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Dispositional Sources of Sanction Perceptions: Emotionality, Cognitive Style, Intolerance of Ambiguity, and Self-Efficacy

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This study contributes to efforts to identify the sources of arrest risk perceptions and ambiguity (or lack of confidence) in such perceptions. Drawing on dual-process theories of reasoning, we argue that arrest risk perceptions often represent intuitive judgments that are influenced by cognitive heuristics and dispositional attributes. Multivariate regression models are estimated with data from 3 national surveys to test 6 hypotheses about the relationships between specific dispositional attributes and perceived arrest risk and ambiguity. We find evidence that dispositional positive affect and intolerance of ambiguity are both positively related to perceived arrest risk, and are also both negatively related to ambiguity. We also find evidence that cognitive reflection and general self-efficacy are, respectively, positively and negatively associated with ambiguity. Mixed evidence emerges about whether cognitive reflection is related to risk perceptions, and about whether either dispositional negative affect or thoughtfully reflective decision making correlate with ambiguity. Taken together, the results provide partial support for each of our hypotheses, and suggest that dispositional attributes are important sources of perceptions of arrest risk as well as of ambiguity in such perceptions.

Keywords: deterrence, dual-process models, heuristics, individual differences, rational choice

Deterrence and rational choice theories of offending are among the most commonly tested models of crime (Nagin, 2013), and also serve as the theoretical foundation for many criminal justice policies (Kleck, Sever, Li, & Gertz, 2005). Even still, the key theoretical concept in perceptual deterrence models—sanction perceptions—is not well understood (Apel, 2013). Most notably, the sources of sanction perceptions remain elusive (Piquero, Paternoster, Pogarsky, & Loughran, 2011). This fact is a "dirty little secret in deterrence research" (Paternoster, 2010, p. 808). Likewise, despite evidence that ambiguity (or lack of confidence) in perceived arrest risk influences criminal behavior (Loughran, Paternoster, Piquero, & Pogarsky, 2011), its origins have largely escaped empirical scrutiny. It is hard to overstate the importance of identifying the various factors that shape sanction perceptions; as Pogarsky (2009) emphasizes, "the formation of threat perceptions is central to deterrence and, more generally, to society's capacity for deterrence-oriented crime control" (p. 241).

The contribution of the current study is to explore several potential sources of sanction perceptions and ambiguity that prior research has missed. Drawing on dual-process theories of reasoning (Chaiken & Trope, 1999; Kahneman, 2011) we argue that for many individuals, sanction perceptions, particularly perceptions of the certainty of punishment, likely represent intuitive judgments based on cognitive heuristics (Piquero et al., 2011). This argument is premised on the assumption that it is often difficult for individuals to find relevant information about the objective probability of arrest, and thus to accurately estimate arrest risk. We identify as potential sources of both sanction perceptions and ambiguity those dispositional attributes that prior theory and research suggest either (a) influence persons' reliance on intuitive reasoning, or (b) shape the outcome of intuitive reasoning processes. At the outset, it bears emphasizing that, conceptually, we distinguish dispositional attributes or tendencies from situational or momentary states and from fixed traits. We assume that the dispositional attributes discussed and examined herein represent long-term patterns—neither fleeting, nor necessarily entirely static—of cognition and emotional experience. To test our theoretical model, we use data from three national surveys, which include measures of perceived arrest risk as well as ambiguity.

Difficulties in Estimating Objective Arrest Risk

Understanding the perceived certainty of punishment is particularly important, because it "is a much stronger deterrent than perceived severity. Often, perceived punishment severity is uncorrelated with individual criminal behavior" (Apel, 2013, p. 73). This is ironic, because there is more information available to the public about the severity of sanctions than about the certainty of arrest. Information about the severity of available sanctions, unlike that for the certainty of apprehension, is available in legal statues

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and sentencing guidelines; is occasionally provided in public service announcements and media coverage; can be gleaned from the graduated nature of sanctions (i.e., one can discern, even if only roughly, the punishment for any given offense by knowing the punishment for a more/less serious offense), and is less contingent on the time, place, and persons involved (e.g., statutory penalties do not vary across local neighborhoods, or depend on offenders' skill/intelligence, victims' reporting tendencies, or police patrolling behaviors and investigative technologies). Despite all of these potential sources of information about sanction severity, citizens still appear to have minimal knowledge about the harshness of criminal punishments, much less about the certainty or risk of punishment (Pickett, Mancini, Mears, & Gertz, 2015).

Not surprisingly, then, the public's estimates of arrest risk appear to be inaccurate for many types of crime (Tittle, 1980). For example, the objective risk of arrest for driving under the influence (DUI) is far less than 1%, ranging from 1/200 to less than 1/1,000 (Beitel, Sharp, & Glauz, 2000; Ross, 1992), yet the average American estimates the arrest risk to be 35% (Piquero et al., 2012). Experiences with both offending and arrest appear to be consistent correlates of perceived arrest risk (Apel, 2013). However, it remains unclear whether offenders are able to obtain *accurate* information about the true level of arrest risk from such experiences (Kleck et al., 2005). Lochner (2007) found that the average perceived arrest risk for auto theft among those who had stolen a car was 45%, but the objective risk was 10%.

Even social scientists have difficulty finding accurate information about objective arrest risk (Nagin, Solow, & Lum, 2015). For example, deterrence researchers are commonly forced to rely on the arrest ratio or clearance rate in a given geographic area to measure the probability arrest. However, scholars have long argued that official arrest data are not a valid indicator of arrest risk (Cook, 1979). Persons travel around in their daily lives, and thus it may not be possible to accurately asses their arrest risk using arrest data for any one location (Pogarsky, 2009). Official arrest data may also be endogenous to offender decision making, because arrest rates may be shaped by offenders' "adaptive responses" to enforcement levels (Cook, 1979). Perhaps most importantly, according to Nagin (2013), "the ratio of arrest per crime is not a valid measure of the risk of apprehension for criminal opportunities that are not acted on" (p. 248).

In short, researchers with access to arrest data and statistical software have difficulty estimating the average objective arrest risk in a given area. Laymen who have access to neither must have at least as much difficulty doing so. Arguably, laymen should have even greater difficulty estimating their own personal arrest risk for a given criminal opportunity, because it requires accurately adjusting their point estimate of generalized arrest risk to account for situational (e.g., presence of witnesses) factors that may affect their probability of apprehension.

Arrest Risk Perceptions as Intuitive Judgments

> I propose a simple account of how we generate intuitive opinions on complex matters. If a satisfactory answer to a hard question is not found quickly, System 1 will find a related question that is easier and will answer it. (Daniel Kahneman, 2011, p. 97)

Our central theoretical argument is that individuals often, although not always, estimate arrest risk using intuitive reasoning processes. In turn, dispositional attributes that influence persons' reliance on intuitive reasoning, or that shape the outcome of intuitive reasoning processes, should impact sanction perceptions and ambiguity. This argument is informed by dual-process theories of reasoning, which suggest that decision-making occurs through two systems: (a) System 1, the experiential system; and (b) System 2, the analytic system (Chaiken & Trope, 1999; Kahneman, 2011). The cognitive operations of System 1 are automatic, fast, intuitive, occur unconsciously, and are heavily influenced by emotion, whereas those of System 2 are slow, deliberate, require conscious attention, and involve logical reasoning (Kahneman, 2011). System 1 constantly and immediately suggests answers to the questions that are encountered in daily life (Kahneman, 2011), including questions about the risk of future events (Johnson & Tversky, 1983; Slovic, 2010). System 1's answers commonly derive from the use of mental shortcuts, or cognitive heuristics, which tends to result in predictable forms of bias (Tversky & Kahneman, 1974). System 2 has the capacity to reject System 1's answers. However, for various reasons (e.g., preoccupation, depletion, individual differences in reasoning styles), System 2 often accepts the heuristic answer, which then becomes the basis for the person's judgment or belief (Kahneman, 2011).

Because of the inherent difficultly in estimating probabilities, "a question about probability or likelihood activates a mental shotgun, evoking answers to easier questions" (Kahneman, 2011, p. 150). To generate probability judgments about future events, such as judgments about arrest risk, System 1 relies on the *availability heuristic* (Tversky & Kahneman, 1973). Specifically, System 1 estimates an event's probability on whether it can either (a) quickly and fluently recall relevant exemplars, or (b) easily imagine a plausible scenario where the event would occur (Breakwell, 2007; Kahneman, 2011). System 1 then substitutes the heuristic answer (i.e., ease of recall or imaginability) in place of an answer to the more difficult question about event probability, such that greater speed and fluency in recall results in a higher perceived probability of the event (e.g., arrest) occurring (MacLeod & Campbell, 1992; Tversky & Kahneman, 1973). In the context of probability judgments, confirmation bias is the tendency to estimate an event's (e.g., arrest) probability by focusing narrowly on the event and trying to bring exemplars of it (e.g., prior arrests) to mind, without doing the same for exemplars of nonevents (e.g., unsanctioned crimes). Kahneman (2011) explains that because of confirmation bias, judgments based on the availability heuristic are biased in a specific direction: "[p]eople overestimate the probabilities of unlikely events" (p. 324). This is what commonly emerges in studies of perceived sanction certainty. Individuals, both offenders and nonoffenders, overestimate the probability of arrest for crimes with low objective arrest risks (e.g., DUI, burglary, auto theft; Kleck et al., 2005; Lochner, 2007; Piquero et al., 2012).

It is important to note that the argument that assessments of arrest risk are often intuitive judgments is not inconsistent with the evidence of sanction perception updating. Prior studies show that offenders' update their sanction perceptions on the basis of personal and vicarious experiences with crime and arrest (Anwar & Loughran, 2011; Matsueda, Kreager, & Huizinga, 2006). Yet it is difficult to identify the precise mechanisms underlying updating. It plausible that updating reflects the temporary impact of recent experiences on intuitive reasoning processes. Lochner (2007, p. 455), for example, finds that "there is little persistence in the

effects of new information on reported beliefs. Instead, unobserved differences in baseline beliefs appear to explain why some individuals hold a high perceived probability of arrest year after year, while others believe the probability of arrest is much lower." As Kahneman (2011, p. 130) observes, relevant prior experiences impact both the availability of events in memory and the ease at which they can be recalled. In addition, longitudinal studies consistently show that one of the strongest predictors of a person's current level of perceived arrest risk is his or her prior level of perceived arrest risk (Lochner, 2007; Matsueda et al., 2006; Thomas, Loughran, & Piquero, 2013). Indeed, even Piliavin et al. (1986), who concluded that sanction perceptions "are unstable over time" (p. 116), found a sizable and significant positive correlation between prior and current levels of perceived sanction risk for offenders, addicts, and youths. Moreover, in all three of the groups they examined, prior perceived risk was a stronger predictor of current perceived risk than were respondents' recent experiences with either offending or arrest (see Table 7, p. 117). This finding is consistent with the possibility that dispositional attributes shape sanction perceptions by influencing intuitive reasoning processes.

Dispositional Influences on Intuitive Sanction Perceptions

There are at least three ways that dispositional attributes may impact intuitive probability judgments: (a) by increasing the tendency to engage in heuristic (System 1) versus systematic (System 2) reasoning; (b) by shaping memory formation or recall; or (c) by providing an alternative substitute answer, other than the availability heuristic, to the probability question (see Breakwell, 2007; Kahneman, 2011; Piquero et al., 2011). One basic prediction of this theoretical model is that dispositional attributes that increase either (a) the accessibility of arrest incidents in memory, or, because of confirmation bias, (b) individuals' reliance on intuitive reasoning, should lead to a greater perceived arrest risk.

Our theoretical model would also suggest that the same dispositional attributes that increase perceived arrest risk should also reduce ambiguity in their risk perceptions, because "intuitive predictions tend to be overconfident and overly extreme" (Kahneman, 2011, p. 192). By contrast, dispositional attributes that increase the use of System 2 reasoning and reduce reliance on the availability heuristic should increase ambiguity. Kahneman (2011) puts it simply: "[c]onscious doubt is not in the repertoire of System 1 . . . Uncertainty and doubt are the domain of System 2" (p. 80). This viewpoint contrasts with the Bayesian conceptualization of subjective confidence in risk estimates as a second-order probability, which holds that confidence is a function of the amount and consistency of information possessed by individuals (Camerer & Weber, 1992; Loughran et al., 2011). Kahneman (2011), on the other hand, argues that "neither the quantity nor the quality of the evidence counts for much in subjective confidence" (p. 87, see also Pickett, Loughran, & Bushway, 2014). He explains that "[o]ur understanding of cognitive ease and associative coherence locates subjective confidence firmly in System 1" (p. 217).

Positive and negative emotionality are both dispositional attributes that likely influence sanction perceptions (Blanchette & Richards, 2010; Piquero et al., 2011; Schwarz & Bless, 1991). Incidental affect is emotion (e.g., trait affect, general moods) that is not triggered by the target object itself, whereas integral affect is emotion (e.g., fear of terrorism) that is intrinsically linked to the specific target object (e.g., terrorism). It is important to distinguish between the two because they appear to have opposite effects on logicality and reasoning (Blanchette & Richards, 2010). Several studies have found that incidental positive affect increases intuitive reasoning and susceptibility to heuristic biases, whereas incidental negative affect increases analytical reasoning and systematic information processing (Bless, Bohner, Schwarz, & Strack, 1990; Mackie & Worth, 1989; Semmler & Brewer, 2002). Theoretically, experienced affect may deplete working memory and, depending on whether it is positive (or negative), decrease (or increase) motivation for careful processing, as well as focus attention away from (or toward) the relevant cognitive task (Blanchette & Richards, 2010). This scholarship suggests that because of their opposite influences on heuristic reasoning, positive affect should increase, and negative affect should decrease, perceived arrest risk.

In addition, a large literature has shown that experienced positive and negative emotions result in affect-congruent judgments of both frequency and probability (Mayer & Hanson, 1995; Rafienia et al., 2008; Zelenski & Larsen, 2002). That is, positive affect increases the perceived probability of positive events, and negative affect does the same for negative events (Blanchette & Richards, 2010; Johnson & Tversky, 1983). Emotional priming likely accounts for these effects, such that emotions increase the accessibility and recall speed of affect-consistent memories and thoughts (Forgas, 2006; MacLeod & Campbell, 1992). By extension, if most persons perceive arrests to be positive events (relative to unsanctioned crimes), at least when they are not the arrested offender, positive affect would again be expected to increase, and negative affect to decrease, perceived arrest risk, because of an affect-congruent speeding of recall latencies (see MacLeod & Campbell, 1992).

Unfortunately, very little prior research has examined the relationships between positive and negative affect and perceived sanction certainty. A small number of studies have provided mixed evidence about whether various types of state emotionality are associated with sanction perceptions. Piquero, Gomez-Smith, and Langton (2004) found an association between state anger and the perception that sanctions applied with low certainty are unfair, though they interpreted the causal order as running from perceived sanction unfairness to anger. Research by Carmichael and Piquero (2004), however, revealed no association between anger and perceived sanction certainty. Kamerdze, Loughran, Paternoster, and Sohoni (2014) found that an experimental manipulation designed to induce either a positive, negative, or neutral mood did not impact college students' perceptions of sanction certainty. Other research has shown that the emotional state of sexual arousal exerts very little, if any, impact on the perceived costs of sexual offending (Loewenstein et al., 1997; Bouffard, 2002, 2014a). By contrast, Bouffard (2014b) found that state fear and anger, respectively, were positively and negatively associated with the perceived costs (e.g., likelihood of getting into an accident or arrested) for drunk driving.

Two recent studies examined the relationship between dispositional emotionality and sanction perceptions. Van Gelder and De Vries (2012) showed that among a sample of Internet panelists, general incidental affect, as measured with the HEXACO emotionality scale (e.g., "I feel like crying when I see other people

crying"), was positively related to perceived sanction risk. They also found that several other personality traits—honesty-humility, agreeableness, extraversion, conscientiousness, and self-control—were associated with sanction perceptions. However, only the effects of honesty-humility and self-control replicated in a subsequent study with college students (Van Gelder & De Vries, 2014, p. 9). In both studies, Van Gelder and De Vries (2012, 2014) found that perceived sanction risk was positively associated with state *integral* negative affect connected to the criminal decision (e.g., "Do you find the situation frightening?"). The authors measured perceived sanction risk as the product of the perceived certainty and severity of sanctions. Thus, it is unclear whether the observed associations operated through perceived certainty, perceived severity, or both. Moreover, no previous studies have evaluated whether either state or dispositional affect is associated with ambiguity in risk perceptions.

We extend this line of inquiry by providing the first direct investigation of whether dispositional positive and negative affect influence both the perceived probability of arrest and ambiguity. We focus on dispositional affect because evidence indicates that affect-related traits directly influence risk perceptions, over and above any effect of mood states (Zelenski & Larsen, 2002). It bears emphasizing that the influence of affect is complex, and differs depending on whether the focus is on risk perceptions, risk preferences, or risk-taking behaviors (Blanchette & Richards, 2010). Studies that have examined risk preferences (Isen, Nygren, & Ashby, 1988), risk-taking decisions (Yuen & Lee, 2003), or general happiness (Schwarz & Clore, 1983) suggest that positive and negative affect may have unique effects on these outcomes. Our focus is specifically on *risk perceptions*. In addition, as noted above, emotions may impact *risk perceptions* differently depending on whether the focus in on desirable (e.g., having a gifted child) or undesirable (e.g., death, victimization) outcomes (Johnson & Tversky, 1983; Zelenski & Larsen, 2002). We believe that for most persons, police effectiveness and offender apprehension are both desirable social outcomes, even if they sometimes result in undesirable personal outcomes (i.e., one's own arrest). Our reading of the relevant literature thus suggests the following hypotheses: dispositional positive affect will increase perceived arrest risk (Hypothesis 1a), and reduce ambiguity (Hypothesis 1b), whereas dispositional negative affect will reduce perceived arrest risk (Hypothesis 2a) and increase ambiguity (Hypothesis 2b).

If intuitive judgments about arrest risk tend to exaggerate objective risk and to be overly confident, then any dispositional attribute that reduces the tendency to engage in heuristic reasoning should reduce the perceived probability of arrest and increase ambiguity. Two such attributes are cognitive reflection (Frederick, 2005), and thoughtfully reflective decision making (Paternoster & Pogarsky, 2009; Paternoster, Pogarsky, & Zimmerman, 2011). Cognitive reflection, as measured with the cognitive reflection test, is "the ability or disposition to resist reporting the response that first comes to mind" (Frederick, 2005, p. 35). Kahneman (2011: 48) explains that the cognitive reflection test "has emerged as one of the better predictors of lazy thinking," because "the supervisory function of System 2 is weak" in people who score low on the test. Supporting this position, extant research shows that lower cognitive reflection test scores predict susceptibility to heuristic reasoning (Toplak, West, & Stanovich, 2011).

Thoughtfully reflective decision making is the tendency to be thoughtful and rational in all stages of decision making—before (gather information), during (carefully deliberate), and after (revisit and critique) making a decision (Paternoster & Pogarsky, 2009, pp. 104–105). In terms of measurement, cognitive reflection and thoughtfully reflective decision making differ in that the former is a measure of the actual quality of a person's decision-making process, whereas the latter is a measure of his perception of that process. To our knowledge, only one study to date has examined whether cognitive reflection and thoughtfully reflective decision making are related to perceived sanction certainty. Kamerdze and colleagues (2014, p. 634) reported weak, nonsignificant bivariate correlations between both cognitive reflection and thoughtfully reflective decision making and undergraduate students' perceived arrest risk ($r = -.006$ to .059). We build on their study in the current study. We test the following hypotheses: Both cognitive reflection and thoughtfully reflective decision making will be negatively related to perceived arrest risk (Hypotheses 3a and 4a), and positively related to ambiguity (Hypotheses 3b and 4b).

Intolerance of ambiguity is another dispositional attribute that likely influences intuitive sanction perceptions. It is the inability "to tolerate a 'here and now' situation characterized by equivocal or ambiguous features" (Grenier, Barrette, & Ladouceur, 2005, p. 596). Individuals high in intolerance of ambiguity experience discomfort when faced with ambiguous situations, because they perceive them "as sources of threat" (Stanley Budner, 1962, p. 29). Scholars have long theorized that intolerance of ambiguity may influence probability judgments as well as subjective confidence in such judgments (Brim, 1955; Pickett et al., 2014). Theoretically, these effects may occur through three mechanisms. Intolerance of ambiguity may (a) increase memory consistency by causing persons to ignore or discount new information and experiences that are inconsistent with their prior beliefs; (b) improve accessibility and recall fluency for consistent (relative to inconsistent) memories and thoughts; or (c) simply discourage the development (or reporting in surveys) of uncertain or ambiguous attitudes and beliefs (Brim, 1955; Naemi, Beal, & Payne, 2009). Because most individuals initially overestimate arrest risk (Tittle, 1980), which, as noted previously, likely results from confirmation bias and the availability heuristic (see Kahneman, 2011), the above mechanisms should lead both to higher estimates of arrest risk and confidence. To our knowledge, prior studies have not examined this possibility. However, Piquero, Exum, and Simpson (2005) examined whether a related but distinct personality trait, the desire for control, was associated with sanction perceptions. They found that although the desire for control was positively related to perceived *informal* sanction certainty (e.g., chance of job loss), it was not related to perceived *formal* sanction certainty (e.g., chance of arrest). We provide the first assessment of whether intolerance of ambiguity is associated with sanction perceptions. We test the hypotheses that intolerance of ambiguity will be positively associated with perceived arrest risk (Hypothesis 5a), and negatively related to ambiguity in perceived arrest risk (Hypothesis 5b).

An additional dispositional attribute that, at least in the case of judgments about personal risk, likely influences both perceived arrest risk and ambiguity through heuristic reasoning processes is general self-efficacy (Breakwell, 2007). Self-efficacy is a person's confidence in his "capabilities to mobilize the motivation, cogni-

tive resources, and courses of action needed to meet given situational demands" (Wood & Bandura, 1989, p. 408). Self-efficacy likely influences perceived arrest risk by (a) providing an alternative, ready-made answer (i.e., one's efficacy belief) to the probability question, and, when an event's probability is judged through the availability heuristic, (b) by shaping the ease at which persons can imagine success scenarios (Breakwell, 2007; Källmén, 2000; Krueger & Dickson, 1994). As Bandura (1989) explains, "[p]eoples' perceptions of their efficacy influence the types of anticipatory scenarios they construct . . . those who have a high sense of efficacy visualize success scenarios . . . those who judge themselves as inefficacious are more inclined to visualize failure scenarios" (p. 1176). High self-efficacy may also signal to individuals that they are "able to analyze, process, and make accurate inference from limited or fuzzy information" (Cho & Lee, 2006: 114). Thus, it is reasonable to expect high self-efficacy to be associated with greater subjective confidence in one's beliefs. To our knowledge, prior research has not evaluated whether self-efficacy is associated with perceived sanction certainty or ambiguity. For this reason, the final hypotheses that we test are that self-efficacy will be negatively related to both perceived personal arrest risk (Hypothesis 6a) and ambiguity (Hypothesis 6b).

General Method

Overview

We conducted three studies to test our hypotheses, using three separate surveys. These studies purposefully used different measures and methods, to assess the robustness of main findings and strengthen external validity (Murayama, Pekrun, & Fiedler, 2014). The analyses considered the influence of individual attributes on perceptions of others' arrest risk and personal arrest risk, and also spanned a variety of crime types. Study 1 tested hypotheses 1 and 2, Study 2 tested hypotheses 3 through 6, and Study 3 tested all six hypotheses, replicating Studies 1 and 2.

Deterrence theory is commonly tested using convenience samples of college students (e.g., Piquero & Pogarsky, 2002; Pogarsky & Piquero, 2003; Van Gelder & de Vries, 2014). However, online surveys conducted using either opt-in Internet panels or online contract labor portals (i.e., crowdsourcing) have greater external validity than college samples, because they allow for access to a larger and far more diverse pool of potential respondents (Behrend et al., 2011; Berinsky et al., 2012; Buhrmester, Kwang, & Gosling, 2011). There is also evidence that researchers can often obtain multivariate results that are very similar to those that emerge with probability samples of the American public by using nonprobability Internet samples (Ansolabehere & Schaffner, 2014; Brickman Bhutta, 2012). For these reasons, our studies use data from three Internet surveys with national nonprobability samples. All of the surveys were restricted to adult (18 and over) U.S. residents.

Analytic Strategy

We use ordinary least squares regression to estimate the models. Because there is evidence of heteroskedasticity in several of the models, we estimate all of the models using robust standard errors. The models control for respondent demographics and factors that have been identified previously, either theoretically or empirically, as potential predictors of perceived arrest risk and ambiguity (see Apel, 2013; Matsueda et al., 2006; Van Gelder & De Vries, 2014), such as prior offending, prior personal and vicarious experience with arrest, neighborhood disorder, low self-control, media consumption, and demographics. Because of cost limitations, not all of the control variables were measured in all three surveys. Therefore, in each study, we included the controls that were measured in the respective survey. The controls are described in detail in the Appendix. Descriptive statistics for all variables used in the models for each Study are presented in Table A1 of the Appendix.

In the models predicting ambiguity, we also controlled for perceived arrest risk, because prior research indicates that the level of perceived risk is a strong predictor of ambiguity (Pickett et al., 2014). Specifically, there appears to be an inverted U-shaped quadratic relationship between risk perceptions and ambiguity, such that middle-range risk perceptions exhibit the highest levels of ambiguity (Brim, 1955). This U-shaped relationship is not simply a result of the tendency, identified by Fischhoff and Bruine de Bruin (1999), for some respondents to use "50 percent" to indicate "epistemic uncertainty" (see Pickett et al., 2014). In all three studies (see below), the U-shaped relationship persists even after dropping respondents who responded "50 percent" to any of the questions measuring perceived arrest risk.

Study 1

Participants

Study 1 uses data from a survey administered in March 2013 to a randomly drawn sample of opt-in panelists ($N = 926$) from SurveyMonkey's large nonprobability Audience panel. SurveyMonkey goes to great lengths during the panel recruitment, panel maintenance, and survey invitation stages to ensure that high quality data is obtained from the Audience panel (see Brandon, Long, Loraas, Mueller-Phillips, & Vansant, 2014). Several published studies have used Audience samples (e.g., Coleman, 2014; Bregman, Peng, & Chin, 2015; Donnellan, Lucas, & Cesario, 2015). The Audience panel includes several hundred thousand active members, and is thus larger than the populations of most U.S. cities. Because random sampling was used in the survey, the results are generalizable to the Audience panel.

Measures

Study 1 focused on respondents' perceptions of others' arrest risk for street crimes. Two survey items asked respondents to estimate the "percent chance (or chances out of 100) that the police in your local county would be able to catch and arrest a person who" committed burglary ("broke into a stranger's home and stole something") or murder ("attacked and killed a stranger on the street"). Responses to the items were highly correlated ($r = .644$). We thus averaged the responses to measure perceived *Street Crime Arrest Risk* ($\alpha = .781$).

Each question about arrest risk was followed by an item gauging ambiguity in the given risk estimate. Two different methods were used to measure ambiguity, and respondents were randomly assigned to receive one of the two methods. The first method simply involved asking respondents: "How sure are you about this answer?" The response options ranged from 1 = *very sure* to 6 =

very unsure. This method was recommended by Loughran et al. (2011) as "[t]he ideal measure for ambiguity" (p. 1045). It has been used in several previous studies to measure assuredness in risk perceptions (Brim, 1955; Kleitman & Stankov, 2007), and has been validated by Pickett et al. (2014). Responses to the sureness items (r = .801, α = .889) for burglary and murder were averaged to measure ambiguity for street offenses (*Unsure Street Crime*). We asked a second randomly selected group of respondents to report numerical ranges, similar to confidence intervals, around their risk estimates to indicate ambiguity. This method was proposed by Manski (2004), who suggested that wider ranges should indicate greater ambiguity. As with the sureness method, we averaged the reported ranges for burglary and murder (r = .635, α = .777) to measure ambiguity (*Range Street Crime*).

We measured dispositional affect using the short form of Watson, Clark, and Tellegen's (1988) Positive and Negative Affect Schedule (PANAS; Mackinnon et al., 1999). The short PANAS presents respondents with 10 emotions, five positive (inspired, alert, excited, enthusiastic, and determined) and five negative (afraid, upset, nervous, scared, and distressed), and asks them to indicate "to what extent you generally feel this way, that is, how you feel on the average," where 1 = *very slightly or not at all* and 5 = *extremely* (Mackinnon et al., 1999). The responses for the positive and negative emotions loaded on separate factors. We thus averaged across the respective responses to measure *Positive Affect* (α = .788) and *Negative Affect* (α = .838). Consistent with prior research (Mackinnon et al., 1999; Watson, Clark, & Tellegen, 1988), there was a modest negative correlation between the two indices (r = –.174).

Results

Table 1 presents the results for Study 1, which tests our first two hypotheses in the context of sanction perceptions for street crimes. First, in contrast with our expectations, we find no evidence that *Negative Affect* is associated with either perceived arrest risk or ambiguity. As predicted, however, *Positive Affect* is positively associated with perceived arrest risk (b = 4.58, p < .001), and is also negatively associated with ambiguity (b = −0.17, p < .01). The negative relationship between *Positive Affect* and ambiguity is only significant when ambiguity is measured with the sureness questions. Although the total explained variance in the models is modest (adjusted R^2 = .06 to .12), the standardized coefficients show that *Positive Affect* is actually the strongest predictor of perceived arrest risk (Model 1), and is the second strongest predictor of ambiguity, when ambiguity is measured with sureness questions (Model 2). Regardless of how ambiguity is measured, the strongest predictor of ambiguity is the level of perceived arrest risk.

Study 2

Participants

Study 2 draws on data from a second survey administered in August, 2013—roughly five months after the survey for Study 1—to another randomly drawn sample of panelists (N = 878) from SurveyMonkey's Audience panel.

Table 1
Regression Models Predicting Perceived Arrest Risk and Ambiguity for Serious Street Crimes (Study 1)

	Model 1 (full sample) DV = street crime arrest risk			Model 2 (Group A) DV = unsure street crime			Model 3 (Group B) DV = range street crime		
Variable	*b*	95% CI	β	*b*	95% CI	β	*b*	95% CI	β
Dispositional attributes									
Positive affect	4.58***	[2.11, 7.05]	0.13	−0.17**	[−0.29, −0.04]	−0.12	−1.29	[−3.63, 1.05]	−0.06
Negative affect	0.36	[−2.04, 2.77]	0.01	0.07	[−0.07, 0.21]	0.05	1.38	[−0.87, 3.62]	0.06
Perceived arrest risk									
S.C. arrest risk^2	—	—	—	−0.00***	[−0.00, −0.00]	−1.24	−0.01***	[−0.01, −0.00]	−1.01
S.C. arrest risk	—	—	—	0.05***	[0.03, 0.06]	1.15	0.69***	[0.44, 0.95]	1.07
Control variables									
White	5.47*	[0.59, 10.35]	0.08	−0.15	[−0.51, 0.21]	−0.05	2.80	[−0.92, 6.51]	0.06
Female	2.60	[−0.76, 5.96]	0.05	0.06	[−0.12, 0.24]	0.03	−3.69*	[−6.92, −0.46]	−0.12
Age	−0.13*	[−0.24, −0.01]	−0.08	0.00	[−0.00, 0.01]	0.07	−0.10	[−0.22, 0.01]	−0.11
Education	−0.82	[−2.63, 0.98]	−0.03	0.01	[−0.09, 0.10]	0.01	−1.10	[−2.63, 0.43]	−0.07
Income	−1.76**	[−3.09, −0.43]	−0.09	0.07*	[0.00, 0.14]	0.09	0.67	[−0.50, 1.84]	0.06
Neigh. disorder	−5.21***	[−8.29, −2.13]	−0.12	−0.00	[−0.20, 0.19]	−0.00	−0.08	[−2.99, 2.82]	−0.00
Neigh. social change	−3.71**	[−6.16, −1.26]	−0.10	−0.10	[−0.23, 0.03]	−0.07	0.33	[−1.99, 2.66]	0.01
Prior arrest	−4.45	[−9.40, 0.50]	−0.06	−0.12	[−0.39, 0.15]	−0.04	0.41	[−4.10, 4.92]	0.01
Peer arrest	0.10	[−3.32, 3.52]	0.00	−0.04	[−0.22, 0.14]	−0.02	−0.39	[−3.42, 2.65]	−0.01
Local TV news	0.53	[−0.17, 1.23]	0.06	−0.03	[−0.07, 0.01]	−0.08	−0.69*	[−1.29, −0.09]	−0.12
Crime TV	0.39	[−0.46, 1.24]	0.03	−0.00	[−0.05, 0.04]	−0.01	0.48	[−0.17, 1.12]	0.07
Newspaper	0.58	[−0.11, 1.27]	0.07	−0.01	[−0.05, 0.02]	−0.04	0.15	[−0.39, 0.69]	0.03
Adjusted *R*-squared	.06			.12			.08		
N	854			460			394		

Note. b = unstandardized coefficient; β = standardized coefficient; CI = confidence interval; DV = dependent variable; Neigh. = neighborhood; S.C. = street crime.
* p < .05. ** p < .01. *** p < .001 (two-tailed).

Measures

Study 2 focused on respondents' perceptions of their own arrest risk for white collar offending. We provided respondents with separate scenarios describing opportunities to commit three white collar crimes: insider trading, tax fraud, and insurance fraud. There is not a consensus on how to define white collar crime (Simpson, 2013). We use Wheeler and colleagues' (1982, p. 642) definition of white collar crimes as "economic offenses committed through the use of some combination of fraud, deception, or collusion." The exact wording of the scenarios is provided in Table 2. We asked about these three offenses because we believed they would be among the most relevant (e.g., compared to offenses such as price-fixing, or environmental pollution) for the Internet panelists in our sample. For each scenario, we asked respondents to estimate "the percent chance (or chances out of 100)" that they "would get caught by law enforcement" if they decided to commit the respective offense. We averaged across the responses for the three offenses to measure perceived *White Collar Arrest Risk* (α = .780).

Our impression from administering Study 1 was that the sureness items were easier for respondents to answer than the range questions, and yielded less missing data. Therefore, in Study 2, we used only the sureness method. All respondents were asked to indicate how sure they were about their estimate of arrest risk (1 = *very sure*, 6 = *very unsure*). We averaged ambiguity levels across the three white collar offenses (α = .832) to measure global ambiguity for these types of crimes (*Unsure White Collar Crime*).

Study 2 included an index measuring *Intolerance of Ambiguity*. Researchers have developed several different scales to measure ambiguity intolerance, but no consensus has emerged as to which is best (Kirton, 1981; Naemi et al., 2009). Therefore, we combined items from several extant scales. The survey included 10 items measuring ambiguity intolerance. Each of the items was selected either because Kirton (1981) found it to be among the most reliable items in its respective scale, or because it appeared to us to have high face validity. However, a promax-rotated factor analysis revealed that six items loaded on a single factor that accounted for the vast majority of variance. Two of the items (e.g., "I like it when issues are black and white rather than 'shades of gray'") were developed by Naemi et al. (2009), three items (e.g., "A good job is one where what is to be done and how it is to be done are always clear") derived from Budner's (1962) scale, and one item ("I don't like to work on a problem unless there is a possibility of coming out with a clear-cut answer") came from MacDonald's (1970) scale. *Intolerance of Ambiguity* was measured by averaging across the responses (1 = *strongly disagree*, 6 = *strongly agree*) to these six items (α = .756), so that higher scores indicated greater intolerance of ambiguity.

We measured general *Self-Efficacy* using four items (e.g., "I believe I can succeed at most any endeavor to which I set my mind") from Chen and colleagues' (2001) New General Self-Efficacy Scale, which is one of the most widely used and valid *SE* scales (Scherbaum et al., 2006). We averaged across the responses (1 = *strongly disagree*, 6 = *strongly agree*) to the items (α = .854).

Study 2 also included two indices measuring respondents' reasoning styles: *Cognitive Reflection* and thoughtfully reflective decision making (*TRDM*). We measured *Cognitive Reflection* using Frederick's (2005) three-item cognitive reflection test. However, we slightly altered the items because of the possibility that a minority of the Internet panelists may have previously encountered the answers to the original test (see Chandler et al., 2014). For example, in place of the first item in the original test—"A bat and a ball cost $1.10 in total. The bat costs $1.00 more than the ball. How much does the ball cost?"—we asked: "A soda and banana cost $1.80 in total. The soda costs a $1.00 more than the banana. How much does the banana cost in cents?" Chandler et al. (2014:120) provided evidence that this approach helps to reduce the effects of nonnaïveté on test performance. For each item, the correct response was coded "1" and all other responses were coded "0." We then summed the responses for the three items (α = .674). *TRDM* was measured using the same four items that Paternoster and Pogarsky (2009) used to measure the concept (e.g., "When making decisions, you generally use a

Table 2
Scenarios Measuring Perceived Arrest Risk for White Collar Crimes

Insider trading
"Now, please imagine that you have $5,000 that you want to invest in the stock market. Also imagine that one of your close friends is on the board of directors at a large computer company. He tells you that if you invest in the company, he will provide you with the company's financial information before it is released to the public. He estimates that you will double your investment within a year. This practice is illegal and is known as insider trading.
In your best judgment, what is the PERCENT CHANCE (or CHANCES OUT OF 100) that you would get caught by law enforcement if you invest in the company and receive insider information?"
Tax fraud
"Now, please imagine that your close friend is an experienced accountant. He tells you that he knows a way that you can reduce your yearly taxes by about half. He also tells you that you will have to provide false information on your tax forms to do so. This is illegal and is known as tax fraud.
In your best judgment, what is the PERCENT CHANCE (or CHANCES OUT OF 100) that you would get caught by law enforcement if you decided to report false information on your tax forms?"
Insurance fraud
"Now, imagine that you are in a car accident where your car is damaged. Your close friend does auto repair work. He tells you that if you bring your car to him to fix, he will overcharge the insurance company by $2,000, and you two can split that $2,000 to keep for yourselves. This is illegal and is known as insurance fraud.
In your best judgment, what is the PERCENT CHANCE (or CHANCES OUT OF 100) that you would get caught by law enforcement if you decided to take your friend up on his offer and split the $2,000?"

systematic method for judging and comparing alternatives"). We averaged across the responses (1 = *strongly disagree*, 6 = *strongly agree*) to these items (α = .805). Interestingly, there was only a weak nonsignificant correlation (r = .003) between *Cognitive Reflection*, the behavioral measure of respondents' reasoning style, and *TRDM*, their self-reported reasoning style. This is consistent with the findings in a recent study by Kamerdze et al. (2014).

Results

Table 3 presents the results for Study 2. We find partial support for our remaining hypotheses. As predicted, *Intolerance of Ambiguity* is positively related to perceived arrest risk (b = 4.49, p < .001), and is negatively related to ambiguity (b = −0.09, p = .038). Also as predicted, *Cognitive Reflection* is negatively related to perceived arrest risk (b = −4.59, p < .001), and is positively related to ambiguity (b = 0.11, p < .001). In contrast to our hypotheses, we find no evidence that either *Self-Efficacy* or *TRDM* are related to perceived arrest risk, but, consistent with our sixth hypothesis, we find that *Self-Efficacy* is associated in the predicted direction with ambiguity. Specifically, there is a strong negative relationship between general *Self-Efficacy* and ambiguity (b = −0.14, p = .007). *TRDM* is also associated with ambiguity, but the direction of this relationship is negative (b = −0.12, p = .031), which is contrary to our fourth hypothesis. It is also opposite of the direction of the coefficient for *Cognitive Reflection*, the behavioral measure of systematic reasoning. We discuss one possible explanation for this finding below. The standardized coefficients in Models 1 and 2 in Table 3 reveal that the included dispositional attributes are the strongest predictors of perceived arrest risk in Study 2, and are among the strongest predictors of ambiguity. As with Study 1, the strongest predictor of ambiguity in Study 2 is the level of perceived arrest risk.

Study 3

Participants

The survey for Study 3 was conducted in the Fall of 2014 with a sample (N = 496) drawn from Amazon's Mechanical Turk (MTurk). There is considerable prior research demonstrating the strengths of MTurk samples for academic research (Buhrmester et al., 2011; Paolacci & Chandler, 2014; Weinberg, Freese, & McElhattan, 2014), and many studies published in top journals in different fields have used MTurk samples (e.g., Dowling & Wichowsky, 2015; Stern, West, Jost, & Rule, 2014). As with all MTurk surveys, our survey was posted as a human intelligence task to the MTurk website, and respondents were paid a small monetary fee for their participation. Consistent with the best practices in research with MTurk samples, we limited participation to workers with an approval rating of at least 95%, employed both a MTurk qualification and an external Internet protocol address blocker to ensure workers participated in the survey only once, and used a slightly altered version of the cognitive reflection test to minimize the effects of nonnaïveté among participants (Chandler, Mueller, & Paolacci, 2014; Peer, Vosgerau, & Acquisti, 2014).

Measures

Like Study 2, Study 3 also focused on respondents' perceptions of their own arrest risk for white collar offending. We provided

Table 3
Regression Models Predicting Perceived Arrest Risk and Ambiguity for White-Collar Crimes (Study 2)

	Model 1 DV = white collar arrest risk			Model 2 DV = unsure white collar crime		
Variables	*b*	95% CI	β	*b*	95% CI	β
Dispositional attributes						
Intolerance of ambiguity	4.49***	[2.53, 6.45]	0.16	−0.09*	[−0.17, −0.00]	−0.07
Self-efficacy	−0.64	[−2.86, 1.58]	−0.02	−0.14**	[−0.23, −0.04]	−0.10
Cognitive reflection	−4.59***	[−6.23, −2.95]	−0.20	0.11***	[0.05, 0.18]	0.11
TRDM	−0.58	[−3.07, 1.91]	−0.02	−0.12*	[−0.24, −0.01]	−0.08
Perceived arrest risk						
White collar arrest risk^2	—	—	—	−0.00***	[−0.00, −0.00]	−1.17
White collar arrest risk	—	—	—	0.04***	[0.03, 0.05]	0.92
Control variables						
White	−5.40*	[−9.97, −0.83]	−0.08	0.11	[−0.09, 0.30]	0.04
Female	0.55	[−3.02, 4.11]	0.01	0.17*	[0.04, 0.31]	0.08
Age	0.08	[−0.03, 0.19]	0.05	−0.01***	[−0.01, −0.00]	−0.12
Education	−2.47*	[−4.38, −0.55]	−0.09	0.11**	[0.04, 0.19]	0.10
Income	−2.21**	[−3.65, −0.77]	−0.11	−0.03	[−0.08, 0.03]	−0.03
Low self-control	−1.58	[−3.88, 0.71]	−0.05	−0.05	[−0.14, 0.05]	−0.03
Prior offending	−3.85	[−9.12, 1.42]	−0.05	−0.05	[−0.25, 0.15]	−0.01
Prior arrest	−4.14	[−8.54, 0.26]	−0.06	−0.08	[−0.26, 0.11]	−0.03
Peer arrest	0.09	[−3.40, 3.58]	0.00	−0.19**	[−0.33, −0.05]	−0.09
Adjusted R-squared		.16			.25	
N		789			789	

Note. b = unstandardized coefficient; β = standardized coefficient; CI = confidence interval; DV = dependent variable; TRDM = thoughtfully reflective decision making.
* p < .05. ** p < .01. *** p < .001 (two-tailed).

respondents with the same scenarios used in Study 2, and averaged across their responses to construct measures of perceived *White Collar Arrest Risk* ($\alpha = .808$) and ambiguity (*Unsure White Collar Crime,* $\alpha = .840$).

We again measured dispositional affect using the short PANAS. Responses for the positive and negative emotions loaded on separate factors. We thus averaged across the respective responses to measure *Positive Affect* ($\alpha = .818$) and *Negative Affect* ($\alpha = .916$). As in Study 1, there was a modest negative correlation between the indices ($r = -.066$). *Intolerance of Ambiguity* ($\alpha = .795$) was measured using the same six questions from Study 2, and *Self-Efficacy* ($\alpha = .895$) was measured using the same four items from Study 2. The measurement strategy for *Cognitive Reflection* ($\alpha = .727$) and *TRDM* ($\alpha = .808$) also followed that used in Study 2. Again, there was a weak correlation ($r = -.056$) between *Cognitive Reflection* and *TRDM*.

Results

The results for Study 3, which attempts to replicate Studies 1 and 2, are presented in Tables 4 and 5. The relationships between *Positive Affect*, perceived arrest risk, and ambiguity that were observed in Study 1 also emerge in Study 3. The relevant results are shown in Model 1 in Tables 4 and 5. Among the respondents in Study 3, *Positive Affect* is positively associated with perceived arrest risk ($b = 3.33$, $p = .019$), and is negatively associated with ambiguity ($b = -0.22$, $p < .001$). In addition, in Study 3, there is a significant positive association between *Negative Affect* and ambiguity ($b = 0.19$, $p = .003$). This finding is consistent with our second hypothesis. By contrast, in Study 1, although the coefficient for the relationship between *Negative Affect* and ambiguity was also positive for both measures of ambiguity, it was not significant in either case.

Next, we evaluate whether the results from Study 2 are replicated in Study 3. The second models in Tables 4 and 5 present the relevant results for Study 3. The coefficients for the two dispositional attributes—*Intolerance of Ambiguity* and *Cognitive Reflection*—that significantly predicted perceived arrest risk in Study 2 are in the same direction in Study 3, but only one of the two is significant. Specifically, as hypothesized, there is a significant positive relationship between *Intolerance of Ambiguity* and perceived arrest risk ($b = 4.11$, $p = 005$). Similarly, in Model 2 in Table 5, the coefficients for the effects of the four dispositional attributes on ambiguity are all in the same direction as in Study 2, but only two reach conventional thresholds for significance. *Self-Efficacy* is negatively associated with ambiguity ($b = -0.25$, $p < .001$), and *Cognitive Reflection* is positively associated with ambiguity ($b = 0.13$, $p < .01$). Both relationships are consistent with our hypotheses. In this model, the hypothesized negative relationship between *Intolerance of Ambiguity* and ambiguity is only marginally significant ($b = -0.10$, $p = .071$). As noted below, however, this relationship becomes significant in the full model predicting ambiguity for Study 3.

The final models in Tables 4 and 5 are the full models for respondents in Study 3. They include all six dispositional attributes evaluated in Studies 1 and 2. The results show that, as hypothesized, *Intolerance of Ambiguity* is positively related to perceived arrest risk ($b = 3.98$, $p = .008$), and is also negatively related to ambiguity ($b = -0.11$, $p = .033$). Also consistent with our hypotheses, the results for the full model predicting ambiguity in Study 3 show that *Self-Efficacy* is negatively related to ambiguity

Table 4
Regression Models Predicting Perceived Arrest Risk for White-Collar Crimes (Study 3)

	Model 1 DV = white collar arrest risk			Model 2 DV = white collar arrest risk			Model 3 DV = white collar arrest risk		
Variables	*b*	95% CI	β	*b*	95% CI	β	*b*	95% CI	β
Dispositional attributes									
Positive affect	3.33*	[0.56, 6.11]	0.10	—	—	—	2.66	[−0.53, 5.85]	0.08
Negative affect	3.06	[−0.27, 6.38]	0.10	—	—	—	3.22	[−0.42, 6.86]	0.10
Intolerance of ambiguity	—	—	—	4.11**	[1.24, 6.99]	0.14	3.98**	[1.06, 6.89]	0.13
Self-efficacy	—	—	—	1.50	[−1.38, 4.37]	0.05	1.54	[−1.79, 4.87]	0.05
Cognitive reflection	—	—	—	−0.40	[−2.51, 1.72]	−0.02	−0.08	[−2.22, 2.05]	−0.00
TRDM	—	—	—	0.03	[−3.42, 3.48]	0.00	−0.16	[−3.55, 3.22]	−0.00
Control variables									
White	−8.77**	[−14.37,−3.18]	−0.13	−7.88**	[−13.39,−2.38]	−0.12	−8.16**	[−13.65,−2.68]	−0.12
Female	8.68***	[3.95, 13.41]	0.16	8.20***	[3.36, 13.04]	0.16	8.19**	[3.32, 13.05]	0.16
Age	−0.15	[−0.34, 0.04]	−0.08	−0.13	[−0.32, 0.07]	−0.06	−0.13	[−0.33, 0.06]	−0.07
Education	−2.49	[−5.31, 0.33]	−0.08	−2.20	[−5.16, 0.76]	−0.07	−1.91	[−4.88, 1.06]	−0.06
Income	−1.15	[−3.66, 1.36]	−0.05	−0.98	[−3.48, 1.53]	−0.04	−1.16	[−3.66, 1.34]	−0.05
Neigh. disorder	−0.49	[−3.96, 2.98]	−0.01	0.33	[−3.01, 3.66]	0.01	−0.43	[−3.80, 2.93]	−0.01
Neigh. social change	3.19	[−0.53 6.90]	0.08	2.92	[−0.73, 6.57]	0.08	3.24	[−0.44, 6.92]	0.08
Low self-control	0.02	[−3.28, 3.32]	0.00	0.39	[−2.92, 3.69]	0.01	−0.08	[−3.49, 3.32]	−0.00
Prior offending	−7.96*	[−15.22,−0.70]	−0.10	−6.90	[−14.19, 0.38]	−0.09	−7.71*	[−14.86,−0.56]	−0.10
Prior arrest	0.39	[−6.22, 7.01]	0.01	1.34	[−5.41, 8.10]	0.02	0.57	[−6.05, 7.18]	0.01
Peer arrest	−0.32	[−5.17, 4.52]	−0.01	−0.66	[−5.59, 4.26]	−0.01	−0.50	[−5.35, 4.34]	−0.01
Adjusted *R*-squared		.07			.07			.08	
N		478			478			478	

Note. *b* = unstandardized coefficient; β = standardized coefficient; CI = confidence interval; DV = dependent variable; Neigh. = neighborhood; TRDM = thoughtfully reflective decision making.
* $p < .05$. ** $p < .01$. *** $p < .001$ (two-tailed).

Table 5
Regression Models Predicting Ambiguity for White-Collar Crimes (Study 3)

Variables	Model 1 DV = unsure white collar crime			Model 2 DV = unsure white collar crime			Model 3 DV = unsure white collar crime		
	b	95% CI	β	*b*	95% CI	β	*b*	95% CI	β
Dispositional attributes									
Positive affect	−0.22***	[−0.33, −0.10]	−0.17	—	—	—	−0.10	[−0.23, 0.03]	−0.08
Negative affect	0.19**	[0.06, 0.32]	0.16	—	—	—	0.13	[−0.00, 0.26]	0.10
Intolerance of ambiguity	—	—	—	−0.10	[−0.20, 0.01]	−0.08	−0.11*	[−0.22, −0.01]	−0.09
Self-efficacy	—	—	—	−0.25***	[−0.36, −0.14]	−0.22	−0.17*	[−0.31, −0.04]	−0.15
Cognitive reflection	—	—	—	0.13**	[0.05, 0.21]	0.15	0.12**	[0.04, 0.20]	0.14
TRDM	—	—	—	−0.07	[−0.19, 0.06]	−0.05	−0.06	[−0.18, 0.06]	−0.04
Perceived arrest risk									
White collar arrest risk^2	−0.00***	[−0.00, −0.00]	−1.20	−0.00***	[−0.00, −0.00]	−1.19	−0.00***	[−0.00, −0.00]	−1.22
White collar arrest risk	0.04***	[0.02, 0.05]	0.91	0.04***	[0.02, 0.05]	0.93	0.04***	[0.02, 0.05]	0.96
Control variables									
White	0.05	[−0.14, 0.25]	0.02	−0.00	[−0.19, 0.19]	−0.00	−0.01	[−0.20, 0.18]	−0.00
Female	0.20*	[0.03, 0.38]	0.10	0.32***	[0.14, 0.49]	0.15	0.29**	[0.11, 0.47]	0.14
Age	0.01	[−0.00, 0.01]	0.08	0.00	[−0.01, 0.01]	0.02	0.00	[−0.00, 0.01]	0.05
Education	−0.03	[−0.14, 0.07]	−0.03	−0.06	[−0.17, 0.04]	−0.05	−0.07	[−0.17, 0.04]	−0.06
Income	0.04	[−0.05, 0.13]	0.04	0.04	[−0.04, 0.13]	0.04	0.04	[−0.04, 0.13]	0.04
Neighborhood disorder	−0.01	[−0.13, 0.12]	−0.00	0.02	[−0.10, 0.15]	0.02	0.02	[−0.11, 0.14]	0.01
Neighborhood social change	−0.12	[−0.26, 0.02]	−0.08	−0.10	[−0.24, 0.04]	−0.06	−0.11	[−0.25, 0.02]	−0.07
Low self-control	−0.02	[−0.16, 0.11]	−0.02	−0.02	[−0.15, 0.11]	−0.02	−0.05	[−0.18, 0.09]	−0.04
Prior offending	0.09	[−0.18, 0.37]	0.03	0.14	[−0.15, 0.43]	0.04	0.12	[−0.16, 0.40]	0.04
Prior arrest	−0.23*	[−0.46, −0.01]	−0.09	−0.18	[−0.40, 0.03]	−0.07	−0.20	[−0.41, 0.02]	−0.07
Peer arrest	−0.08	[−0.26, 0.09]	−0.04	−0.06	[−0.23, 0.11]	−0.03	−0.07	[−0.24, 0.10]	−0.03
Adjusted *R*-squared	.20			.24			.24		
N	478			478			478		

Note. *b* = unstandardized coefficient; β = standardized coefficient; CI = confidence interval; DV = dependent variable; TRDM = thoughtfully reflective decision making.
* $p < .05$. ** $p < .01$. *** $p < .001$ (two-tailed).

($b = -0.17$, $p = .013$), and *Cognitive Reflection* is positively related to ambiguity ($b = 0.12$, $p = .003$). Finally, the results reveal that the relationships between dispositional affect and both perceived risk and ambiguity that were observed in Study 1, as well as in the earlier models for Study 3, do not emerge in the full models for Study 3, which suggests that dispositional affect influences risk perceptions and ambiguity indirectly. Supplementary analyses provide evidence that this is in fact the case, at least for ambiguity. In Study 3, *Positive Affect* exerts a significant negative indirect effect on ambiguity through both *Self-Efficacy* ($b = -0.08$, 95% CI = −0.14 to −0.02) and *Cognitive Reflection* ($b = -0.03$, 95% CI = −0.07 to −0.01). *Negative Affect* exerts a significant positive indirect effect on ambiguity through *Self-Efficacy* ($b = 0.06$, 95% CI = 0.02 to 0.12). Consistent with the best practices in mediation analyses (Hayes, 2013), we estimate the indirect effects using the product of the coefficients approach and report percentile-based bootstrap ($k = 5{,}000$) confidence intervals. The finding in our study that dispositional emotionality influences self-efficacy beliefs as well as reasoning styles is consistent with prior research (Blanchette & Richards, 2010; Lyubomirsky, King, & Diener, 2005). Finally, additional analyses revealed that when the four dispositional attributes that have nonsignificant effects on perceived arrest in all of the models in Study 3 are excluded from the final model, *Positive Affect* and *Intolerance of Ambiguity* both have sizable and significant positive associations with perceived arrest risk ($b = 3.37$, $p = .017$ and $b = 4.27$, $p = .003$, respectively).

Discussion

Drawing on dual-process models of reasoning, we posited that sanction perceptions often represent intuitive judgments. We theorized that many individuals likely judge the probability of arrest using either the availability heuristic, or by substituting an answer to another easier question for the probability or assuredness question (Breakwell, 2007; Kahneman, 2011). We identified several dispositional attributes that should be correlated with sanction perceptions and ambiguity if our theoretical model is correct. Table 6 summarizes the findings from our analyses. Each of the three studies provided partial support for our hypotheses, and did so in the case of both perceived arrest risk and ambiguity, and regardless of whether respondents' were judging others' arrest risk for street crimes or their own arrest risk for white collar offenses.

When compared across Studies 1 through 3, the findings for the effects of the six dispositional attributes were relatively consistent (see Table 6)—differences in significance levels will inevitably emerge by chance when multiple studies are conducted. We found consistent evidence that positive emotionality and ambiguity intolerance are both positively associated with perceived arrest risk, and are also both negatively correlated with ambiguity in perceived arrest risk, at least when ambiguity is measured with the sureness questions. Likewise, we found consistent evidence that the tendency to have more favorable self-efficacy beliefs is negatively associated with ambiguity, whereas the tendency to use a deliberate and systematic reasoning style (System 2), as

Table 6
Summary of Support for Hypotheses

(Hypothesis number) Dispositional attribute	Supported (yes/mixed/no)			
	Study 1	Study 2	Study 3	Overall
Positive affect				
(1a) Positive affect will increase perceived arrest risk	Yes	—	Yes	Yes
(1b) Positive affect will reduce ambiguity	Mixed	—	Yes[a]	Yes[b]
Negative affect				
(2a) Negative affect will reduce perceived arrest risk	No	—	No	No
(2b) Negative affect will increase ambiguity	No	—	Yes	Mixed
Cognitive reflection				
(3a) Cognitive reflection will reduce perceived arrest risk	—	Yes	No	Mixed
(3b) Cognitive reflection will increase ambiguity	—	Yes	Yes	Yes
Thoughtfully reflective decision making (TRDM)				
(4a) TRDM will reduce perceived arrest risk	—	No	No	No
(4b) TRDM will increase ambiguity	—	No[c]	No	No
Intolerance of ambiguity				
(5a) Ambiguity intolerance will increase perceived arrest risk	—	Yes	Yes	Yes
(5b) Ambiguity intolerance will reduce ambiguity	—	Yes	Yes	Yes
General self-efficacy				
(6a) Self-efficacy will reduce perceived arrest risk	—	No	No	No
(6b) Self-efficacy will reduce ambiguity	—	Yes	Yes	Yes

[a] Indirect effect. [b] The negative relationship between positive affect and ambiguity consistently emerged when ambiguity was measured with the sureness questions. [c] There was a significant effect in the opposite direction.

measured with the cognitive reflection test, is positively associated with ambiguity. Mixed evidence was found that the tendency to use a System 2 style of reasoning, as measured with the cognitive reflection test, is associated with lower perceived arrest risk. We also found mixed evidence that negative emotionality is associated with increased ambiguity, and, interestingly, that self-reported use of thoughtfully reflective decision making is associated with *reduced* ambiguity. There was, however, no evidence that either negative emotionality or thoughtfully reflective decision making are associated with lower perceived arrest risk.

One potential explanation for the lack of association between dispositional negative affect and perceived arrest risk in our analyses may be that certain types of negative emotions (e.g., anger, fear) are more important than general negative affect for understanding sanction perceptions (see, e.g., Bouffard, 2014b; Lerner & Keltner, 2001). Future studies should thus examine whether there are specific types of negative emotionality that exert more theoretically consistent influences on sanction perceptions. Likewise, that cognitive reflection and thoughtfully reflective decision making had opposite effects in our analyses may suggest that the latter is not measuring the use of System 2 reasoning. Recall that the thoughtfully reflective decision making index measures respondents' *perceptions* of their style of reasoning, whereas the cognitive reflection test is a *behavioral* measure of their reasoning style. However, prior research suggests that respondents' perceptions of their reasoning style often do not accurately reflect their true style of reasoning (see Frederick, 2005). Consistent with this literature, we find very weak correlations between cognitive reflection and thoughtfully reflective decision making in Studies 2 and 3 (see also Kamerdze et al., 2014).

Taken together, the findings support the argument that dispositional attributes are important for understanding perceptions of arrest risk as well as ambiguity in such perceptions. Additionally, with the exception of thoughtfully reflective decision making, the findings are all in the direction that would be expected if sanction perceptions represent intuitive judgments, and the dispositional attributes we examined influenced perceived arrest risk and ambiguity through intuitive reasoning processes. In each of the three studies, the included dispositional attributes were among the strongest predictors of both perceived arrest risk and ambiguity, and were more strongly correlated with the outcomes than were any of the experiential variables (e.g., prior offending or arrest) that we examined.

Although the level of explained variance in the models—ranging from 6% to 16% for risk perceptions, and from 8% to 25% for ambiguity—was relatively high in comparison with many prior cross-sectional studies of subjective punishment risk (Apel, 2013, pp. 78–79), it was still modest. Therefore, it would be useful for future studies to explore whether there are additional dispositional attributes, and also perhaps situational influences (e.g., state affect or mood) (see Bouffard, 2014b; Piquero et al., 2011), that are important sources of both perceived arrest risk and ambiguity. Researchers should investigate whether incorporating measures of the desire for control and trait self-confidence in models predicting risk and ambiguity increases explanatory power. There is some evidence that the former may influence sanction perceptions, at least in the case of corporate offenses (Piquero et al., 2005), and that the latter may be associated with ambiguity in risk perceptions about other types of events (Kleitman & Stankov, 2007).

Researchers should also examine whether the inclusion of measures of the Big Five personality traits (see Zelenski & Larsen, 2002) improves explanatory power in models predicting risk perceptions and ambiguity. As noted previously, Van Gelder and De Vries (2012, 2014) have provided some evidence that these broader personality traits, particularly honesty-humility, may help to explain sanction perceptions. Their studies also yielded mixed evidence that HEXACO

emotionality is positively associated with such perceptions. The evidence herein that dispositional positive affect is positively associated with perceived arrest corroborates the relationship they identified, but suggests that positive affect specifically, rather than general emotionality, may exert the larger influence on sanction perceptions. More generally, given our findings, it seems advisable to devote greater empirical attention to the various ways that individual differences in experienced incidental affect, personality types, and reasoning styles may potentially shape sanction perceptions.

There are several noteworthy policy implications if potential offenders intuitively estimate arrest risk. It may be very difficult to influence intuitive sanction perceptions simply by manipulating objective levels of punishment risk (Pickett et al., 2015). Rather, to influence popular perceptions of sanction regimes, it may be necessary to adopt public communication strategies designed specifically to influence System 1 reasoning processes (see Kahneman, 2011). For example, a promising strategy might be to "advertise" arrest risk using emotional exemplars or surprising narratives that demonstrate causal linkages between crime and punishment (see Betsch et al., 2011; Zillmann, 2006). Such an approach, of course, would differ considerably from the present state of affairs. Currently, as Kennedy (2009) observes in his seminal review of the deterrence literature, "legal authorities make next to no effort to inform offenders and potential offenders about penalties and risks" (p. 27).

Another promising approach to deterring intuitive offenders may be to implement policies that increase the visibility in the local environment of symbols of arrest risk (e.g., CCTV cameras, signs or billboards warning about punishment for offending). In particular, increasing the number and visibility of police officers—or "sentinels" (Nagin et al., 2015)—routinely patrolling an area may be especially effective because, theoretically, it should increase both intuitive and reasoned arrest risk perceptions (Nagin, 2013). Potential offenders who estimate arrest risk via System 1 and the availability heuristic should have greater fluency in imagining an arrest, and thus perceive greater risk, if they have recently witnessed police sentinels on patrol. Likewise, in environments patrolled by police sentinels, offenders estimating arrest risk using analytical reasoning (System 2) should also perceive a greater arrest risk, assuming such sentinels do, in fact, increase the objective risk of apprehension in the area.

Policymakers and practitioners may also be able to deter intuitive offenders by implementing programs that impact the dispositional attributes found in this study to be associated with sanction perceptions. Research suggests that although dispositional attributes tend to be relatively stable, they are responsive to experiences with life events (e.g., employment) and are also sensitive to social influence, particularly during young adulthood (Lucas & Donnellan, 2011; Specht, Egloff, & Schmukle, 2011; Vaidya, Gray, Haig, & Watson, 2002). For instance, a growing literature finds that mindfulness-based therapies and loving-kindness mediation can increase positive affect and general self-efficacy (Hofmann, Grossman, & Hinton, 2011; Schutte, 2014; Shahar et al., 2015). We find that positive effect is positively associated with perceived arrest risk, and both positive affect and self-efficacy are negatively correlated with ambiguity (lack of assuredness) in risk perceptions. Thus, to the extent that mindfulness and loving-kindness interventions are effective in fostering positive affect and self-efficacy, our results suggest they may also lead individuals to perceive a higher arrest risk with greater confidence, which in turn should increase crime deterrence. Interventions may be most effective when targeted toward young persons who are not only at a relatively high risk of offending because of their age but also have yet to fully develop their personalities.

Our findings also have important research implications. Assuming that many dispositional sources of sanction perceptions are also independent predictors of offending behavior, researchers testing perceptual deterrence processes would need to control for these dispositional attributes to avoid misspecifying models. As but one example, we find that positive affect is positively associated with perceived arrest risk. There is also evidence from prior research that positive affect has an independent *negative* effect on criminality through other mechanisms (Kamerdze et al., 2014), such as the subjective valuation of criminal outcomes (see Blanchette & Richards, 2010). It is thus possible that in perceptual deterrence studies that do not control for positive affect, omitted variable bias may artificially inflate the magnitude of the negative relationship between perceived arrest risk and offending.

There are several limitations to our studies, which we hope will be addressed in future research. Most notably, all three studies drew on data from nonprobability Internet samples. Internet samples tend to be younger than the general population (Weinberg et al., 2014). Although dispositional attributes, such as emotionality, tend to exhibit considerable (though not perfect) differential stability over time (Watson & Walker, 1996), this stability is less pronounced during periods of the life course (e.g., adolescence and young adulthood) when individuals are developing their personality (Lucas & Donnellan, 2011). Likewise, there is evidence that dispositional factors such as low IQ may interact with arrest experiences to shape sanction perceptions (Thomas et al., 2013). In short, although the sampling methodology we use is stronger than the approach of relying on convenience samples of college students (Behrend et al., 2011; Berinsky et al., 2012), it still leaves open the possibility that the findings may not generalize either to the broader population or to persons with criminal justice experience.

To provide preliminary evidence about whether our findings may vary depending on individuals' age or criminal justice experience, we examined whether age and prior arrest interacted with the included dispositional attributes to influence perceived arrest risk or ambiguity. In total, across Studies 1–3, we tested 52 interaction terms. Because of multiple testing, some "significant" coefficients should be observed simply due to chance. Thus, the critical question is whether the same interaction effect emerges in more than one study. We found no consistent evidence that either age or arrest experience moderated the effects of any of the dispositional attributes on perceived arrest risk or ambiguity. However, one finding does bear mention. In both Studies 2 and 3, there was a significant positive association between intolerance of ambiguity and perceived arrest risk only among persons who had not previously been arrested. However, when tested formally, the interaction was only significant in Study 2. Nonetheless, the evidence suggests that it is plausible that ambiguity intolerance may be most influential for sanction perceptions when individuals lack extensive experience with offending and arrest. A priority for future research, then, should be to attempt to replicate our results using at-risk or offending samples (Apel, 2013). Studies are also needed that examine whether similar findings are observed with representative samples of the general public.

Additionally, given the evidence in Study 1 that positive emotionality is only significantly associated with ambiguity when the latter is measured with sureness questions, future research should explore whether the findings observed in Studies 2 and 3 replicate when ambiguity is measured with the range method. This dovetails with a more general need for researchers to investigate how the measurement of sanction perceptions and ambiguity impacts findings. For example, Slovic (2010) found that respondents' probability judgments about smokers' risk of dying from lung cancer were highly sensitive to question context, shifting by more than 50% depending on whether respondents judged lung cancer risk alone, or in conjunction with the risks of other possible causes of death. To our knowledge, there have not been similar efforts to investigate the effects of question wording and question context in relation to the measurement of sanction perceptions in perceptual deterrence research.

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Appendix

Question Wording and Coding for Control Variables

In all three studies we included controls for respondents race (*White* = 1), gender (*Female* = 1), *Age* in years, *Education*, and *Income*. *Education* was measured as follows: 1 = high school degree or less, 2 = some college, 3 = college degree, and 4 = postgraduate degree. *Income* was measured such that: 1 = $24.9K or less, 2 = $25-49.9K, 3 = $50-99.9K, 4 = $100-149.9K, and 5 = $150+K. In each study, we imputed missing data on the *Income* variable based on respondents' values on the other variables in the analyses.

In Studies 1 and 3 we included a 5-item index (α = .808 and .845) measuring *Neighborhood Disorder*. We asked respondents "How much of a problem is each of the following in your neighborhood: (a) Litter and trash? (b) Graffiti? (c) Run-down houses? (d) Noisy neighbors? (e) Teenagers hanging out on corners?" The response options were: 1 = not a problem, 2 = a small problem, 3 = a problem, 4 = a big problem, and 5 = a very big problem. Very few respondents reported these issues were very big problems. We thus combined the last two response categories, and then averaged across the responses. In both studies, we also included a 4-item index (α = .882 and .905) measuring perceptions about *Neighborhood Social Change.* The survey question asked "In your community, how much has each of the following decreased or increased in the past five years: (a) The sense of belonging among residents? (b) The sense of trust among residents? (c) The sense of right and wrong among residents? (d) The sense of shared responsibility for the community among residents?" The response options included: 1 = decreased greatly, 2 = decreased some, 3 = stayed about the same, 4 = increased some, and 5 = increased greatly. We reversed these response categories so that higher values indicated greater social deterioration, and then averaged across responses to the four items.

In Studies 2 and 3, we included controls for *Prior Offending* and *Low Self-Control.* In both studies, prior offending was measured with the following question: "How many times have you done each of the following in the past 12 months: (a) Snuck out without paying for such things as movies or food? (b) Stolen (or tried to steal) something worth $50 or less? (c) Stolen (or tried to steal) something worth more than $50? (d) Claimed government benefits to which you were not entitled? (e) Cheated on taxes by not reporting or underreporting income?" The original response options ranged from 1 = "none" to 5 = "8+ times." However, because there was a relatively low frequency of offending in both samples, we generated a binary *Prior Offending* variable that simply indicates whether the respondent had done at least one of these five offenses in that past year (1 = yes, 0 = no). In both studies, *Low Self-Control* was a 6-item index (α = .709 and .772) equal to the average across responses (1 = *strongly disagree*, 6 = *strongly agree*) to the following items from the Grasmick et al. (1993) scale: (a) "I often act on the spur of the moment without stopping to think," (b) "I often do whatever brings me pleasure here and now, even at the cost of some distant goal," (c) "I frequently try to avoid projects that I know will be difficult," (d) "I try to look out for myself first, even if it means making things difficult for other people," (e) I lose my temper pretty easily," and (f) "When I'm really angry, other people better stay away from me."

In all three studies, we included binary controls indicating whether respondents have previously been arrested (*Prior Arrest* = 1), and whether they have any close friends or family members who have been arrested (*Peer Arrest* = 1). In Survey 1, these variables were measured with the following two survey questions: (a) "Have you ever been arrested?" (b) "To the best of your knowledge, have any of your family members or close friends ever been arrested?" In Studies 2 and 3, *Peer Arrest* was measured with a slightly different question: "To the best of your knowledge, have any of your family members or close friends ever been arrested for committing a crime?" Studies 2 and 3 also differed from Study 1 in that *Prior Arrest* was measured with the following question: "In your lifetime, how many different times have you been arrested by a police officer?" where 0 = none, 1 = once, 2 = 2-3 times, 3 = 4-5 times, 4 = 6-7 times, and 5= 8+ times. We recoded these responses to generate a binary measure coded "1" if the respondent had previously been arrested, and coded "0" if not.

(*Appendix continues*)

Table A1
Descriptive Statistics for Variables Used in Studies 1 Through 3

Variables	Study 1		Study 2		Study 3	
	Mean	*SD*	Mean	*SD*	Mean	*SD*
Dependent variables						
Street crime arrest risk	54.31	24.44	—	—	—	—
Unsure street crime[a]	2.69	0.99	—	—	—	—
Range street crime[a]	19.40	15.59	—	—	—	—
White collar arrest risk	—	—	50.81	26.54	49.59	26.34
Unsure white collar crime	—	—	2.90	1.13	2.90	1.05
Independent variables						
Positive affect	3.39	0.69	—	—	3.02	0.82
Negative affect	1.85	0.72	—	—	1.69	0.85
Intolerance of ambiguity	—	—	3.76	0.93	4.05	0.86
Self-efficacy	—	—	4.60	0.88	4.45	0.92
Cognitive reflection	—	—	1.25	1.15	1.28	1.19
TRDM	—	—	4.78	0.77	4.71	0.74
Control variables						
White	0.85	0.35	0.80	0.40	0.81	0.39
Female	0.53	0.50	0.52	0.50	0.58	0.49
Age	49.56	15.79	46.54	16.18	37.72	13.19
Education	2.81	0.99	2.80	0.96	2.62	0.87
Income	2.92	1.30	2.86	1.28	2.21	1.03
Neighborhood disorder	1.48	0.56	—	—	1.75	0.72
Neighborhood social change	3.10	0.67	—	—	3.12	0.67
Low self-control	—	—	2.55	0.78	2.72	0.87
Prior offending	—	—	0.12	0.32	0.12	0.33
Prior arrest	0.15	0.35	0.21	0.40	0.18	0.38
Peer arrest	0.49	0.50	0.47	0.50	0.42	0.49
Local TV news	3.13	2.65	—	—	—	—
Crime TV	1.82	2.13	—	—	—	—
Newspaper	2.64	2.75	—	—	—	—
N	926		878		496	

[a] Respondents in Study 1 were randomly assigned to receive either the sureness questions (Group 1, $N = 492$) or the range questions (Group 2, $N = 434$).

Finally, because prior research indicates that media consumption may influence sanction perceptions (Pickett et al., 2015), in Study 1, we controlled for respondents' consumption of three different types of media content: *Local TV News, Crime TV*, and *Newspaper*. The variables were measured with a question that asked: "In a typical WEEK, on how many days do you do each of the following: (a) Watch local television news? (b) Read a newspaper? (c) Watch crime programs like COPS, CSI, and Law and Order?" The response categories ranged from 0 = 0 days to 7 = 7 days.

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