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Why Suspects Confess: The Power of Outcome Certainty

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Objective: In custodial interrogations, suspects tend to give disproportionate weight to immediate outcomes relative to future outcomes when deciding whether to confess or deny guilt. The current research examined whether the perceived (un)certainty of an immediate outcome influences suspects' short-sighted confession decisions. ***Hypotheses:*** We hypothesized that suspects are more likely to make short-sighted confession decisions when an immediate punishment is certain versus uncertain and that the effects of a certain immediate punishment become stronger the longer suspects are interrogated. ***Method:*** Using the repetitive question paradigm, college student participants (N = 164, 57% women, 87% Caucasian, M age 18.9 years) admitted or denied 20 illegal and unethical behaviors in an interview. Participants' admissions and denials received either an immediate punishment (answering repetitive questions) or a future punishment (meeting with a police officer in several weeks to discuss their misconduct). In addition, we manipulated participants' perceptions of the immediate punishment to be either certain or uncertain. ***Results:*** Participants showed greater short-sightedness in their admission decisions when they perceived the immediate punishment to be certain versus uncertain. Moreover, the influence of the certain immediate punishment on participants' admission decisions tended to increase over time. ***Conclusions:*** These findings provide empirical evidence that the certainty of immediate outcomes may contribute to suspects' shorted-sighted confession decisions.

Public Significance Statement
Because of the certainty of immediate punishment, an interrogation situation could exert strong influence on suspects' decision-making. This effect helps to understand why suspects might choose to confess during an interrogation, despite the possible negative consequences of confessing.

Keywords: confessions, certainty effect, decision-making, police interrogation

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In custodial interrogations, suspects often face interrogation methods designed to weaken their resistance to confessing guilt, for example, confrontational questioning, prolonged detainment, and social disapproval from interrogators (Kassin & McNall, 1991; Leo, 1996). Exposure to these interrogation methods is unpleasant, but it pales in comparison to the legal sanctions suspects might encounter if they confess, for example, mandatory fines, probation, imprisonment, and in some extreme cases, execution (Drizin & Leo, 2004; Gudjonsson, 2003). Even though a confession greatly increases the chance that a suspect receives legal sanctions, between 42% and 55% of all suspects confess during custodial interrogations (Kassin & Gudjonsson, 2004), including some who are innocent. Indeed, postconviction DNA testing shows that false confessions or admission statements are involved in more than 25% of DNA exoneration cases (Innocence Project, 2019).

One factor that contributes to the seemingly irrational act of confessing is suspects' tendency to place more weight on short-term gains (e.g., terminating the uncomfortable interrogation situation immediately) over long-term goals (e.g., avoiding conviction and incarceration) when making confession decisions (Kassin et al., 2010; Kassin & Gudjonsson, 2004). In support of this idea, empirical research has shown that participants give disproportion-

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The data are available at https://osf.io/pa8jw/.

The experiment materials are available at https://osf.io/pa8jw/.

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ate weight to immediate punishment relative to future punishment when responding to questions about their prior misconduct (Madon, Guyll, Scherr, Greathouse, & Wells, 2012; Madon, Yang, Smalarz, Guyll, & Scherr, 2013; Yang, Madon, & Guyll, 2015). These findings suggest that suspects enter an interrogation with a vulnerability of short-sighted thinking that increases their risk of self-incrimination and jeopardizes their long-term interests. To protect the rights of all suspects from self-incrimination (U.S. Const. amend. V) because of aversive interrogation tactics (Gudjonsson & Sigurdsson, 1999), it is essential for scientific research to uncover the psychological processes that lead to short-sighted thinking among interrogated suspects.

The Interrogation Decision-Making Model

The interrogation decision-making model provides a useful theoretical framework to understand suspects' tendency to make short-sighted confessions (Yang, Guyll, & Madon, 2017). The model proposes that (a) suspects weigh the immediate and future outcomes of their choices by the utilities (i.e., how desirable or undesirable the outcomes would be) and probabilities of the outcomes (i.e., how likely the outcomes are to occur) and (b) suspects discount future outcomes. Using a small set of parameters (utilities, probabilities, and discounting factor), the model explains how various factors, including crime characteristics, suspects' individual differences, and interrogation techniques, influence suspects' decision-making. Moreover, the model highlights the dynamic nature of an interrogation; not only does the model predict that the effect of an interrogation technique can change over time but also that the effects of interrogation techniques may accumulate such that suspects gradually move from denials to a confession over the course of an interrogation.

According to the interrogation decision-making model, a key parameter that influences suspects' decision-making is the degree to which suspects perceive the immediate outcomes of their decisions to be certain. In custodial interrogations, suspects' denials are associated with negative immediate outcomes such as stress, anxiety, and physical and psychological discomfort caused by police interrogation methods (Gudjonsson & Sigurdsson, 1999). Custodial interrogations are often designed to be uncomfortable, confession-inducing situations (Gudjonsson, 2003). Suspects are subjected to unpleasant interrogation tactics, such as confronting them with evidence (both true and false), undermining their confidence, subjecting them to physical isolation, and minimizing the severity of their alleged crimes (Kelly, Miller, Redlich, & Kleinman, 2013; Leo, 1996).

Because suspects repeatedly experience these negative outcomes when they deny guilt, they might expect the same negative outcomes to happen for future denials. In other words, suspects might perceive the negative immediate outcomes that follow from a denial as highly certain. Comparatively, suspects might perceive negative future outcomes for a confession (e.g., conviction, probation, prison sentence) as less probable; they do not directly experience these future outcomes at the time they are being interrogated, and these future outcomes are not absolutely certain to happen (e.g., police might find the real perpetrator, the prosecutor might drop the charges, the jury might return a not-guilty verdict; Yang et al., 2015).

Certainty Effect

Psychological research supports the idea that the inherent certainty of immediate outcomes may contribute to suspects' short-sighted thinking. Indeed, when choosing between certain and uncertain outcomes, people tend to weigh certain outcomes more heavily relative to uncertain ones. This phenomenon, referred to as the *certainty effect*, is well documented in both psychology and economics literatures. People prefer choices that produce more certain outcomes, even when these certain outcomes are not as rewarding as the less certain ones (e.g., Kahneman & Tversky, 1979, 1984; Keren & Roelofsma, 1995).

The certainty effect occurs for both gains and losses. In the domain of gains, decision makers prefer certain gains over uncertain gains, even when the uncertain gains have larger expected values. For example, in Kahneman and Tversky's (1979) classic research, participants chose between a certain (100% chance) gain of \$3,000 and an 80% chance of gaining \$4,000. The majority (80% of participants) chose the certain gain, even though the uncertain gain could have produced a greater profit ($\$4000 \times 80\% = \$3{,}200 > \$3000 \times 100\% = \$3000$). This finding illustrates that overweighing certainty corresponds to risk aversion when considering gains, meaning that people prefer the choice that ensures a certain, but smaller, gain (Tversky & Kahneman, 1986).

In the domain of losses, decision makers tend to avoid certain losses over uncertain losses that are more deleterious. In Kahneman and Tversky's (1979) research, for example, participants also chose between a certain (100% chance) loss of \$3,000 and an 80% chance of losing \$4,000. The majority (92%) chose to avoid the certain loss and opted to take their chances with the latter option that could have produced a greater loss ($-\$4000 \times 80\% = -\$3{,}200 < -\$3000 \times 100\% = -\$3000$). Accordingly, overweighing certainty corresponds to risk seeking when considering losses, meaning that people tend to avoid the choice guaranteed to incur a loss (Tversky & Kahneman, 1986).

The certainty effect could potentially explain why the immediate interrogation situation has such a powerful effect on suspects' confession decisions. Because of the inherent certainty of immediate outcomes, suspects might tend to overweigh the negative immediate outcomes of a denial and, as a result, be willing to sacrifice their long-term interests in exchange for ending the unpleasant interrogation.

Research Overview

Drawing on the above theoretical analysis, we hypothesized that the tendency for suspects to weigh immediate outcomes disproportionately when making confession decisions partly stems from the perceived certainty of immediate outcomes. We tested this hypothesis with the repetitive question paradigm (Madon et al., 2013): Participants took part in an interview in which they admitted or denied ever having engaged in 20 illegal and unethical behaviors. Participants made their admission decisions in the context of a punishment pairing such that their admissions and denials were paired with either an immediate punishment (answering a set of repetitive questions) or a future punishment (meeting with a police officer in several weeks). To test the effect of certainty on participants' admission decisions, we systematically varied the

certainty with which the immediate punishment corresponded to participants' interview responses.

Method

Participants

College students (N = 169) from a large Midwestern public university participated in the experiment in exchange for partial fulfillment of a course requirement. The sample was 57% women and included 142 Caucasians, 10 Asians, seven African Americans, three Latinas/os, one Native American, five who self-described as multiethnic, and one who did not specify ethnicity. The mean age was 18.9 years (SD = 1.3 years). Due to a computer malfunction, five participants did not complete the experiment. The final sample contained 164 participants.

Design

We randomly assigned participants to a 2 (punishment pairing: interrogation-parallel vs. interrogation-reversed) × 2 (certainty of immediate punishment: certain vs. uncertain) between-subjects factorial design. Each participant answered 20 interview questions that assessed whether they had previously engaged in illegal and unethical behaviors (see Table 1). Participants' responses to these interview questions were paired with an immediate punishment and a future punishment. The immediate punishment was to answer a set of 32 repetitive questions, and the future punishment was having to meet with a police officer in a few weeks to discuss their interview responses in greater detail. The punishment that participants received for their responses differed according to the punishment pairing and punishment certainty factors.

Punishment pairing manipulation. The punishment pairing factor manipulated which punishment participants experienced for denials and admissions to the 20 interview questions. Participants in the interrogation-parallel condition (n = 82) experienced the immediate punishment for denials and the future punishment for admissions. Specifically, each time participants in this condition denied a behavior, they immediately incurred the punishment of answering a set of repetitive questions. Even though these participants could avoid the immediate punishment by admitting to a behavior, they were led to believe that doing so would increase their risk of encountering the future punishment of meeting with a police officer in several weeks. This condition paralleled what typically happens in custodial interrogations: Suspects who deny guilt often receive immediate punishment, such as facing extended detainment and additional interrogation tactics (Gudjonsson, 2003). Although suspects can escape from these forms of immediate punishment by confessing, doing so increases their chance of suffering more severe punishment in the long run (e.g., conviction and incarceration). By contrast, participants in the interrogation-reversed condition (n = 82) experienced the immediate punishment for admissions and the future punishment for denials.

Certainty manipulation. The certainty factor manipulated participants' perceived (un)certainty of the immediate punishment. In the certain condition (n = 81), experimenters told participants they must answer a set of repetitive questions each and every time they gave a response that required it (i.e., a denial in the interrogation-parallel condition or an admission in the interrogation-reversed condition). In the uncertain condition (n = 83), experimenters told participants it was not necessary for them to answer every set of repetitive questions because researchers had already collected data about some of the illegal and unethical behaviors under investigation. Consistent with

Table 1
Interview Questions Used in the Experiment

Have you ever . . .
1. Drunk, bought, or tried to buy alcohol before you were 21?
2. Tried, used, or experimented with any illegal drugs such as marijuana, cocaine, crack, LSD, or any other illegal drug?
3. Cheated on an exam, homework, school project, or helped another person cheat?
4. Transported fireworks across state lines?
5. Used something that belonged to somebody else without permission, such as something that belonged to a family member, friend, roommate, or acquaintance?
6. Hunted or fished without a license?
7. Made a harassing, threatening, or prank phone call or text message?
8. Failed to wear a seat belt?
9. Knowingly kept something of value that you received in error, such as extra change given to you by a cashier or extra merchandise from a store or from an internet purchase?
10. Texted somebody while driving since it became illegal in Iowa?
11. Engaged in criminal mischief such as a senior prank, egging a house or car, or TP-ing a house?
12. Invaded another's privacy such as by reading another's diary, text messages, or emails without permission?
13. Jumped or cut in line such as at the dining hall, movie theater, or grocery store?
14. Purposefully not returned something that you borrowed like a book, clothing, or money?
15. Driven a vehicle while under the influence of alcohol or any other drug like marijuana, cocaine, LSD, etc.?
16. Run a red light?
17. Started or spread a rumor about someone?
18. Been publicly intoxicated?
19. Bought or held stolen goods worth $25 or more?
20. Illegally downloaded music, movies, software, or anything else?

Note. Participants responded yes or no to each interview question. The questions were developed by Madon, Guyll, Scherr, Greathouse, and Wells (2012, 2013) and adapted from the illegal behavior checklist (McCoy et al., 2006). The order of the questions was counterbalanced among participants.

this story, participants in the uncertain condition were led to believe that the computer would signal whether they needed to answer the repetitive questions for a denial (interrogation-parallel condition) or an admission (interrogation-reversed condition). In reality, we programmed the computer to randomly decide whether a set of repetitive questions would appear with 50% probability, with one exception: All participants had to answer the repetitive questions the first time their response required it to ensure that they had a direct experience with the immediate punishment early in the experiment.

Materials

Interview questions. The interview consists of 20 questions that assessed whether or not participants had ever engaged in 20 illegal and unethical behaviors (see Table 1; Madon et al., 2013, Experiment 2; Yang et al., 2015). The interview questions were developed by Madon et al. (2012) and adapted from the illegal behavior checklist (McCoy et al., 2006). Participants denied or admitted to each behavior by responding *no* (coded as 0) or *yes* (coded as 1) to each question. The coded responses were summed to create one score per participant that equaled the total number of admissions. We fully counterbalanced the order of the 20 interview questions by creating 40 distinct versions of the question set and then randomly assigning one version to each participant.

All participants answered the interview questions twice. First, they answered them during the individual interview with the experimenter in the context of the experimental manipulations. Second, they answered them immediately after debriefing in private and in the absence of any experimental manipulations. The postdebriefing administration attempted to obtain participants' honest responses about their past behaviors. We included the postdebriefing assessment to use the interrogation decision-making model to examine the influences of various factors involved in participants' admission decisions.

Repetitive question set. The immediate punishment consisted of a set of 32 repetitive questions that participants answered on a computer. For the first 16 questions, participants rated how the average person from their state would feel when engaging in the illegal or unethical behavior to which they just responded (e.g., Thinking about the average IOWAN . . . , how resentful do you think the average IOWAN would be while drinking, buying, or trying to buy alcohol before the age of 21?). For the next 16 questions, participants rated how the "average American" would feel when engaging in that same behavior (e.g., Thinking about the average AMERICAN . . . , how guilty do you think the average AMERICAN would be while drinking, buying, or trying to buy alcohol before the age of 21?).

All repetitive questions had five response options: 1 (*not at all*), 2 (*a little bit*), 3 (*moderately*), 4 (*quite a bit*), and 5 (*extremely*). There was a programmed 4-s delay between questions. We did not record participants' responses to the repetitive questions because the repetitive questions were developed simply to provide participants with an immediate punishment and were unrelated to the research question in this study. The computer programs used to administer the repetitive questions are available upon request. More details about the repetitive questions are included in the online supplemental materials.

Suspicion check. To probe for suspicion, we asked participants whether they believed they had been misled in any way during the experiment and, if so, to describe how.

Punishment pairing and certainty check. To examine participants' understanding of the punishment pairing and the (un)certainty of the immediate punishment, participants selected one of the following response options: (a) "I had to answer the additional questions every time I denied a behavior"; (b) "I had to answer the additional questions when I denied a behavior but not every time"; (c) "I had to answer the additional questions every time I admitted to a behavior"; or (d) "I had to answer the additional questions when I admitted to a behavior but not every time."

Interview Room and Cover Story

An experimenter individually interviewed each participant in a small room equipped with a desk, a computer, and two chairs—one for the participant and the other for the experimenter. To support the cover story that the researchers had partnered with local law enforcement personnel to examine the rates of illegal behaviors among college students, we furnished the room with several props. Next to the computer was a pencil vase that held a pencil engraved with the name of the local police department. In addition, two colored flyers with safety tips for crime prevention were affixed to the wall directly above the computer monitor. One flyer was from the website of the university's Department of Public Safety and had a university logo printed on it. The other flyer was from the website of the local police department and had the police department emblem.

Procedure

The study procedure was approved by the Institutional Review Board at Iowa State University. After obtaining informed consent and providing the cover story, the experimenter explained the punishment pairing and the (un)certainty of the immediate punishment via a prepared script. The content of the script, which is shown below, was the same across the two punishment pairing conditions except for the placement of YES and NO (shown in parentheses) that served to manipulate the punishment pairing. The script also slightly varied between the two certainty conditions. The script for the certain immediate punishment conditions explained that the follow-up questions would appear for every denial (interrogation-parallel condition) or admission (interrogation-reversed condition). The script for the uncertain immediate punishment conditions explained that denials (admissions) would be succeeded by follow-up questions only when necessary (shown in brackets).

> I'm going to ask you some yes/no questions that will assess whether or not you've ever engaged in a variety of illegal and unethical behaviors. Every time you answer NO (YES) to one of these questions, you'll be asked some additional follow-up questions to get some more information. [Because we've already collected data for some of these behaviors, you'll be asked only about behaviors that we need more information for. So every time you answer NO (YES) to one of the behaviors, the computer will let you know whether or not you need to answer the additional follow-up questions.] You'll answer these additional questions on the computer during your session today. On

the other hand, if you tend to answer YES (NO) to the questions I ask you, then I will sign you up to meet with one of the police officers involved in this research to discuss your answers in more detail. We're doing this to get more information about people's illegal behavior.

After explaining the punishment pairing and the (un)certainty of the immediate punishment, the experimenter interviewed each participant individually. Following the interview, participants privately responded to the suspicion and manipulation check items and provided demographic information. The experimenter then debriefed all participants and explained that they would not have to meet with a police officer after all.

After debriefing, the experimenter explained to participants that the truthfulness of their responses to the interview questions could not be assumed because the interview involved the immediate and future punishments, but that it was very important to the goals of the research that the investigators obtain truthful information about their past illegal and unethical behaviors. To obtain this information, the experimenter requested participants to answer the same 20 illegal and unethical behaviors for a second time. To underscore the need for honest responding, the experimenter explained to participants that they would complete the second assessment on the computer, in private, and without any additional questions to slow them down, and that nobody, not even the experimenter, would know how they responded. The entire 20 item postdebriefing assessment was described as requiring approximately 1–2 min. Participants were dismissed after completing the postdebriefing assessment.

Results

Suspicion and Manipulation Checks

The suspicion check identified one suspicious participant; this participant correctly inferred the purpose of the punishment pairing. The manipulation checks revealed that 99% of participants (n = 162) correctly reported the punishment pairing that was associated with their interview responses, and 96% (n = 157) correctly reported the certainty of the immediate punishment. Overall, as expected, participants in the uncertain conditions experienced the repetitive questions significantly less often (M = 57%, SD = 19%) than participants in the certain conditions (M = 100%, SD = 0%), $t(82) = 27.8$, $p < .001$; $d = 2.26$, 95% CI [2.04, 2.48]. These results support the effectiveness of the cover story, punishment pairing, and certainty manipulations. As we report below, removing the data of the 10 participants who were suspicious about the true purpose of the study, misreported the punishment pairing, or misreported the certainty of the repetitive questions did not meaningfully alter the results.

ANOVA Model on Total Number of Admissions

We first analyzed the data with a 2 (punishment pairing: interrogation-parallel vs. interrogation-reversed) × 2 (certainty of immediate punishment: certain vs. uncertain) between-subjects factorial ANOVA. The dependent variable was the total number of admissions made by each participant under the experimental manipulations. Table 2 summarizes the descriptive and inferential statistics of the total number of admissions in all experimental conditions.

Results of the ANOVA model indicated the main effect of punishment pairing was significant. Participants in the interrogation-parallel conditions (M = 9.48, SD = 4.57) made more admissions than those in the interrogation-reversed conditions (M = 7.10, SD = 3.55). The main effect of certainty was not significant. Results also revealed a significant interaction between punishment pairing and certainty. The pattern of means showed that the perceived certainty of the immediate punishment influenced participants' tendency to make their admission decisions on the basis of short-term punishment. Figure 1 shows the average number of admissions participants made in each condition.

To examine whether the pattern of the interaction supported our hypothesis, we conducted two simple-effects tests at each level of certainty. In the certain conditions, the results indicated that participants made significantly more admissions in the interrogation-parallel than the interrogation-reversed punishment pairing condition, $F(1, 160) = 25.48$, $p < .001$. As shown in the left panel of Figure 1, the discrepancy in the admission rates is consistent with previous empirical findings; participants were short-sighted in their admission decisions when they perceived the immediate punishment to be certain (e.g., Madon et al., 2012, 2013). By contrast, the admission rates between the two punishment pairing conditions did not differ significantly in the uncertain conditions, $F(1, 160) = 0.17$, $p = .68$. Thus, a certain immediate punishment amplified participants' tendency to make short-sighted admission decisions. Table 2 summarizes these results.

The pattern of results remained the same when the analyses excluded the 10 participants who reported being suspicious about

Table 2
Descriptive and Inferential Statistics of the Total Number of Admissions in All Experimental Conditions

	Certain immediate punishment			Uncertain immediate punishment			
Punishment pairing	n	M	SD	n	M	SD	Main effect
Interrogation-parallel	40	10.83	4.50	42	8.19	4.31	$F(1, 160) = 14.68$; $p < .001$; $\eta^2 = .084$;
Interrogation-reversed	41	6.37	3.33	41	7.83	3.65	$d = .59$, 95% CI [.28, .89]
Simple effects	$d = 1.13$, 95% CI [.69, 1.57]			$d = .09$, 95% CI [–.34, .52]			Interaction effect
							$F(1, 160) = 10.89$; $p = .001$; $\eta^2 = .064$
Main effect	$F(1, 160) = .89$; $p = .35$; $\eta^2 = .006$; $d = .14$, 95% CI [–.15, .43]						

Note. CI = confidence interval.

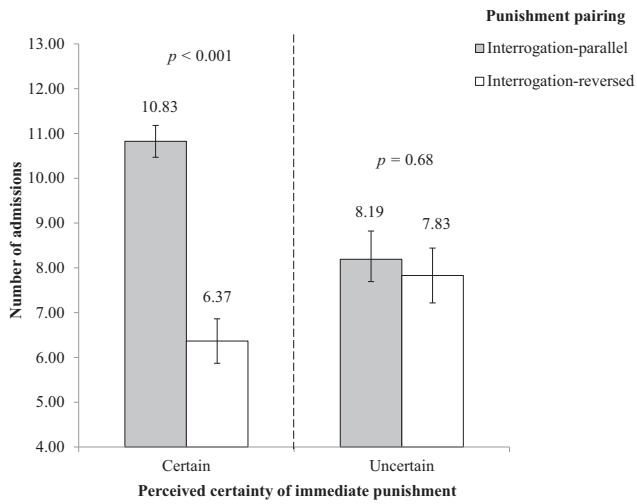

Figure 1. Values reflect the average number of admissions made during the interview. The number of admissions could range from 0 to 20. Error bars indicate standard errors of the estimates. The immediate punishment exerted stronger influence on participants' admission decisions when participants perceived the immediate punishment as certain versus certain.

the true purpose of the study, misreported the punishment pairing, or misreported the certainty of the repetitive questions. In particular, the main effect of punishment pairing and the interaction between punishment pairing and certainty remained significant and in the same direction as reported above, Fs ≥ 9.42, ps $< .01$; η^2s ≥ 0.059. The main effect of certainty remained nonsignificant, $F(1, 150) = 1.32$, $p = .25$; $\eta^2 = 0.009$.

Multilevel Generalized Linear Model

Because the ANOVA model focuses on the participants' responses aggregating over all 20 interview questions, it does not allow for examining participants' responses to each of the interview questions and how participants' responses might change over time. To get a more comprehensive understanding of participants' decision-making, we applied the interrogation decision-making model to analyze participants' admission decisions to each of the interview questions. Specifically, we built a multilevel generalized linear model from the interrogation decision-making model,

$$Y_{ij} \sim Bernoulli(\theta_{ij})$$
$$logit(\theta_{ij}) = \alpha_i + [(\tau_{RQ} - \tau_{PM}) + (\tau_{UnRQ} - \tau_{RQ})D_i]E_i + \tau_{Deception}Z_{ij}$$
$$= \alpha_i + (\tau_{SS} + \tau_{Uncertain}D_i)E_i + \tau_{Deception}Z_{ij}$$

In the model, Y_{ij} denotes the jth response from the ith participant. $Y_{ij} = 1$ denotes an admission, and $Y_{ij} = 0$ denotes a denial. Y_{ij} follows a Bernoulli distribution with the parameter θ_{ij}, which denotes the probability that the ith participant will admit guilt to the jth interview question. According to the interrogation decision-making model, the logit function of θ_{ij} is influenced by a variety of factors. Specifically, the parameter τ_{SS} denotes the level of short-sightedness in participants' decisions, that is, the difference in the influence between the immediate punishment (i.e., the repetitive questions) and the future punishment (i.e., the police meeting); $\tau_{Uncertain}$ denotes the difference in the influence between the uncertain and certain immediate punishments; $\tau_{Deception}$ denotes the influence of deviating from participants' postdebriefing responses; and α_i denotes the random intercept of the ith participant, which accounts for the influences of additional factors such as social desirability, self-esteem, and individual differences. Readers can refer to the online supplemental materials for the complete derivation of the statistical model and detailed interpretations of the parameters.

The variable D denotes whether the immediate punishment (i.e., the repetitive questions) was certain or uncertain, $D = 0$ for certain punishment and $D = 1$ for uncertain punishment. The variable E denotes the punishment pairing, $E = 1$ for the interrogation-parallel conditions, and $E = -1$ for the interrogation-reversed conditions. The variable Z denotes participants' postdebriefing responses. $Z = 1$ if the participant reported having engaged in the behavior before, and $Z = -1$ if the participant reported not having engaged in the behavior before.

To estimate the parameters, we fit the multilevel generalized linear model using the *glmer* function in the R package *lme4* (Bates, Mächler, Bolker, & Walker, 2015). Results indicated that the immediate punishment influenced participants' admission decisions more strongly than the future punishment in the certain punishment conditions, $\tau_{SS} = 0.65$, Wald $z = 4.76$, $p < .001$; $OR = 1.91$, 95% CI [1.46, 2.51]. In other words, participants were short-sighted when responding to the interview questions. However, the influence of the immediate punishment decreased significantly in the uncertain punishment conditions, $\tau_{Uncertain} = -0.71$, Wald $z = 3.68$, $p < .001$; $OR = 0.49$, 95% CI [0.34, 0.72]. In fact, in the uncertain punishment conditions, the influence of the immediate punishment did not differ from that of the future punishment, $\tau_{SS} = -0.06$, Wald $z = 0.44$, $p = .66$; $OR = 0.94$, 95% CI [0.72, 1.23]. In other words, participants were not short-sighted when they perceived the immediate punishment to be uncertain. Results also indicated a significant effect of deviating from the postdebriefing responses on participants' interview responses, $\tau_{Deception} = 2.88$, Wald $z = 26.11$, $p < .001$; $OR = 17.79$, 95% CI [14.46, 22.30]. These results suggest that participants were more short-sighted in their admission decisions when they perceived the immediate punishment to be certain versus uncertain, a pattern that matches the results of the ANOVA model.

We also used the interrogation decision-making model to examine whether the effect of the immediate punishment varied as a function of time. The interrogation decision-making model proposes that the effects of interrogation techniques can accumulate over the course of an interrogation. If that process occurred in these data, the effect of the immediate punishment on participants' admission decisions should have increased over time because of the fact that participants increasingly experienced the punishment as the interview continued. To test this hypothesis, we modeled the parameters, τ_{SS} and $\tau_{Uncertain}$, as linear functions of time instead of assuming time-invariant effects. As such, the logit function was updated to,

$$logit(\theta_{ij}) = \alpha_i + (\tau_{SS} + \tau_{Uncertain}D_i)E_i + \tau_{Deception}Z_{ij}$$
$$= \alpha_i + (\beta_{SS}X_{ij} + \beta_{Uncertain}X_{ij}D_i)E_i + \tau_{Deception}Z_{ij}$$

In this model, β_{SS} denotes the rate at which the immediate punishment influenced participants' admission decisions more strongly than the future punishment in the certain punishment conditions, and $\beta_{Uncertain}$ denotes the difference in the rates of

change between the uncertain and certain punishment conditions. The variable X denotes the position of an interview question, which serves as an indicator of time. We then fit the multilevel generalized linear model to the data. Results indicated that participants increasingly exhibited more short-sighted thinking over the course of the interview in the certain punishment conditions, $\beta = 0.066$, Wald $z = 6.46$, $p < .001$; $OR = 1.07$, 95% CI [1.05, 1.09]. However, this rate dropped significantly in the uncertain punishment conditions, $\beta = -0.055$, Wald $z = 3.95$, $p < .001$; $OR = 0.95$, 95% CI [0.92, 0.97]. In fact, in the uncertain punishment conditions, the rate of change was not significant, $\beta = 0.010$, Wald $z = 1.04$, $p = .30$; $OR = 1.01$, 95% CI [0.99, 1.03]. The influence of deviating from the postdebriefing responses remained significant, $\tau_{Deception} = 2.89$, Wald $z = 26.05$, $p < .001$; $OR = 18.07$, 95% CI [14.67, 22.69]. Table 3 summarizes the results of the two multilevel generalized linear models.

In general, the results of the multilevel generalized linear model and the ANOVA model converged on the conclusion that the perceived certainty of the immediate punishment influenced participants' tendency to make short-sighted admission decisions. The more certain the immediate punishment, the more short-sighted participants were in their admission decisions. In other words, participants tended to shift their admissions to avoid the immediate punishment when it was certain even though doing so increased their risk of encountering the future punishment. This pattern was not evident when the immediate punishment was uncertain; participants did not shift their admissions to avoid the immediate punishment when it was uncertain. Put together, these patterns support the hypothesis that suspects are more likely to make short-sighted confession decisions when immediate punishments are certain versus uncertain, and the effects of these certain immediate punishments become increasingly stronger the longer suspects are interrogated.

Discussion

Previous research reveals that suspects place disproportionate weight on immediate outcomes when deciding whether to confess or deny guilt during a custodial interrogation (Madon et al., 2012, 2013; Yang et al., 2015). The results of the present research indicated that this tendency partly stems from the certainty of these outcomes. Our participants were significantly more short-sighted in their admission decisions when the immediate punishment was certain than uncertain. In addition, the influence of the certain immediate punishment on participants' admission decisions increased over the course of the interview.

These findings provide several important insights into suspects' decision-making processes in custodial interrogations. First, they help to explain the seemingly counterintuitive choice of suspects to self-incriminate when interrogated by police. The negative outcomes that are associated with a confession—conviction and legal sanctions—although severe, are not certain: New leads could direct police toward other suspects; the case could be dropped because of insufficient evidence; and jurors might render a not guilty verdict. In contrast, the negative outcomes that are associated with a denial, though relatively minor, are more certain by comparison. In the United States, for example, suspects who deny guilt are often subjected to an array of aversive interrogation tactics—confrontation, extended detainment, and physical and psychological discomfort (e.g., Kelly et al., 2013; Leo, 1996). To the extent that suspects perceive these aversive tactics to be certain, they could become psychologically immersed in the immediate situation and neglect the long-term consequences of their behavior.

These findings also raise the possibility that the way police portray an interrogation could exacerbate suspects' short-sighted thinking. For example, when an interrogator says, "If you tell me the truth, it'll be a piece of cake. If you don't tell me the truth, we'll be here awhile" (Leo, 2009, p.149), suspects might begin to believe that their denials will likely lead to a lengthy interrogation. When an interrogator expresses disapproval or exerts pressure on suspects in response to denials, suspects might begin to expect the same negative outcomes the next time they deny guilt. Therefore, police interrogators might influence suspects' confession decisions by directly manipulating the perceived certainty of immediate punishment.

Cumulative Effects of Interrogation Techniques

The interrogation decision-making model posits that the effects of different interrogation techniques can accumulate and dynamically influence a suspect's decision-making (Yang et al., 2017). Suspects might elect to deny guilt at the beginning of an interrogation, but gradually come to view denials as a suboptimal strategy when they reliably elicit immediate and negative consequences. Over the course of an interrogation, therefore, suspects' re-evaluations of their choices can gradually shift to a confession. Thus, suspects who repeatedly made the decision to deny guilt during the early stage of an interro-

Table 3
Inferential Statistics of the Multilevel Generalized Linear Models

Model	Parameter	Estimate	p-value	OR	95% CI Lower	95% CI Upper
Constant effect	α	–1.34	<.001	.26	.21	.33
	τ_{SS}	.65	<.001	1.91	1.46	2.51
	$\tau_{Uncertain}$	–.71	<.001	.49	.34	.72
	$\tau_{Deception}$	2.88	<.001	17.79	14.46	22.30
Time-varying effect	α	–1.35	<.001	.26	.20	.33
	β_{SS}	.07	<.001	1.07	1.05	1.09
	$\beta_{Uncertain}$	–.06	<.001	.95	.92	.97
	$\tau_{Deception}$	2.89	<.001	18.07	14.67	22.69

Note. OR = odds ratio; CI = confidence interval.

gation might ultimately decide to confess guilt because of the cumulative effects of interrogation techniques.

Our findings provide empirical support for this predicted effect. The influence of the immediate punishment increased as participants repeatedly incurred the immediate punishment. This finding sheds light on why even innocent suspects may falsely confess. Although a single interrogation technique might not be sufficient to elicit a confession, the effects of interrogation techniques could accumulate and eventually overwhelm innocent suspects' willingness to defend their innocence.

The cumulative effects of interrogation techniques on suspects' short-sighted thinking might partially reflect self-regulatory decline. According to Davis and Leo (2012), suspects' ability to resist interrogation pressures to self-incriminate wanes over the course of questioning through a process of diminishing self-regulatory resources. Specifically, mounting interrogation pressures increase suspects' urge to escape while simultaneously depleting the pool of resources suspects need to resist this urge. If an interrogation continues long enough, suspects will reach a point at which the urge to escape exceeds their capacity to override it, putting them at risk of self-incrimination. Self-regulatory decline may explain why participants in our research became increasingly short-sighted over the course of the interview. The cumulative effects of the immediate punishment may have caused a decline in participants' self-regulatory resources, which made them more vulnerable to short-sighted thinking.

Limitations

Several limitations of this research warrant discussion. The first limitation pertains to the sample. Our sample consisted exclusively of college students. As a result, the magnitude of the effects in our research might be systematically different from those that exist in real interrogation situations. In particular, because the college students might be more intelligent and less susceptible to coercive interrogation tactics than typical criminal suspects (Gudjonsson, 2003), the effects reported here might underestimate the magnitude of the effect of certain immediate outcomes. Real suspects, especially those with cognitive or social impairments, could be especially prone to give disproportional weight to immediate punishment in the interrogation room, no matter the long-term consequences (Clare & Gudjonsson, 1995; Redlich, 2007). In addition, the students in our sample were predominantly Caucasian and did not represent the populations that are most frequently interrogated (Kelly, Redlich, & Miller, 2015; Leo, 1996).

Second, because of ethical constraints, the experimental situation created by our procedures was necessarily less coercive than that of real interrogations. For example, the immediate and future punishments we used were less severe than those typically faced by criminal suspects, and the physical environment in which participants made their admission decisions was less threatening than that experienced by interrogated suspects. As a result, the effects of certainty might have been mitigated.

Third, the research procedure limited our ability to assess the ground truth of participants' admissions. We could not assume the veracity of participants' interview responses because participants made their decisions in a context that involved both the immediate and future punishments. Although participants reported their past illegal and unethical behaviors after being debriefed, the postdebriefing assessment might have not accurately reflected ground truth because it relied on self-report (see the online supplemental materials for the analysis of the postdebriefing assessment). Self-report measures are vulnerable to responding biases, such as social desirability or introspective ability (Schwarz, 1999; Wilson & Schooler, 1991). For two reasons, however, we do not believe that this limitation undermines our conclusions or the importance of our findings.

First, the purpose of our research was to examine how the certainty of an immediate punishment influences suspects' willingness to admit guilt during custodial interrogations. It was not designed to examine the effect of the punishment certainty on suspects' truthfulness. Thus, even if the participants in our research misrepresented their past illegal and unethical behaviors during the interview, it is still the case that they more readily shifted their admissions to avoid the immediate punishment when it was certain versus uncertain. Second, our participants responded to the postdebriefing assessment in private and under the condition of complete anonymity. The fact that these procedures tend to mitigate responding biases gives us confidence that our participants responded truthfully when completing the measure.

Future Directions

Our research suggests directions for future research to further the field's understanding of police interrogations and confessions. First, our research shows the utility of constructing a statistical model from a theoretical framework (Yang et al., 2017). Such an approach has the potential to provide richer and more accurate information about how various factors affect suspects' decision-making. By using this kind of analytical approach, future confession research could quantify how various factors could impinge upon suspects' confession decisions during custodial interrogations.

Second, our findings raise important questions about the way in which the certainty of immediate punishment affects suspects with personal vulnerabilities. Suspects with cognitive deficits, mental illness, and substance dependence, as well as minors, tend to be impulsive (Owen-Kostelnik, Reppucci, & Meyer, 2006; Redlich & Drizin, 2007), which could substantially increase the extent to which the certainty of immediate punishment unduly influences them. A similar tendency might be present among individuals who are highly susceptible. Suspects with high interrogative suggestibility are especially sensitive to the effects of negative feedback (e.g., repeated questioning) and could therefore be strongly influenced by the certainty of immediate punishment when deciding whether to confess or deny guilt (Gudjonsson & Clark, 1986). Future research should empirically document these effects to further support recommended reforms to limit the use of aversive and manipulative interrogation techniques that focus suspects' attention too narrowly on the short-term benefits associated with confessions.

Finally, it is important to examine the effects of punishment certainty and the cumulative effects of interrogation techniques with designs that have greater ecological validity than was present in the current research. For example, future research could use samples of military personnel enrolled in survival schools, who experience highly stressful interrogations as a part of their training (e.g., Morgan, Southwick, Steffian, Hazlett, & Loftus, 2013). Such research could provide further evidence as to how suspects might be influenced by the certainty of immediate punishment in real-world settings.

Conclusion

Previous research reveals that suspects tend to focus on short-term gains over their long-term interests when deciding to confess or deny guilt in a custodial interrogation (Madon et al., 2012, 2013; Yang et al., 2015). In the current research, an immediate punishment exerted greater influence on participants' responses when participants perceived the punishment to be certain versus uncertain. This result suggests the certainty of immediate punishment might be an important factor that contributes to the power of custodial interrogations to elicit short-sighted thinking among suspects. Our research also revealed the cumulative effects of interrogation techniques. Over the course of the interview, participants increasingly engaged in short-sighted thinking as they repeatedly experienced an immediate punishment. These findings provide evidence that the certainty of immediate outcomes could play an important role in suspects' shorted-sighted confession decisions.

References

Bates, D., Mächler, M., Bolker, B., & Walker, S. (2015). Fitting linear mixed-effects models using lme4. *Journal of Statistical Software, 67,* 1–48. http://dx.doi.org/10.18637/jss.v067.i01

Clare, I. C., & Gudjonsson, G. H. (1995). The vulnerability of suspects with intellectual disabilities during police interviews: A review and experimental study of decision-making. *Mental Handicap Research, 8,* 110–128. http://dx.doi.org/10.1111/j.1468-3148.1995.tb00149.x

Davis, D., & Leo, R. A. (2012). Interrogation-related regulatory decline: Ego depletion, failures of self-regulation, and the decision to confess. *Psychology, Public Policy, and Law, 18,* 673–704. http://dx.doi.org/10.1037/a0027367

Drizin, S. A., & Leo, R. A. (2004). The problem of false confessions in the post-DNA world. *North Carolina Law Review, 82,* 891–1007.

Gudjonsson, G. H. (2003). *The psychology of interrogations and confessions: A handbook*. Chichester, England: Wiley.

Gudjonsson, G. H., & Clark, N. K. (1986). Suggestibility in police interrogation: A social psychological model. *Social Behaviour, 1,* 83–104.

Gudjonsson, G. H., & Sigurdsson, J. F. (1999). The Gudjonsson Confession Questionnaire–Revised (GCQ-R) factor structure and its relationship with personality. *Personality and Individual Differences, 27,* 953–968. http://dx.doi.org/10.1016/S0191-8869(98)00278-5

Innocence Project. (2019). *False confessions and recording of custodial interrogations*. Retrieved from https://www.innocenceproject.org/causes/false-confessions-admissions/

Kahneman, D., & Tversky, A. (1979). Prospect theory: An analysis of decision under risk. *Econometrica, 47,* 263–291. http://dx.doi.org/10.2307/1914185

Kahneman, D., & Tversky, A. (1984). Choices, values, and frames. *American Psychologist, 39,* 341–350. http://dx.doi.org/10.1037/0003-066X.39.4.341

Kassin, S. M., Drizin, S. A., Grisso, T., Gudjonsson, G. H., Leo, R. A., & Redlich, A. D. (2010). Police-induced confessions: Risk factors and recommendations. *Law and Human Behavior, 34,* 3–38. http://dx.doi.org/10.1007/s10979-009-9188-6

Kassin, S. M., & Gudjonsson, G. H. (2004). The psychology of confessions: A review of the literature and issues. *Psychological Science in the Public Interest, 5,* 33–67. http://dx.doi.org/10.1111/j.1529-1006.2004.00016.x

Kassin, S. M., & McNall, K. (1991). Police interrogations and confessions: Communicating promises and threats by pragmatic implication. *Law and Human Behavior, 15,* 233–251. http://dx.doi.org/10.1007/BF01061711

Kelly, C. E., Miller, J. C., Redlich, A. D., & Kleinman, S. M. (2013). A taxonomy of interrogation methods. *Psychology, Public Policy, and Law, 19,* 165–178. http://dx.doi.org/10.1037/a0030310

Kelly, C. E., Redlich, A. D., & Miller, J. C. (2015). Examining the meso-level domains of the interrogation taxonomy. *Psychology, Public Policy, and Law, 21,* 179–191. http://dx.doi.org/10.1037/law0000034

Keren, G., & Roelofsma, P. (1995). Immediacy and certainty in intertemporal choice. *Organizational Behavior and Human Decision Processes, 63,* 287–297. http://dx.doi.org/10.1006/obhd.1995.1080

Leo, R. A. (1996). Inside the interrogation room. *Journal of Criminal Law & Criminology, 86,* 266–303. http://dx.doi.org/10.2307/1144028

Leo, R. A. (2009). *Police interrogation and American justice*. Cambridge, MA: Harvard University Press.

Madon, S., Guyll, M., Scherr, K., Greathouse, S., & Wells, G. (2012). Temporal discounting: The differential effect of immediate and future punishments on confession decisions. *Law and Human Behavior, 36,* 13–20. http://dx.doi.org/10.1037/h0093962

Madon, S., Yang, Y., Smalarz, L., Guyll, M., & Scherr, K. C. (2013). How factors present during the immediate interrogation situation produce short-sighted confession decisions. *Law and Human Behavior, 37,* 60–74. http://dx.doi.org/10.1037/lhb0000011

McCoy, K., Fremouw, W., Tyner, E., Clegg, C., Johansson-Love, J., & Strunk, J. (2006). Criminal-thinking styles and illegal behavior among college students: Validation of the PICTS. *Journal of Forensic Sciences, 51,* 1174–1177. http://dx.doi.org/10.1111/j.1556-4029.2006.00216.x

Morgan, C. A., III, Southwick, S., Steffian, G., Hazlett, G. A., & Loftus, E. F. (2013). Misinformation can influence memory for recently experienced, highly stressful events. *International Journal of Law and Psychiatry, 36,* 11–17. http://dx.doi.org/10.1016/j.ijlp.2012.11.002

Owen-Kostelnik, J., Reppucci, N. D., & Meyer, J. R. (2006). Testimony and interrogation of minors: Assumptions about maturity and morality. *American Psychologist, 61,* 286–304. http://dx.doi.org/10.1037/0003-066X.61.4.286

Redlich, A. D. (2007). Double jeopardy in the interrogation room for youths with mental illness. *American Psychologist, 62,* 609–611. http://dx.doi.org/10.1037/0003-066X62.6.609

Redlich, A. D., & Drizin, S. (2007). Police interrogation of youth. In C. L. Kessler & L. Kraus (Eds.), *The mental health needs of young offenders: Forging paths toward reintegration and rehabilitation* (pp. 61–78). Cambridge, England: Cambridge University Press. http://dx.doi.org/10.1017/CBO9780511543913.005

Schwarz, N. (1999). Self-reports: How the questions shape the answers. *American Psychologist, 54,* 93–105. http://dx.doi.org/10.1037/0003-066X.54.2.93

Tversky, A., & Kahneman, D. (1986). Rational choice and the framing of decisions. *Journal of Business, 59,* S251–S278. http://dx.doi.org/10.1086/296365

U.S. Const. amend. V.

Wilson, T. D., & Schooler, J. W. (1991). Thinking too much: Introspection can reduce the quality of preferences and decisions. *Journal of Personality and Social Psychology, 60,* 181–192. http://dx.doi.org/10.1037/0022-3514.60.2.181

Yang, Y., Guyll, M., & Madon, S. (2017). The interrogation decision-making model: A general theoretical framework for confessions. *Law and Human Behavior, 41,* 80–92. http://dx.doi.org/10.1037/lhb0000220

Yang, Y., Madon, S., & Guyll, M. (2015). Short-sighted confession decisions: The role of uncertain and delayed consequences. *Law and Human Behavior, 39,* 44–52. http://dx.doi.org/10.1037/lhb0000100

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