0.35$).

We submitted a 2 × 2 ANOVA to test the effects of decision time (less-than-ten vs more-than-ten seconds) and attribution (reaction time vs external time pressure) on expectations of extremity (Fig. 2): There was a significant decision time by attribution interaction, $F(1, 584) = 5.75$, $p = 0.017$, $\eta^2 = 0.01$. When decision times were attributable to reaction time, fast decisions were seen as more extreme ($N_{fast} = 150$, $M = 0.69$, $SD = 0.43$) than slow decisions ($N_{slow} = 132$, $M = 0.49$, $SD = 0.42$), $t(280) = 4.04$, $p < 0.001$, $d = 0.48$. However, when decision times were attributed to the external manipulation of time pressure, there was no significant difference in the perceived extremity of fast ($N_{fast} = 149$, $M = 0.53$, $SD = 0.45$) and slow ($N_{slow} = 157$, $M = 0.50$, $SD = 0.44$) decisions, $t(304) = 0.66$, $p = 0.51$, $d = 0.075$.

We also tested the effects of decision time and attribution on expectations of cooperation. Again, there was a significant decision time by attribution interaction, $F(1, 584) = 4.01$, $p = 0.046$, $\eta^2 = 0.007$. In the reaction time condition, fast decisions were seen as significantly less cooperative ($M = 0.48$, $SD = 0.40$) than slow decisions ($M = 0.57$, $SD = 0.31$), $t(284) = 2.05$, $p = 0.042$, $d = 0.24$. However, when decision times were attributable to an external cause, there was no significant difference in the expected cooperation of fast ($M = 0.59$, $SD = 0.34$) and slow ($M = 0.57$, $SD = 0.33$) decisions, $t(304) = 0.68$, $p = 0.49$, $d = 0.07$.

6.2.2. Perceptions of decision conflict, morality, and rationality

Next, we investigated the effects of decision time and attribution on perceptions of conflict, morality, and rationality. To begin, we used

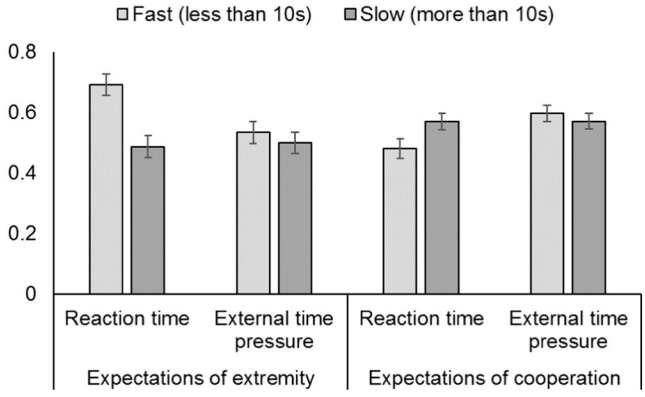

Fig. 2. The effects of decision time (less-than-ten vs more-than-ten seconds) and attribution (reaction times vs external time pressure) on expectations of cooperation and extremity. Error bars denote standard errors of the means.

simultaneous multiple regressions to test the effects of these variables on expectations of extremity and cooperation (see Table 1). Perceived decision conflict was negatively associated with expectations of extremity and positively associated with expectations of cooperation. In other words, conflicted individuals were seen as less likely to select extreme responses and more likely to select cooperative responses. Aside from these effects, the only other significant finding was the positive association between perceived morality and expectations of cooperation. Not surprisingly, moral individuals were seen as more likely to cooperate.

6.2.2.1. Decision conflict and extremity. We analyzed the effects of decision time on perceived decision conflict and there was a significant time by attribution interaction, $F(1, 584) = 209$, $p < 0.001$, $\eta^2 = 0.26$. In the reaction time condition, faster decisions were seen as less conflicted ($M = 2.48$, $SD = 1.21$) than slow decisions ($M = 5.09$, $SD = 1.33$), $t(280) = 17.0$, $p < 0.001$, $d = 2.03$. In the external time pressure condition, fast decisions were seen as slightly *more* conflicted ($M = 4.39$, $SD = 1.10$) than slow decisions ($M = 4.13$. $SD = 1.14$), $t(304) = 2.0$, $p = 0.045$, $d = 0.23$.

We also estimated a moderated mediation model to test if the interactive effects of decision time and attribution on extremity were mediated by perceived feelings of conflict. To test for moderated mediation, we used the bootstrapping procedure to compare the indirect effects of conflict within the reaction time and external time pressure conditions (Hayes, 2013; Model 7). The indirect effects of conflict were significantly different across experimental conditions, $M = 0.09$, $SE = 0.036$, 95% *CI*: 0.061 to 0.165. In the reaction time condition, perceived conflict significantly mediated the effect of decision time on extremity, $M = -0.083$, $SE = 0.033$, 95% *CI*: −0.15 to −0.016. Fast decisions were seen as less conflicted and, in turn, more extreme. In the external time pressure condition, there was a nearly significant indirect effect of conflict in the opposite direction, $M = 0.008$, $SE = 0.005$, 95% *CI*: 0.0 to 0.023.

6.2.2.2. Perceptions of morality. Perceptions of morality were influenced by a significant time by attribution interaction, $F(1, 584) = 5.27$, $p = 0.022$, $\eta^2 = 0.009$. When decision times were attributable to reaction time, fast decision-makers were seen as less moral ($M = 4.24$, $SD = 1.09$) than slow decision-makers ($M = 4.53$, $SD = 0.98$), $t(280) = 2.37$, $p = 0.018$, $d = 0.28$. However, when decision times were attributed to the external manipulation of time pressure, there was no significant difference in the perceived morality of fast ($M = 4.38$, $SD = 0.75$) and slow ($M = 4.32$, $SD = 0.86$) decision-makers, $t(304) = 0.62$, $p = 0.54$, $d = 0.071$.

6.2.2.3. Perceptions of rationality. Interestingly, a different pattern of results was observed for perceptions of rationality: There was no significant decision time by attribution interaction, $F(1, 584) = 0.62$, $p = 0.43$, $\eta^2 = 0.001$. Instead, there was a significant main effect of attribution, such that decision-makers in the reaction time condition were seen as more rational ($M = 4.66$, $SD = 0.93$) than decision-makers in the external time constraint condition ($M = 4.47$, $SD = 0.79$), $F(1, 584) = 7.01$, $p = 0.008$ $\eta^2 = 0.012$. Finally, decision time had no significant main effect on perceptions of rationality, $F(1, 584) = 1.27$, $p = 0.26$ $\eta^2 = 0.002$.

Table 1
The effects of perceived conflict, morality, and rationality on behavioral expectations.

	Expected extremity			Expected cooperation		
	b (*SE*)	*β*	*p*	*b* (*SE*)	*β*	*p*
Conflict	−0.042 (0.012)	−0.14	<0.001	0.021 (0.009)	0.089	0.027
Morality	−0.010 (0.024)	0.024	0.68	0.081 (0.021)	0.22	<0.001
Rationality	0.011 (0.027)	0.027	0.67	0.006 (0.021)	0.015	0.77

6.3. Summary

Replicating the main results of Study 1, people believed that fast decisions were more extreme than slow decisions. However, these effects only occurred when decision time was attributable to a self-paced reaction time. In contrast, people had inconsistent or heterogeneous beliefs about the effects of external time constraints on decision extremity and cooperation. When participants made judgments based on self-paced reaction times, they used time to infer the decision-maker's feelings of conflict, and those feelings of conflict mediated the effects of decision time on expectations of extremity. People also believed that fast deciders were less cooperative and less moral, and again these effects were only observed when time was not attributable to external time constraints. Overall, the results of Study 2 strongly support the idea that people use decision time to draw inferences about the underlying preferences of the decision-maker.

7. Study 3: Decision time and trustworthiness detection

Our third study investigates how people integrate observed decision time with other informational cues. In our first two studies, participants believed that fast decisions were more extreme than slow decisions. This suggests that expectations of fast decisions are more variable than expectations of slow decisions. Some fast decisions are extremely cooperative, whereas others are extremely selfish. On the other hand, slow decisions are less heterogeneous and lie close to the midpoint response (Fiedler & Krueger, 2012). Hence, when people observe a fast decision, they may be inclined to draw more extreme conclusions based on additional informational cues, which may suggest that the decision-maker is either extremely cooperative or extremely selfish. Such cues should have less of an effect when paired with slow decisions, because participants believe that feelings of conflict draw slow deciders towards the midpoint response.

To test how decision time interacts with other cues, we manipulated the facial expressions of decision-makers. When judging a face for the first time, people quickly and automatically form an impression about whether that person is trustworthy (Todorov, Pakrashi, & Oosterhof, 2009; Willis & Todorov, 2006). In particular, we focused on the effects of happy (vs neutral) facial expressions. People believe that positive emotions are associated with trustworthiness (Krumhuber et al., 2007; Oosterhof & Todorov, 2009); and they are more willing to cooperate with a smiling interaction partner (Scharlemann, Eckel, Kacelnik, & Wilson, 2001). Importantly, smiling indeed predicts altruistic behavior (Mehu, Grammer, & Dunbar, 2007). We expected that happy interaction partners would be seen as more likely to cooperate and more trustworthy; however, we also predicted that the effect of this cue would be moderated by decision time. People may be more sensitive to the decision-maker's emotional expression and perceived trustworthiness when they observe a fast decision – we expected that positive facial expressions would have weaker effects on behavioral expectations when paired with slow decisions.

7.1. Method

Psychology students from Tilburg University completed this study in exchange for course credit, $N = 166$. There were 39 men and 127 women, and the average age was 19.8 ($SD = 1.67$). Sample size was based on the number of participants that we were able to recruit over a one-week period. This experiment was presented to participants as part of a series of unrelated studies.

At the beginning of the experiment, participants read a description of the PGG. They were told that they would need to make predictions about the contribution decisions of 24 different targets. These targets were ostensibly students from an American university. Before each prediction, participants learned how quickly the target made a decision (less-than-ten vs more-than-ten seconds) and saw a photo of his or

her face (neutral vs happy expression). The randomization was such that each participant made predictions for 6 fast-neutral targets, 6 slow-neutral targets, 6 fast-smiling targets, and 6 slow-smiling targets. For each category, participants were presented with equal numbers of male and female targets. The 24 targets were presented to participants in a random order.

The target faces used in the experiment were selected from the Chicago Face Database (Ma, Correll, & Wittenbrink, 2015). Twelve white-male and twelve white-female targets were selected by the experimenters. For each target face, participants were presented with a neutral or smiling-with-closed-mouth expression. There was a between-subjects manipulation to control which target faces were paired with neutral or smiling expressions.

After participants completed the prediction phase of the experiment, they were asked to judge the trustworthiness of each target's appearance (1 = not trustworthy; 9 = very trustworthy). During this phase, participants were shown the same photos used during the behavioral prediction phase. However, participants were *not* reminded of the targets' decision times. Demographics were measured at the end of the experiment.

7.2. Results and discussion

7.2.1. Manipulation check

To test the effects of our expression manipulation, we compared the perceived trustworthiness of happy and neutral faces. We estimated linear Generalized Estimating Equations to control for the clustered nature of the data, predicting trustworthiness with emotional expression entered as a predictor (neutral faces were coded as −0.5; happy faces were coded as +0.5). Replicating earlier findings (Krumhuber et al., 2007; Oosterhof & Todorov, 2009), happy faces were seen as significantly more trustworthy in appearance ($M = 6.01$, SD = 1.91) than neutral faces ($M = 4.17$, $SD = 1.88$): $b = 1.83$, $SE = 0.093$, $p < 0.001$.

7.2.2. Decision time and expectations

To begin, we estimated linear GEE models to test the effects of decision time on expectations of extremity and cooperation. Slow decisions were coded as −0.5 and fast decisions were coded as +0.5. Consistent with our previous studies, fast decisions were seen as significantly more extreme than slow decisions: $b = 0.08$, $SE = 0.014$, $p < 0.001$. Surprisingly, and contrary to the pattern observed in Study 2, fast decisions were also seen as marginally *more* cooperative than slow decisions, $b = 0.029$, $SE = 0.015$, $p = 0.057$. We discuss this finding in further detail in our summary.

7.2.3. Decision time and trustworthiness cues

Next, we examined the interactive effects of decision time and facial expression on expectations of cooperation. We hypothesized that facial expression (neutral vs happy) would have a stronger effect on expectations of cooperation for fast decisions than for slow decisions. To test this hypothesis, we estimated a linear GEE predicting expectations of cooperation with decision time, facial expression, and the decision time by facial expression interaction term entered as predictors. Indeed, there was a significant decision time by facial expression interaction, $b = 0.036$, $SE = 0.016$, $p = 0.025$. To understand this interaction, we tested the simple effects of facial expression within the fast and slow conditions. Happy faces were generally seen as more cooperative than neutral faces, but this effect was stronger for fast decisions ($b = 0.224$, $SE = 0.0157$, $p < 0.001$) than for slow decisions ($b = 0.188$, $SE = 0.0154$, $p < 0.001$). This pattern of results is illustrated in Fig. 3.

We also tested the interactive effects of decision time and perceived trustworthiness on expectations of cooperation. As in the previous analyses, we expected a stronger relationship between perceived trustworthiness and expected cooperation for fast decisions. To test for this interaction, perceived trustworthiness was scaled to range from −0.5 to +0.5. Critically, expectations of cooperation were influenced by a significant decision time-by-trustworthiness interaction, $b = 0.115$, $SE = 0.033$, $p = 0.001$.[2] Perceived trustworthiness had a stronger effect on expectations of cooperation when decisions occurred quickly ($b = 0.63$, $SE = 0.029$, $p < 0.001$) than when decisions occurred slowly ($b = 0.55$, $SE = 0.028$, $p < 0.001$). These results are illustrated in Fig. 4.

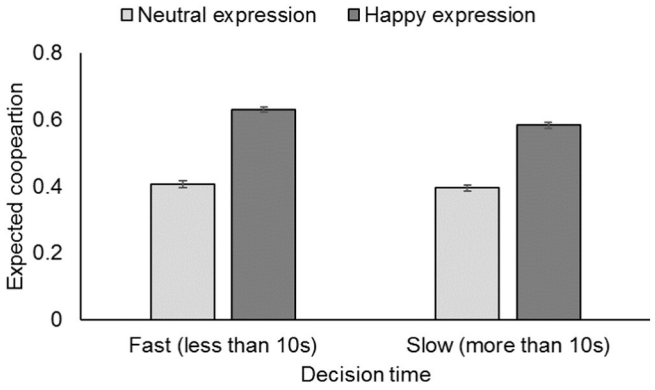

Fig. 3. The effects of decision time and facial expression (happy vs neutral) on expectations of cooperation. Error bars denote standard errors of the means.

7.3. Summary

Consistent with our previous studies, participants believed that fast decisions were more extreme than slow decisions. Decision time also influenced how people used other types of information to form expectations of cooperation. Emotional expressions (happy vs neutral) and perceived trustworthiness ratings had stronger effects on expectations of cooperation for fast decision-makers. These results are consistent with the idea that people hold more heterogeneous beliefs about fast (vs slow) decisions. Interestingly (and contrary to the results of our Study 2), participants also believed that fast decisions were marginally more cooperative than slow decisions. We believe this pattern emerged because participants were presented with positive trustworthiness cues (e.g., smiling faces). The effects of positive cues were attenuated for slow decisions, resulting in lower expectations of cooperation. It is plausible that we would observe the opposite pattern, with participants expecting less cooperation from fast decisions, when participants are presented with negative cues (e.g., angry or untrustworthy faces).

8. Study 4: Behavioral consequences of decision time

Our final study tested the behavioral consequences of observed decision time on cooperation in social dilemmas: The results of Studies 1–3 suggest that time influences expectations when people interact with decision-makers of unknown or ambiguous intent. Following from our previous results, we hypothesized that participants would use observed decision time to form expectations of other players' decisions, and that these expectations would influence participants' ultimate cooperative decisions. More specifically, given more extreme expectations, we expected that participants would, in turn, select more extreme responses when interacting with fast decision-makers.

8.1. Pre-test

To present participants with actual decision times, we conducted a pre-test measuring decision time, cooperation, and feelings of conflict in the Prisoners Dilemma: American participants were recruited using Mturk, $N = 100$. Participants read a page of instructions explaining the rules of the Prisoners Dilemma: each player received 100 cents

[2] This interaction did not change when the target's facial expression (happy vs neutral) was controlled for as a covariate.

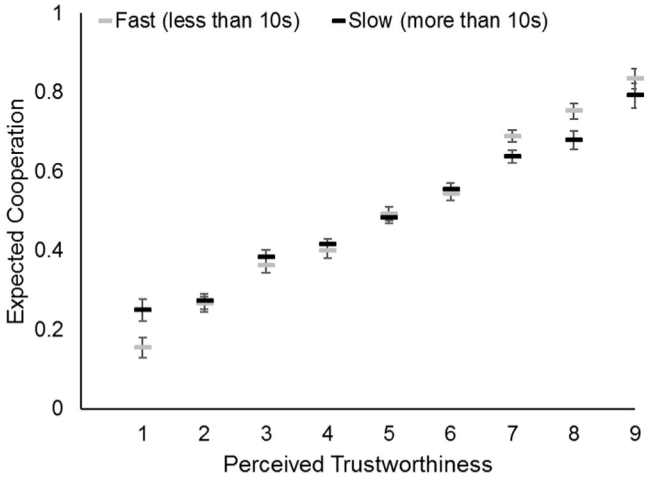

Fig. 4. The effects of perceived trustworthiness and decision time on expectations of cooperation. Error bars denote standard errors of the means.

and they could give some, all, or none of this money to their partner. Any money sent to the partner was doubled by the experimenter, and players were also informed that their partners faced the same choice. On the following page, participants decided how much money to give to their partners (in 10-cent increments) using radio buttons and decision time was measured. On the following screen, participants indicated how doubtful, certain, and confident they felt about their choices ($\alpha = 0.92$).

Consistent with previous studies of decision time and cooperation in social dilemmas (Evans et al., 2015), fast decisions were both more extreme, $r(98) = -0.19$, $p = 0.061$, and less conflicted, $r(98) = 0.33$, $p = 0.001$, than slow decisions; and feelings of conflict were negatively associated with decision extremity, $r(98) = -0.33$, $p = 0.001$.

The average decision time was 4.78 s ($SD = 3.83$). Excluding the decision time of one extreme participant who took 32.59 s to make a choice, we selected the five fastest (1.89 to 2.06 s) and five slowest (11.21 to 15.9 s) decision times for use in Study 4.

8.2. Method

We recruited 101 American participants using MTurk. The average age was 34.5 years ($SD = 10.5$) and 42 were women. Participants were paid 80 cents for their time. The sample size was based on the number of participants needed to detect a small-to-medium sized difference between two dependent means ($d = 0.30$) with 80% power, minimum $N = 90$.

At the beginning of the study, participants read a page of instructions explaining the rules of the Prisoners Dilemma. These rules were identical to the ones used in the pre-test, except that participants were informed they would make ten separate decisions with different partners. Participants were also informed that their potential partners had previously completed the study and had already made their decisions. Participants were told they would not learn how much money their partners decided to send (vs keep), but they would learn about the time their partners took to make a decision. Participants were also told that the average decision time was 4.7 s.[3]

After reading the instructions, participants made decisions in ten rounds of the Prisoners Dilemma: At the beginning of each round, participants learned about their partner's decision time. Note that we used the five fastest (1.89, 1.95, 2.02, 2.03, and 2.06 s) and five slowest (11.21, 11.75, 11.89, 15.68, and 15.9 s) decision times from our pre-test; these decision times were presented in a randomized order. Participants then decided how much money they wanted to give to their partner in 10-cent increments. After each decision was made, participants were asked to state how much money they thought their partner had decided to send to them.

After data collection was completed, ten randomly selected participants were paid based on the consequences of one decision, and the corresponding participants from the pre-test were also paid based on their choices. No deception was employed in this study.

8.3. Results and discussion

8.3.1. Decision time and expectations

We estimated linear GEE models to test the effects of decision time on expectations of extremity and cooperation. Slow decisions were coded as −0.5 and fast decisions were coded as +0.5. Consistent with our previous studies, participants believed that fast decisions were significantly more extreme than slow decisions: $b = 0.27$, $SE = 0.0134$, $p < 0.001$. Fast decisions were also seen as less cooperative than slow decisions, $b = -0.11$, $SE = 0.036$, $p = 0.002$.

8.3.2. Decision time and behavior

Turning from expectations to participants' decisions, we tested the effects of partner decision time on decision extremity and cooperation. When participants interacted with a fast decision-maker, they selected a more extreme response, $b = 0.10$, $SE = 0.036$, $p = 0.002$. Participants were also slightly less cooperative when interacting with a fast partner, but this difference was not significant, $b = -0.042$, $SE = 0.028$, $p = 0.15$. The effects of decision time on expectation and participants' ultimate decisions are illustrated in Fig. 5.

We also tested the relationship between participants' expectations and their cooperation decisions: Expectations of extremity were associated with more extreme decisions, $b = 0.39$, $SE = 0.048$, $p < 0.001$; and expectations of cooperation predicted more cooperative decisions, $b = 0.50$, $SE = 0.063$, $p < 0.001$.

8.3.3. Decision time and feelings of conflict

Finally, we conducted exploratory analyses looking at the effects of observed decision time on the time participants took to make their own cooperation decisions. As shown in our pre-test and previous studies (Evans et al., 2015), slow reaction times are correlated with feelings of conflict in social dilemmas. Therefore, analyses of participants' reaction times may give some insight into how conflicted (or certain) participants felt when they decided how much money to send to fast (vs slow) interaction partners.

We used linear GEE to test the effects of observed decision time on the time that participants took to make decisions in the Prisoners

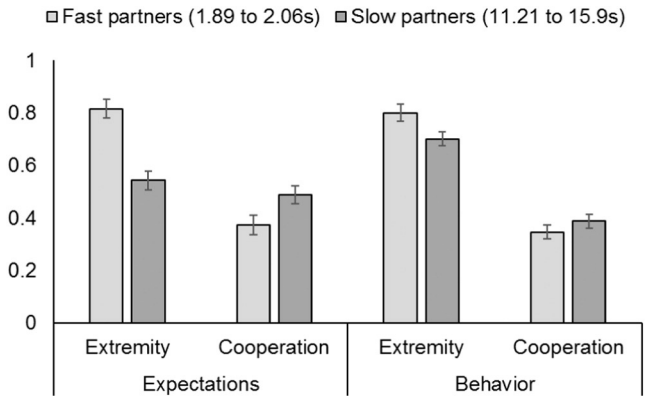

Fig. 5. The effects of observed decision time on expectations and behavior in the Prisoners Dilemma. Error bars denote standard errors of the means.

[3] On average, decision times were faster than those reported in previous studies of reaction times (e.g., Evans et al., 2015), this may be due to variations in the game (e.g., the two person Prisoners Dilemma was used) or participants' prior experience with social dilemmas (Rand et al., 2014).

Dilemma. Reaction times were log-transformed, $M = 0.53$, $SD = 0.29$. Participants took less time to reach a decision when they played the Prisoners Dilemma with a fast interaction partner, $b = -0.060$, $SE = 0.017$, $p < 0.001$. This result did not change we added the participant's level of cooperation ($b = -0.001$, $SE = 0.025$, $p = 0.97$) and the level of decision extremity ($b = -0.003$, $SE = 0.029$, $p = 0.92$) as predictors. This difference in reaction times suggests that participants may have felt less conflicted when interacting with fast deciders, possibly because they felt more confident about their expectations of the other party's choice.

9. General discussion

The ability to form expectations of when others will cooperate plays a central role in social and economic relationships (Bonnefon et al., 2013; DeSteno et al., 2012; Gottman, 2011). Previous work has investigated how people use personal (Rule et al., 2013) and situational (Evans & Krueger, 2014) cues to form expectations of cooperation – our work suggests that people also attend to cues observed in the process of social decision-making.

We found consistent evidence that observed decision time in social dilemmas influenced expectations of extremity and cooperation. People believed that fast decisions were more extreme (and somewhat more selfish) than slow decisions. Individuals who took less time to decide were also judged to be less moral (Studies 1 and 2) and, in some cases, less rational (Study 1) than slow deciders. Replicating previous work (Critcher et al., 2013; Van de Calseyde et al., 2014), fast decisions were seen as less conflicted, and feelings of conflict mediated the effects of decision time on expectations of extremity. Decision time also influenced sensitivity to other informational cues – happy facial expressions and perceived trustworthiness ratings had stronger effects on expectations of cooperation when they were paired with fast decisions. Importantly, observed decision time also had behavioral consequences – in Study 4, people were more likely to select extreme responses when they interacted with a fast partner. These findings suggest that observed decision time plays a crucial role in the process of trustworthiness detection in social dilemmas.

9.1. Trustworthiness detection in social decision-making

Recently, researchers in psychology and economics have begun to investigate the relationship between time and prosocial behavior. Many of the present results are in line with the findings of Evans et al. (2015): fast reaction times are indeed correlated with weaker feelings of conflict and more extreme responses, and there are different psychological processes associated with correlational reaction times and external time constraints. External time pressure activates the use of intuitive (vs reflective) mental processes (Rand et al., 2014; Shalvi, Eldar, & Bereby-Meyer, 2012), whereas correlational reaction times are associated with feelings of conflict (Krajbich et al., 2015). The results of Study 2 suggest that people indeed differentiate between self-paced reaction times and external time pressure. Time loses its diagnostic value when it is attributable to an external source, suggesting that people rely on decision time as a cue to form inferences about the underlying preferences of the decider.

Participants were accurate in their expectations of self-paced reaction times, correctly predicting that fast decisions were more extreme than slow decisions (Evans et al., 2015). However, they had inconsistent beliefs about the effects of external time constraints on cooperation. Participants did not anticipate that external time pressure would lead to increased cooperation (Rand et al., 2012, 2014). A possible reason for this inconsistency might be that people have heterogeneous beliefs about whether people are intuitively selfish or intuitively cooperative (Rotter, 1967; Wrightsman, 1991). Individuals who are habitually cooperative may predict that time pressure increases cooperation, whereas those who are habitually selfish may predict a change in the opposite direction (Capraro, Smyth, Mylona, & Niblo, 2014; Van Lange, 1999). Similarly, past experiences in cooperative or competitive social environments may also contribute to beliefs about the nature of intuitive or reflective decisions (Peysakhovich & Rand, 2015). Future studies that better account for individual differences may reveal interesting findings about the effects of external time constraints on behavioral expectations.

In our studies, fast decisions were seen as either extremely cooperative or extremely selfish. Judgments about fast decisions depend on other informational cues, such as the decision-maker's facial expression or whether they have a trustworthy appearance (Study 3). It would also be interesting to examine how individual differences in perceivers influence expectations of fast and slow decisions: Dispositional variables that influence behavior expectations, such as generalized trust (Yamagishi et al., 2015) and Social Value Orientation (Van Lange, 1999), may predict whether people believe that fast decisions are extremely cooperative or extremely selfish.

Similarly, beliefs about fast decisions may also be shaped by the specific payoffs associated with cooperation and defection: In our studies, we used versions of the Public Goods Game and Prisoners Dilemma where participants' contributions to the common pool were doubled by the experimenter. However, recent research suggests that changes in the rate-of-return have large effects on the emergence of cooperation among strangers (Capraro, 2013), and also influence the speed at which people decide to cooperate or defect (Krajbich et al., 2015). Specifically, models of conflict in decision-making emphasize that the time needed to reach a decision decreases as the evidence increasingly favors one option (Klauer, 2014). Financial payoffs, then, may also influence the relationship between observed decision time and behavioral expectation. For example, it is plausible that fast decisions are seen as extremely cooperative (but not extremely selfish) when there are extreme financial incentives for cooperation (e.g., there is a very high rate-of-return on contributions to the group).

9.2. Decision time and metacognitive beliefs

The present studies add to a growing literature examining naive beliefs about how social decisions are made: De Vito and Bonnefon (2014) posited that people expect others to be utility maximizers, but that the maximization of utility could potentially involve the pursuit of selfish or altruistic motives. Our results suggest that people differentiate between high- and low-conflict decisions, and that low-conflict decisions can potentially be in the pursuit of self-interest or the collective good. People also differentiate between the effects of decision time and the effects of self-control on prosocial behavior (Critcher et al., 2013; Righetti & Finkenauer, 2011). People believe that impulsivity leads to selfish behavior (Righetti & Finkenauer, 2011), but in our studies feelings of conflict were primarily associated with extreme, rather than selfish, choices. Future research should attempt to disentangle how process cues influence perceptions of impulsivity and conflict in decision-making.

9.3. Conclusion

Expectations play a central role in the development of cooperation among strangers (Axelrod & Hamilton, 1981; Dawes, 1980; Krueger et al., 2012; Van Lange, 1999). People use an array of personal and situational cues to judge whether others have prosocial intentions, and they also attend to cues observed in the process of decision-making (Critcher et al., 2013; Van de Calseyde et al., 2014). People use decision time to judge if others feel confident or conflicted about how to act, and perceptions of conflict influence expectations of how others will behave. Moreover, observed decision time also influences how people use other types of informational cues to form expectations of cooperation; trustworthiness cues have stronger effects for fast decisions compared to slow decisions. To understand how expectations of

cooperation are formed and how the ultimate decision to cooperate is made, it is important to consider naive beliefs about the effects of decision time.

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