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A Threat to Valid Guilty Pleas: The Impact of Guilt Status, Acute Stress, and Plea Knowledge on Plea-Bargaining Decisions

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Abstract

The most common route through the US criminal justice system is through plea-bargaining, with over 95% of criminal cases ending in a guilty plea. Previous studies have found different factors (e.g., plea discounts; Wilford et al., 2021) that can increase the likelihood of a false guilty plea. This study aimed to further investigate the effect of guilt status on plea decisions, but also to see how guilt may work alongside acute stress and pre-existing knowledge of the plea process to drive plea-bargaining decisions. Participants (N = 188) were assigned to complete either a stressful or a non-stressful version of the Trier Social Stress Task (Kirschbaum et al., 1993), then were asked to complete a virtual plea-bargaining simulation that assigned participants to assume the role of either a guilty or an innocent defendant. Each participant answered questions relating to their plea decision and how voluntary they found their decision to be. Overall, plea decisions were driven by guilt status and plea knowledge, with guilty participants, and innocent participants with less knowledge being more likely to accept guilty pleas, but not acute stress. Likewise, innocent participants viewed their decision as being less voluntary than guilty participants. This study can add to the existing literature on plea-bargaining by providing evidence for legal concerns surrounding the validity of guilty pleas.

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A Threat to Valid Guilty Pleas: The Impact of Guilt Status, Acute Stress, and Plea Knowledge on Plea-Bargaining Decisions

Plea bargaining is exceptionally common within the criminal adjudication process, with over 95% of convictions arising from guilty pleas (Redlich et al., 2017). Originally, plea bargaining was created to conserve resources in the justice system and free up space on court dockets (See Redlich et al., 2017, for a review). To incentivize guilty pleas, prosecutors began offering discounted plea deals, which would reduce a sentence or charge if a defendant agreed to accept a plea deal instead of going to trial (Redlich et al., 2017). This plea discount is meant to serve as a mutually beneficial agreement between the defense (who will receive a lighter punishment) and the prosecution (who will conserve resources by going to trial).

However, not all people who accept pleas committed the crime; innocent people also accept pleas, thus admitting guilt and accepting punishment for a crime they did not commit. According to the National Registry of Exonerations (2022), 22% of those exonerated since 1989 had originally entered a guilty plea, despite not having actually committed the crime. Though it is impossible to know just how many innocent defendants plead guilty in the real world, there is reason to suspect that the number of exonerations after a guilty plea (i.e., the number of false guilty pleas that we are aware of) is a massive underestimation of the true number of false guilty pleas (Blume & Helm, 2014). This is referred to as plea bargaining's innocence problem, wherein the system designed to incentivize guilty pleas will consequently incentivize false guilty pleas as well (Covey, 2009).

The aim of this study is to examine the impact of guilt on plea decisions in addition to two understudied factors that have potential to influence plea bargaining decisions: acute stress and plea-bargaining knowledge. I start by reviewing the current legal standard for a valid guilty

plea, focusing on aspects of this standard that have been questioned by scholars. After this, I provide an overview of the existing psychological literature that speaks on the impact of stress on decision-making broadly and discuss how it can be applied to plea-bargaining. Next, I describe the current study that directly tested the impact of guilt status and stress on plea decisions and will conclude with a discussion of the results and future directions.

Legal Standard for a Valid Plea Bargain

Brady v United States (1969) established that to be valid, a defendant's guilty plea must meet three requirements: 1) knowing and intelligent; 2) voluntary; and 3) competent. The court must confirm that a plea meets all these requirements, as well as confirm a factual basis of the guilty plea before it is valid (Fed. R. Crim. P. 11(b)(2)). This standard might appear to protect defendants on its face; however, in practice there is great concern that the standard has been loosely construed (Reed et al., 2022). In practice, many plea bargains are admitted even when the defendant does not appear to fully understand their rights (Redlich & Summers, 2012). Or, when the defendant is innocent, which calls into question the factual basis of the plea.

The present section will focus on the concerns with the knowing/intelligent and voluntary standards, as those will be the focus of the present study. There are also concerns that the competence standard is too low (Reed et al., 2022); however, competence refers to a defendant's ability to consult with their attorney *(Godinez v. Moran,* 1993*).* Ultimately, competence concerns are primarily based in clinical psychology (e.g., Zapf & Roesch, 2000) and will therefore not be highlighted in this paper.

Knowing and Intelligent

The first requirement for a valid plea under *Brady* is that the plea must be knowing and intelligent. To meet this standard, a defendant seeking to enter a guilty plea must be "fully aware of the direct consequences" of pleading guilty (pg. 397). The Court did not define "fully aware" or "direct consequences" (*Brady v. United States,* 1970), and interpretation of these terms has been left to lower courts. Because of this, many states have developed their own procedure for guilty plea hearings, but as noted by McDonald (1987), these procedures vary widely, resulting in states having different standards for valid guilty pleas. This is further evidenced by Redlich and colleagues (2022) who coded plea hearings in juvenile and criminal courts in Virginia. They found that plea hearings are very unstandardized: they only last about 13 minutes on average for adults, the line of questioning to determine the validity can be very shallow, and the practice is not standardized at all across courts (Redlich et al., 2022).

Though states are given a lot of freedom to create their own plea hearing process, the Federal Rule of Criminal Procedure offers guidelines for what should be addressed before a defendant pleads guilty. Legally, in federal cases and in many states, the court must inform a defendant of 15 specific aspects of pleading guilty and confirm that the defendant understands each aspect before a plea is considered legally valid (Federal Rule of Criminal Procedure 11(b)(1)). Some of these elements include the rights the defendant is waiving, the nature of the charges, any minimum or maximum sentences for the charges, and any other direct consequences of pleading guilty they may face.

Although the court is required to inform the defendant of specific factors, the Supreme Court has determined that defendants need not *understand* everything about their guilty plea for it to be considered valid (e.g., *Bradshaw v Stumpf, 2005*). The Court has held that a plea is

knowing and intelligent if the defendant is aware of 1) the charges and 2) the possible maximum sentence they are facing at trial (*US v Guerra*, 1964). This standard has further been reduced over time to requiring that the defendant merely be aware of the charges against them (*Bousley v US,* 1998), but need not fully comprehend these charges (*Bradshaw v Stumpf*, 2005). For example, in a criminal case, the prosecution must prove that a crime occurred (*actus reus*) and that the defendant had the necessary criminal intent (*mens rea;* Legal Information Institute, 2020). In *Bradshaw* (2005), the defendant accepted a plea even though he did not understand that the prosecution had to prove mens rea. Although intent was a crucial element of the charge and the defendant did not understand it, the plea was nevertheless held to be valid.

Not only has the knowing and intelligent standard been watered-down to only require the defendant have a basic awareness of the charges against them, but courts often rely on a defendant's self-reported level of knowledge to make such assessments (Redlich & Summers, 2012). In most courts, "knowing" is established by asking the defendant "do you understand the charges against you?" without asking any further specific questions or ensuring the defendant actually understands. Previous research in metacognition suggests that, in general, people do not have a good understanding of what they do or do not know (Schultze & Stabell, 2004), so this self-reported knowledge of the plea process is likely not a good indicator of actual knowledge. In fact, a study from Redlich & Summers (2012) which interviewed people who had previously plead guilty found that most of their sample (87%) indicated that they understood the plea process well. However, when tested on their actual knowledge of plea bargaining, most scored below 60% and none scored higher than 75% (Redlich & Summers, 2012). So, defendants might indicate that they understand the charges without actual understanding. Thus, in practice, in most cases defendants only need to affirm that they were told of the charges and possible maximum

sentence for a plea to be considered knowing and intelligent; no actual understanding is required (Redlich & Summers, 2012; Reed et al., 2022).

Additionally, there are many consequences of pleading guilty about which the court is not required to inform the defendant. Research indicates that defendants may waive up to 42 unique rights (Redlich & Bonventre, 2015). However, defendants often do not realize many of the rights they are waiving. For example, a study from Reed and colleagues (2022) interviewed people who had been offered a plea bargain. Responses indicated that defendants are often aware of some of the major rights they are waiving (e.g., the right to a trial), but are unaware of other very important waived rights (e.g., the right to appeal). Moreover, in the aforementioned study from Redlich et al. (2022), though most judges asked defendants to confirm that they understood they were waiving their right to a trial and to appeal (95% and 86%, respectively), they did not consistently ask defendants if they understood many of the other rights they are waiving, like the right to force the state to prove their case beyond a reasonable doubt (only 1%). This is not to mention the meaningful indirect consequences (i.e., "collateral consequences") of pleading guilty that defendants could face, like loss of custody, loss of eligibility for public housing or federal loans, restrictions on employment, and loss voting rights, which the court is not required to inform defendants of (Redlich et al., 2017).

Thus, there are many major rights and other consequences that most defendants are unaware they are relinquishing when accepting a plea offer. Moreover, actual defendants have reported that they would have opted to go to trial if they had fully understood all consequences (Reed et al., 2022). This all suggests that the Court has set a problematically low bar for what is considered a "knowing and intelligent" plea.

Voluntary

Brady (1969) established that valid pleas must be voluntary, a term that was later defined in *McCarthy v. United States* (1969). According to the *McCarthy* definition, voluntary means an "intentional relinquishment of constitutional rights" (pg. 394, citing *Johnson v. Zerbst,* 1938). The Federal Rules of Criminal Procedure also require defendants to affirm to a judge that their plea is voluntary and "did not result from force, threats, or promises (other than the promises in a plea agreement)" (Federal Rule of Criminal Procedure 11(b)(2)). Despite these protections, legal precedent also indicates the standard for a "voluntary" plea is very low.

Legally, the standard prohibits misrepresentation of the plea offer, use of actual or threatened harm, and mental coercion. (*Brady v. United States*). Yet, most pleas have been found to be voluntary as long as a defendant is physically able to reject the offer (*United States v. Farris,* 2004; *Bordenkircher v. Hayes,* 1978; see Reed et al., 2022 for more cases). As with "knowing and intelligent," voluntariness is often tested through defendant affirmation (Redlich & Summers, 2012). Redlich & Summers (2012) found that the vast majority of their sample of previous pleaders (97%) had affirmed their voluntariness in court.

Nevertheless, evidence suggests that defendants often feel substantial pressure to accept a plea, stemming from many internal and external sources. For example, many people who have accepted plea bargains indicated that pre-trial detainment (either because they were denied bail or were unable to pay) would have severe negative consequences, such as losing custodial rights of their children, losing housing, or losing jobs/wages (Reed et al., 2022). These individuals expressed that they felt as if they had no other alternative because the consequences of being imprisoned awaiting their day in court were substantial. And these pressures might

disproportionally impact defendants of lower socioeconomic status who struggle to make bail (Reed et al., 2022).

Another potential pressure on defendants is the inherent risk in going to trial. Plea decisions are often conceptualized as the choice between a risky option (trial, where the outcome is unknown) and a certain option (the plea offer, which typically is presented in plea research as a guaranteed outcome; Helm et al., 2018). Defendants should be aware of the range of outcomes, from being released without punishment (if acquitted) to possibly the specified maximum (if convicted), or something in between. But the likelihood of conviction is often either entirely unknown or overexaggerated to defendants by the prosecution (Wilford et al., 2019). On the other hand, pleas offer certain outcomes. The offer contains a specific punishment for which there is no gamble (but they also lose the possibility of facing no punishment, as they might if they are acquitted at trial). Consequently, in order to make the certain outcome more attractive, prosecutors often offer a plea discount (or trial penalty), whereby the defendant is offered a reduction in sentence for accepting the plea compared to what is possible or likely at trial (Redlich et al., 2017).

The practice of plea discounting was designed to incentivize guilty pleas (Redlich et al., 2017). Plea discounting is not inherently coercive and can benefit both parties – the prosecutors close cases using fewer resources, while the defendants get a more lenient sentence than they might at trial. However, there are two primary situations in which plea discounts might appear to be more coercive. The first is overcharging, in which prosecutors charge the defendant with more extreme charges (either in consequence or in number) than they can actually prove at trial for the purpose of getting a defendant to plea to a lower charge (Caldwell, 2011). In this case, there is concern that the defendants are not actually receiving a plea discount compared to what the

punishment would be at trial based on evidence. Yet, they feel pressure to accept the plea due to the daunting charges that are not supported by evidence. Courts have found that this practice is acceptable (*Bordenkircher v. Hayes,* 1978).

Secondly, there are concerns if the trial penalty is so extreme that a defendant feels pressure to accept the plea (Caldwell, 2011). A main example of this is when a defendant is facing the death penalty at trial and accepting a plea would remove the possibility of death (but usually carries a life sentence). The Court has held that pleas accepted under these circumstances are also valid (*Brady v. United States*, 1969). Thus, there are concerns that the current plea-bargaining standard might allow extreme plea discounts/trial penalties that psychologically challenge the idea of voluntariness (Redlich & Summers, 2012).

Psychological Stressors and Plea Bargaining

Legal precedence on plea bargaining has established that the standard for a valid guilty plea is very low. Because of this, psycholegal researchers have often focused on two types of pleas: false guilty pleas, when a factually innocent defendant pleads guilty (e.g., Wilford et al., 2021), and true guilty pleas that are accepted without being truly knowing or voluntary (e.g., Redlich & Summers, 2012). Scholars have previously focused on several psychological factors that may influence plea bargaining decisions (e.g., processing style; Helm & Reyna, 2017), but no research has been done to assess the impact of stress on plea decisions.

There are many factors that may increase a defendant's stress level during plea bargaining (e.g., time pressure, discussed below), and considering the effect of stress on plea decisions when developing studies may be important, as external validity is a common criticism of empirical plea research (e.g., Edkins & Dervan, 2013). This section provides a theoretical background for risky decision-making through prospect theory (Tversky & Kahneman, 1979),

reviews the existing literature on the impact of guilt in plea decisions, and concludes with discussion of relevant psychological research that can help predict the effect of stress in plea-bargaining decisions.

Risk and Decision-Making

As discussed above, plea-bargaining broadly involves choosing between a risky option and a certain option (Helm et al., 2018). Oftentimes, risky decision-making is viewed through the lens of framing, where certain options and risky options are framed so as to focus on either the gains or losses associated with the options (e.g., Tversky & Kahneman, 1981). Framing a risky decision as a gain typically results in a different decision than the same decision framed as a loss (Tversky & Kahneman, 1981). The findings have become to be known as "traditional framing effects;" people are more risk-seeking when problems are framed as losses, but more risk-averse when problems are framed as gains.

In addition to accounting for how a plea deal may be presented (i.e., framed) to a defendant in studying their propensity for risk, it may be important to consider how an individual defendant's perspective of a plea deal may impact their decision. For this, I turn to prospect theory (Kahneman & Tversky, 1979), which could better account for a defendant's unique point of view in the plea-bargain decision-making process.

Prospect Theory

Although prospect theory has typically been used to describe economic decision-making, scholars have proposed that it can help explain decision-making in a plea-bargaining context as well (Wilford et al., 2019). Classic framing studies present problems as either a gain or a loss, prospect theory recognizes that in real-life decisions rely on our perception of an outcome as a gain or a loss (Wilford et al., 2019). Prospect theory utilizes reference points to describe how

one's perception of their current status impacts the way they make decisions (Tvsersky & Kahneman, 1992). For example, if one perceives their outcome as a gain, they will be more likely to be risk-averse; however, if they view the outcome as a loss, they will be more risk-seeking, in an attempt to avoid a loss. Additionally, prospect theory posits that losses and gains do not hold equal weight to the decision-maker: As explained by Wilford et al (2019), a $20 loss is associated with a stronger negative reaction than a $20 gain is with a positive reaction. As humans, we are averse to any possible loss, and tend to make decisions that will help us avoid perceived losses (Wilford et al., 2019).

For example, prospect theory would predict a factually guilty defendant will be more likely to see a plea deal as a gain, because they are receiving a discount on their expected outcome at trial and would therefore be more risk-averse and accept the plea deal. On the other hand, a factually innocent defendant would view a plea deal as an inherent loss, because it would be a guaranteed penalty when they feel they do not deserve any such punishment. In this case, prospect theory would predict that a factually innocent defendant would be more risk-seeking to avoid the loss associated with a plea deal and would reject the plea deal (Wilford et al., 2019).

Guilt

Findings from laboratory studies reflect what we already know about plea-bargaining in the real world: some innocent defendants will plead guilty (e.g., Tor et al., 2010). In an ideal world, this number would be zero: Ideally, the system would not be able to convict a factually innocent defendant, and they would not feel incentivized to accept a guilty plea. However, because the world is not ideal, and plea bargaining still has an 'innocence problem' (Covey, 2009), it is important to establish how a defendant's guilt status may impact their decision to plead guilty, and what factors may increase the presence of false guilty pleas. Given the concern

with punishing innocent people, much of the research on plea bargaining has focused on reducing the likelihood of false guilty pleas by innocent defendants.

Across many laboratory studies, scholars have found that a defendant's (participant's) guilt status will almost always lead to the same result: Guilty defendants can be expected to plead guilty more often than innocent defendants (e.g., Hellgren, 2021; Tor et al., 2010; Wilford et al., 2021). However, the important part of these findings is that much like in the real world, although guilty defendants will plead guilty more often, there is always a percentage of innocent defendants that accept guilty pleas. Some external factors can provide even greater incentive for defendants to plead guilty regardless of factual guilt, like being detained pre-trial (Sacks & Ackerman, 2014), the threat of COVID-19 spreading in pre-trial detention (Wilford et al., 2021), or the discounted sentence offered by a plea deal (Wilford et al., 2021). This is consistent with meta-analytic findings in a related realm of research, confessions, which has shown that false confessions tend to be driven by external, rather than internal factors (Houston et al., 2014).

As mentioned above, prospect theory can help explain why studies almost always find guilty pleas more often from factually guilty participants than innocent participants – their frame of reference (gain vs. loss) is different. However, prospect theory cannot explain why some innocent participants plead guilty or why some guilty participants reject a plea deal. For this, we can turn to a potential psychological mechanism that can drive these kinds of plea decisions: stress.

Stress

There are many sources of stress that might be present during plea bargaining. However, one major source of stress in the plea-bargaining process is time pressure. Psychologically speaking, time pressure has been shown to cause stress in individuals and can have a significant

impact on decision-making (See Edland & Svenson, 1993, for a review). Time pressure has been shown to increase stress and arousal in individuals; most studies of time pressure and decision-making start with the assumption that time pressure will lead to arousal (Edland & Svenson, 1993; Maule & Hockey, 1993). In plea bargaining, defendants will often face significant time pressure to make a plea decision primarily from two sources: 1) the limited time defendants have to meet with their defense attorney and discuss their options, which can be a few days or even a few hours for some defendants (Redlich et al., 2017); and 2) prosecutor-imposed deadlines, which often allow only a narrow window of time for a defendant to accept a plea offer before the offer is taken off the table entirely, or otherwise replaced with a harsher offer (i.e., an "exploding offer"; Petersen, 2020). Additionally, some defendants may feel additional pressure to plead guilty quickly to avoid negative consequences with going to trial, like the high monetary cost (e.g., bail, attorney fees, possible fines) or the high personal cost (e.g., loss of wages, employment, or childcare; Reed et al., 2022).

Existing psychological research on plea bargaining has shown that the time pressure put onto defendants to plead can negatively impact how they process a plea deal. For example, a study from Daftary-Kapur & Zottoli (2014) found that juveniles who accepted pleas in criminal court displayed very low understanding of the plea process, and many had difficulty fully appreciating the long-term consequences of their decision. Many of the juveniles were drawn more to the short-term benefits of accepting a plea deal (e.g., getting released from jail that day) without considering the potential long-term consequences of doing so (e.g., having to report a felony record on job applications; Daftary-Kapur & Zottoli, 2014).

Although these effects have only been directly studied in juveniles, the findings are congruent with the literature on stress and temporal discounting in adults: under stress, people

tend to prefer an immediate option than the potential for a better outcome in the future (though this may be dependent on the way the options are framed; Haushofer et al., 2021). Additionally, when dealing with potential gains or losses of time (as opposed to money), people can exhibit even more preference towards the immediate option, an effect known as temporal discounting (Abdellaoui et al., 2018). Extended from an economic to a legal context, we'd expect that defendants would prefer the immediate resolution of a plea deal to the unknown future resolution (possibly better, possibly worse) of going to trial. Thus, it is important to understand how stress impacts plea decisions. The present project experimentally examined the role of stress on plea decisions.

Stress and Risky Decision-Making

Stress has been shown to hinder one's ability to make careful, well-thought-out decisions. Specifically, prior research suggests that stress leads to a greater reliance on heuristics, or mental shortcuts, to reach a decision (e.g., Finucane et al., 2000). Heuristic-based decisions are shallower and tend to rely more on emotional reasoning than logical reasoning (Starcke & Brand, 2012), as the emotions tied to one's situation can serve as a proxy for one's personal values (Pham, 2004). This way, heuristics make it possible to make a quick and efficient decision that aligns with one's values as much as possible.

However, relying on heuristics for decision-making is not always beneficial; prior research has shown that heuristic decision-making can lead a person to improperly appraise the risk and benefits of a situation, which could lead to a different decision than they would have otherwise made (Alhakami & Slovic, 1994). Additionally, because stress has been shown to increase the use of heuristics in decision-making (e.g., Porcelli & Delgado, 2009), one can expect problems arising from heuristic-based decisions to be more prevalent under stress. Prior

literature on the reliance on heuristics in decision-making can help explain *why* decision-making may be impaired under stress (i.e., can exacerbate framing effects and heuristic-based decisions; Porcelli & Delgado, 2009). However, to better understand *how* stress can impact one's decisions, I will turn instead to the body of research on the impact of stress on decisions framed by prospect theory.

Because plea decisions can be best conceptualized through the lens of framing (loss vs. gain; Helm et al., 2018), the existing literature on the impact of stress on risky decision-making in prospect theory can provide some insight into how decision-making may be impacted by stress. However, there is not one definitive answer for how exactly stress can impact risky decision-making. For example, in time pressure-induced stress, some studies suggest that stress will lead to an overall decrease in risk-taking, regardless of whether the outcome is seen as a gain or a loss (Lighthall et al., 2009). However, other theories would suggest that stress would increase risk-taking for gain decisions but decrease risk-taking in loss decisions (Porcelli & Delgado, 2009). It is also possible that the reality lies in a mix of those two theories: In a series of studies from Young et al. (2012), the researchers found that time pressure-induced stress did increase risk-taking when the outcome was viewed as a gain but did not impact risk-taking when the outcome was viewed as a loss.

Extended to a plea-bargaining context, these findings would suggest that stress would have the largest impact on guilty defendants. If the results from Young et al. (2012) were applied in a plea context, we would anticipate that, under stress, guilty defendants will become more risk-seeking, and would more often reject the plea deal, whereas innocent defendants' decisions would not be impacted by stress and would remain strongly loss averse (i.e., reject the plea deal) regardless.

However, not all studies of stress in risky decision-making have found these results. For example, Pabst et al. (2013) found that stress had no impact on the frequency of risky decision-making in the gain frame, but significantly decreased risk-taking in the loss frame. This is in direct contrast to the studies above, as this study would predict that decisions from guilty defendants would not be impacted by stress, but that innocent defendants would become more risk-averse under stress and would choose to accept plea deals more often. These findings also fall more in line with the general concern of plea bargaining's innocence problem: It is possible that stress is one of the factors that leads more innocent defendants to accept guilty pleas.

Inducing Stress in a Laboratory Setting

Although time pressure is likely a very common stressor in plea decisions, it is not the only source of stress, nor is it the only way to induce stress in a laboratory setting. Though time constraint can serve as a stressor in some laboratory experiments, researchers have developed better ways to induce moderate, acute stress to mimic the physical and cognitive effects of stress more consistently in decision-making.

Some methodologies use physical stressors to evoke a stress response in participants, like the Cold Pressor Test (CPT; e.g., Mitchell et al., 2004), where participants are asked to keep their hand submerged in ice water until it is too uncomfortable to continue doing so. More dated methodologies utilize the mere threat of physical harm, like the threat of an electric shock, to induce stress without harm ever occurring (Keinan, 1987), though this is not commonly used today.

Although many options involve physical stressors, others induce stress through social stressors. One widely (and currently) used social stressor method is the Trier Social Stress Test (TSST; Kirschbaum et al., 1993), in which participants are asked to perform a task under social

scrutiny. For example, one version of the TSST asks participants to speak about themselves while a panel of emotionally disengaged evaluators wearing lab coats takes notes (e.g., van den Bos et al., 2009). Other versions ask participants to perform cognitive tasks, like complex arithmetic (e.g., Villada et al., 2014), aloud for a group of experimenters, in addition to a speech task. The TSST has been tested and validated in adult (Shields & Slavich, 2017) and adolescent (Seddon et al., 2020) samples, and has shown to increase both self-report and physiological measures of stress similar to differences in real-world acute stress (Henze et al., 2017). While the effect of the TSST can vary from person to person (Shields & Slavich, 2017), the effects seem to be robust in nature: a 2004 meta-analysis of the tasks involved in the TSST found the largest effect on physiological stress responses (i.e., increased cortisol levels) from studies that utilized both a cognitive and a speech task (Cohen's d = .87; Dickerson & Kemeny, 2004). Additionally, Henze et al. (2017) found that in addition to the physiological measurements, the TSST had a sizeable effect (η^2 = .44) on negative affect reported by the Positive and Negative Affect Scale (PANAS; Watson & Clark, 1994). Overall, the TSST has been found to be a robust way to induce stress in a laboratory setting.

The Present Study

Plea bargaining is a stressful process that requires defendants to make important, risky decisions. Although psychological research indicates that stress can impact the ability to evaluate risky decisions (e.g., Alhakami & Slovic, 1994), psycholegal research has yet to examine the role of stress on plea decisions. The goal of this study was to determine whether moderate, acute stress, along with a defendant's guilt status and pre-existing knowledge of the plea-bargaining process, can impact their overall decision to plead guilty. Additionally, this study examined the

impact of these same variables on the legal requirements for a valid guilty plea (i.e., knowledge and voluntariness).

Hypotheses

Based on the prior research and legal standard of plea bargaining, I had hypotheses about the role of guilt and stress in three areas: the overall plea decision, knowledge of the offer, and perceptions of voluntariness. These hypotheses were pre-registered on the Open Science Framework at https://osf.io/d32rf.

Hypothesis 1: Plea Decisions

Guilt. Based on the prior literature on plea bargaining (e.g., Tor et al., 2010) and prospect theory (Kahneman & Tversky, 1979), I anticipated a main effect of guilt, such that factually guilty participants would plead guilty more often than factually innocent participants (*Hypothesis 1a*).

Stress. Previous research on plea bargaining in juveniles has shown that time constraint on plea decisions can lead juveniles to focus on the short-term benefits of pleading guilty, and consequently can increase guilty pleas. Though this study only examined juvenile plea decisions, previous studies from Redlich & Summers (2012) and Reed et al. (2022) indicate that many adult defendants who plead guilty also do so because of the short-term benefits (e.g., being released from jail). Because of this, I anticipated a main effect of stress on plea decisions, such that stressed participants would plead guilty more often than non-stressed participants (*Hypothesis 1b*).

Guilt and stress. Because prior literature has produced different findings on the impact of stress on risky decision-making, I present competing hypotheses about the interaction between guilt and stress:

Based on the findings from Young et al. (2012), I predict that stress would cause participants in the guilty condition to become more risk-seeking but will not impact the risk-seeking of innocent participants. Therefore, I anticipated a two-way interaction of guilt and stress, such that among guilty participants, those that are stressed will reject the plea deal more often than those that are not stressed (*Hypothesis 1c*).

Alternatively, based on the findings from Pabst et al. (2013), I predict that stress would cause innocent participants to become more risk-averse under stress, but would not impact the risk-seeking of guilty participants. Therefore, I anticipated a two-way interaction of guilt and stress, such that among innocent participants, those that are stressed will accept the plea deal more often than those that are not stressed (*Hypothesis 1d*).

Legal Knowledge. Because interviews with defendants who have previously plead guilty have shown that many of those who accept guilty pleas exhibit very low legal knowledge (e.g., Redlich & Summers, 2012), I predicted a main effect of legal knowledge, such that participants who exhibited lower legal knowledge would plead guilty more often than participants with higher legal knowledge (*Hypothesis 1e*). Additionally, if a significant main effect of legal knowledge on plea decisions is found, I anticipated that legal knowledge would mediate the relationship between guilt status, stress, and plea decisions (*Hypothesis 1f*).

Guilt and Legal Knowledge. Additionally, I predicted that legal knowledge would have a differential impact on guilty and innocent participants (*Hypothesis 1g; not pre-registered*). As a guilty defendant will be more likely to find a plea deal appealing regardless of the situation, they

may not be as subject to differential effects of plea knowledge. However, innocent defendants who know less about the plea-bargaining process may find the deal more advantageous than it actually is, leading to more accepted guilty pleas.

Hypothesis 2: Confidence

Stress. Prior literature suggests that stress can lead to shallower information searching and simplified decisions (Hey et al., 2008). Because of this, I anticipated a main effect of stress, such that stressed participants would be less confident in their decision than non-stressed participants (*Hypothesis 2a*).

Guilt and Plea Decision. I also predicted that guilt status would interact with a defendant's final plea decision to impact confidence. I anticipated that guilty participants who decline the plea deal and innocent defendants who accept the plea deal would be less confident in their decision than guilty participants who accept and innocent participants who decline the plea offer (*Hypothesis 2b; not pre-registered*).

Hypothesis 3: Plea Knowledge

Stress. Because prior literature has shown that time pressure (and consequently stress) can lead to less deliberative, more heuristic-based decisions (e.g., Finucane et al., 2000), I anticipated a main effect of stress on plea knowledge, such that stressed participants would demonstrate less understanding of the plea deal than non-stressed participants (*Hypothesis 3).*

Hypothesis 4: Voluntariness

Stress. Previous studies on experiences with plea bargaining suggest that many people who plead guilty do not feel as though they have another choice (e.g., Redlich & Summers, 2012). Because of this, I anticipated that there would be a main effect of stress on perception of

pressure to accept a plea deal, such that stressed participants would feel more pressure to accept the plea than non-stressed participants (*Hypothesis 4a*).

Guilt and stress. I also anticipated a two-way interaction between guilt and stress, such that innocent participants who are stressed would report greater feelings of coercion than innocent participants who are not stressed (*Hypothesis 4b*).

Method

Participants

Participants for this study were 202 undergraduates recruited through the University of Texas at El Paso's SONA system. Although previous research has found an effect size of $f = .39$ when examining the effect of guilt on plea decisions (Helm et al, 2018), I predicted the effect of stress to be smaller, and opted for a small-to-medium effect size ($f = .25$) instead. Power analyses in R indicated that for a two-way ANOVA with an expected effect size of $f = .25$, and an 80% chance of detecting an effect in the sample when one exists in the population, a sample of at least 128 participants would be needed[1]. I collected more participants[2] than was indicated by the power analysis to account for missing data and rejected participants. Fourteen participants were excluded from analyses as a result of failing the guilt manipulation check, resulting in a final sample size of 188 participants.

The majority of the final participant sample identified as women (70%), White (71%) and Hispanic or Latinx (80%), with $M_{Age} = 21.44$ years. On average, participants identified themselves as moderately liberal on a political ideology scale, and approximately 53% of participants reported a household income level below $40,000. Participants received course credit in exchange for their participation in the study. See Table 1 below for demographic information of participants.

[1] The proposal for this study was written based on an incorrectly executed power analysis in G*Power, which indicated for these same parameters that a sample of 180 would be needed.
[2] I collected an additional 10% (N = 28) from the original power analysis.

Table 1: Demographic Information

Variable		M	SD
Age in years		21.44	5.59
Political ideology (0 = Extremely Liberal, 100 = Extremely Conservative)		36.77	24.66
		N	%
Gender			
	Man	54	28%
	Woman	132	70%
	Nonbinary	1	1%
	Prefer not to say	1	1%
Sexual orientation			
	Straight	156	83%
	Gay	6	3%
	Bisexual	13	7%
	Queer	2	1%
	Asexual	3	2%
	Prefer not to say	8	4%
Race			
	White	133	71%
	Black or African American	6	3%
	Asian	8	4%
	Native Hawaiian or Pacific Islander	1	1%
	Mixed	21	11%
	Other	11	6%
	Missing	8	4%
Ethnicity			
	Hispanic or Latinx	159	85%
	Not Hispanic or Latinx	26	14%
Religion			
	Catholic	90	48%
	Protestant	3	2%
	Evangelical	11	6%
	Mormon	2	1%
	Broadly Spiritual	4	2%
	No Religion	55	29%
	Other	22	12%
Work status			
	Full-time student, not working	89	47%
	Employed full-time	8	4%

Employed part-time	69	37%
Other	20	10%
Household income		
Under $20,000	51	27%
$20,001 - $40,000	49	26%
$40,001 - $60,000	28	15%
$60,001 - $80,000	31	17%
$80,001 - $100,000	12	6%
Over $100,000	16	9%
Prior experience with the criminal justice system		
Yes	91	48%
No	96	51%
Prior experience with plea bargaining		
Yes	41	22%
No	146	78%

Design

This study utilized a 2 (Guilt status: guilty vs. innocent) x 2 (Induced stress: Stressed vs non-stressed) between-subjects design.

Materials

Stress Manipulation

For the stress manipulation, participants assigned to receive stress induction underwent the Trier Social Stress Test (TSST; Kirschbaum, Pirke, & Hellhammer, 1993). As mentioned above, the TSST is a longstanding method of inducing moderate acute stress in a laboratory setting, by asking participants to perform in a social environment. This study utilized a version of the TSST modeled after that used by Eagle et al. (2021), which included both a speech and an arithmetic task.

Participants were first given two minutes to prepare a five-minute argumentative speech about a topic they feel passionate about. In the stress condition, participants were also told that the experimenter and research assistant would be taking notes and coding for certain things to analyze with the rest of the study and were told the task would be recorded for further analysis. After two minutes, participants were instructed give their five-minute speech (to the emotionally disengaged experimenter and research assistant in the stress condition, and to an empty room in the non-stress condition). Participants were stopped after three minutes and moved onto the next portion of the task.

After the speech task, participants were asked to complete a mental arithmetic task aloud. Participants were asked to begin at the number 2023 and count backwards by 17. This was done in front of the same team of researchers in the stress condition, and alone in the non-stress condition. Additionally, participants in the stress condition were stopped and asked to try again if they gave an incorrect answer, but otherwise no feedback was given to participants. After three minutes of arithmetic, the task was finished. Appendix A shows the prompts given during the TSST.

Virtual Plea-Bargaining Simulation

To simulate the plea-bargaining process, participants were presented with a plea deal vignette, using an interactive simulation of plea-bargaining (Wilford et al., 2021). In the virtual plea simulation, participants are asked to select an avatar to represent themselves and are taken through the entire plea process with their avatar, from arrest to the decision to accept or decline the plea deal.

In the simulation, participants were being charged with committing a hit-and-run in a parking lot and are shown flashbacks of the crime taking place. In these flashbacks, participants

were able to see the guilt manipulation clearly: in the guilty condition, participants could see their avatar recall hitting the other car, and in the innocent condition, participants saw them narrowly avoid hitting the car. Their avatar also explicitly stated either "I must be guilty" or "I know I'm innocent" to themselves in the simulation. Aside from the guilt manipulation, participants will all receive the same scenario. See Appendix B for a more in-depth description of the plea simulation and www.pleajustice.org for the full simulation materials.

Measures

Knowledge

Participants' legal knowledge was assessed using two scales. First, participants completed a general legal knowledge scale (Clough & Morera, in preparation; see Appendix E). Overall, participants displayed a wide range of knowledge of the legal system in general, with scores ranging from 3 to 12 (M = 7.57; SD = 1.93) out of 14 possible points. Additionally, participants' level of confidence was recorded after each question. Results from a simple linear regression suggest that participants who demonstrated less legal knowledge also tended to be less confident in their answers, F (1, 186) = 19.81, $p < .001$.

Next, participants completed a plea-specific legal knowledge questionnaire (Redlich & Summers, 2012; see Appendix F). Similar to the general legal knowledge scale, participants displayed a wide range of knowledge of the plea-bargaining process, with scores ranging from 3 to 26 (M = 16.78; SD = 4.02) prior to the plea simulation and from 4 to 28 (M = 17.05; SD = 3.92) after the simulation, out of 32 possible points.

Both questionnaires contained a series of true/false questions that assess participants' understanding of the legal system, and plea bargaining in particular. Redlich & Summers' plea knowledge scale (2012) was completed both before and after the plea-bargaining simulation.

Stress

To measure participants' self-reported levels of stress, participants were asked to complete a modified version of the PANAS-X (See Appendix C; Watson & Clark, 1994) before and after the stress manipulation. This version of the PANAS-X was shortened for time, and also included items relating to their feelings of stress and anxiety. This shortened version of the PANAS-X showed sufficient reliability on both the positive affect subscale (current study α = .87, previous α = .89; Crawford & Henry, 2004) and the negative affect subscale (current study α = .81, previous α = .85; Crawford & Henry, 2004).

Plea decision

Participants were asked to decide whether to accept or reject the plea offer (See Appendix D). The decision was recorded in two ways: a dichotomous variable (accept vs. reject) and a scaled variable (1 = Definitely would reject; 6 = Definitely would accept). Additionally, participants were asked to rate their confidence in their decision on a five-point Likert-type scale.

Reasoning for decision. Additionally, participants were asked to report what they considered when deciding how to respond to their plea offer in an open-ended response. These responses were coded by two research assistants on whether or not participants mentioned three specific considerations in their responses: guilt status, desire to avoid trial, and the shorter sentence offered in the deal. This item had high inter-rater reliability between the coders, with Cohen's κ = .90. See Appendix G for the coding guidelines.

Manipulation / Attention Check

To serve as a manipulation and attention check, participants were asked to answer questions relating to the virtual plea simulation. Participants were asked about the crime with which they were charged, the maximum possible sentence at trial, and the specific terms of the plea deal (See Appendix D for more information). Additionally, participants confirmed whether they were guilty or innocent in the simulation. As pre-registered, participants who failed the guilt manipulation check (N = 14), or more than one of the other manipulation check questions (N = 0) were excluded from analyses.

Voluntariness

To assess the level of voluntariness participants perceived in their plea decision, participants answered a series of questions relating to their feelings towards accepting or declining the plea deal (e.g., "Did you feel pressure to accept the plea deal?"). Participants also completed a short measure from Redlich & Summers (2012) to assess voluntariness of a plea decision (See Appendix G for the complete voluntariness measure).

Demographics

Participants were also asked to complete a brief demographic questionnaire (See Appendix H), which contained questions regarding their age, race/ethnicity, gender identity, political ideology, as well as previous experience with the criminal justice system. These variables were used primarily as control variables in analyses.

Procedure

Participants registered for this study through UTEP's SONA system, and participated in-person in the Legal Decision Lab. After providing informed consent, participants were randomly

assigned to 1 of 4 experimental conditions. Before the manipulation, participants rated their stress and completed the legal knowledge measures. Participants then underwent the TSST: Each participant gave a three-minute speech and performed mental arithmetic. The participants assigned to the stress condition completed these tasks in the presence of others, consistent with the TSST.

After the TSST, participants completed the modified PANAS-X again. Then, the survey redirected participants to complete the virtual plea-bargaining simulation (Wilford et al., 2021). Once the simulation was finished, participants were redirected back to Qualtrics to finish the survey. This final set of questionnaires included manipulation check questions, questions about their decision to accept or reject the plea offer, the plea knowledge measure (Redlich & Summers, 2012), feelings of voluntariness, as well as a demographic questionnaire.

Results

Stress Manipulation Check

To test whether the TSST successfully manipulated stress in participants, I conducted a mixed-effects ANOVA, with stress scores pre- and post-TSST as a within-subjects factor, and stress condition as a between-subjects factor. This analysis indicated that there was a significant interaction between stress condition and change in self-reported stress levels before (M_S = 2.31, 95% CI: [2.07, 2.56], SE_s = .12; M_{NS}= 2.23, CI*:* [2.00, 2.46], SE_{NS} = .12) and after the manipulation (M_S = 2.99, 95% CI: [2.73, 3.25], SE_s = .13; M_{NS} = 2.30 CI: [2.05, 2.55], SE_{NS} = .13). Participants in the stress condition were significantly more stressed after the manipulation than participants in the no stress condition, though this effect was very small, F (1, 184) = 10.525, p = .001, η^2 = .05.

Hypothesis 1: Plea Decision

My first hypothesis addressed the impact of guilt, stress, and knowledge on plea decisions. In this study, I utilized two different ways to measure a plea decision (binary and scaled). Because of this, I address each outcome in this section separately.

Binary Plea Decision

To examine the impact of guilt, stress, and plea knowledge on binary plea decisions, I conducted a binary logistic regression using guilt (guilty vs. innocent), stress (stressed vs. non-stressed), and scores on the plea knowledge scale as predictors, and plea decision (reject vs. accept) as the outcome variable (see Table 2 for full regression results). Overall, as expected (*H1a*), the effect of guilt was significant, such that guilty participants were more likely to accept the plea (78%) than innocent participants (18%). As expected, participant's knowledge of the plea-bargaining process was a significant predictor of decision (*H1e*), such that for each one-

point increase in plea knowledge score, the odds of accepting a plea deal were .91 times as high. However, contrary to hypotheses, there was no significant effect of stress on plea decisions (*H1b*), nor was there a significant interaction between guilt and stress (*H1c/d*).

Table 2: Binary logistic regression for the effect of guilt status, stress, and plea knowledge on binary plea decisions

Variable	B	SE	Wald	df	p	OR
Step 1 - Main effects						
Guilt	**2.90**	**0.39**	**56.61**	**1**	**<.001**	**18.15**
Stress	-0.127	0.376	0.114	1	0.736	0.88
Plea knowledge	**-0.09**	**0.05**	**4.20**	**1**	**0.041**	**0.91**
Constant	0.04	0.78	0.003	1	0.957	1.04
Step 2 - Interactions						
Guilt	2.00	1.58	1.59	1	.207	7.37
Stress	0.60	0.60	0.99	1	.320	1.81
Plea knowledge	**-0.15**	**0.07**	**4.85**	**1**	**.028**	**0.87**
Guilt x stress	-1.22	0.78	2.45	1	.117	0.30
Guilt x knowledge	0.09	0.09	1.01	1	.316	1.10
Constant	0.43	1.04	0.17	1	.677	1.54

Note. The predictor and outcome coding for this analysis is as follows: for plea decision, 0 = reject, 1 = accept; for guilt, 0 = innocent, 1 = guilty; for stress, 0 = no stress, 1 = stress. Plea knowledge was assessed as a continuous predictor, with higher scores (out of 32) indicating higher plea knowledge.

Guilt and Knowledge. I also assessed whether the significant effect of plea knowledge on binary plea decisions varied by condition. When added into the full binary logistic regression (see Table 2), this interaction was non-significant, but does draw variability away from the main effect of guilt, suggesting an issue with the power to detect such an interaction, which did not support my hypothesis. However, in order to explore the pattern of results for this interaction overall, I opted to run separate binary logistic regression for plea knowledge on plea decisions for each of the guilt conditions (see Table 3). Though I cannot draw substantive conclusions from these analyses, the results were consistent with my hypothesis (*H1g; not pre-registered*), innocent participants' plea decisions were significantly impacted by how much they understood the plea process, but guilty participants' decisions were not.

Table 3: Binary logistic regression to explore the pattern of results for knowledge on plea decisions by guilt status.

Variable	B	SE	Wald	df	p	OR
Guilty participants						
Plea knowledge	-0.053	0.066	0.631	1	0.427	0.949
Constant	2.177	1.161	3.514	1	0.061	8.822
Innocent participants						
Plea knowledge	**-0.133**	**0.064**	**4.352**	**1**	**0.037**	**0.876**
Constant	0.586	1.016	0.332	1	0.564	1.796

Note. Outcome coding for this analysis: 0 = reject, 1 = accept.

Scaled plea decision

Similarly, to analyze the impact of guilt, stress, and plea knowledge on scaled plea decisions, I conducted a multiple linear regression with the above predictor variables, and the scaled plea decision as the outcome variable. The full regression results can be seen in Table 4

below. As expected (*H1a*) guilt condition was a significant predictor of decision, such that guilty participants reported a higher likelihood of pleading guilty (M = 4.18; SD = 1.19) than innocent participants (M = 2.60, SD = 1.17). Legal knowledge was also a significant predictor of plea decision, such that participants scoring higher in plea knowledge were less likely to accept a guilty plea (*H1e*). Additionally, as with the binary plea results, there was no significant difference between stressed (M = 3.27, SD = 1.54) and non-stressed (M = 3.55, SD = 1.29) participants in their scaled plea decisions (*H1b*), nor was there an interaction seen between guilt and stress (*H1c/d*).

Table 4: Linear regression for the impact of guilt status, stress, and plea knowledge on scaled plea decisions

	B [95% CI]	SE_B	*P*
Intercept	3.48 [2.73, 4.24]	0.38	<.001
Guilt	**1.57 [1.23, 1.91]**	**0.17**	**<.001**
Stress	-0.01 [-.35, .33]	0.17	0.95
Plea knowledge	**-0.05 [-.09, -.01]**	**0.02**	**0.02**

Correlational analyses

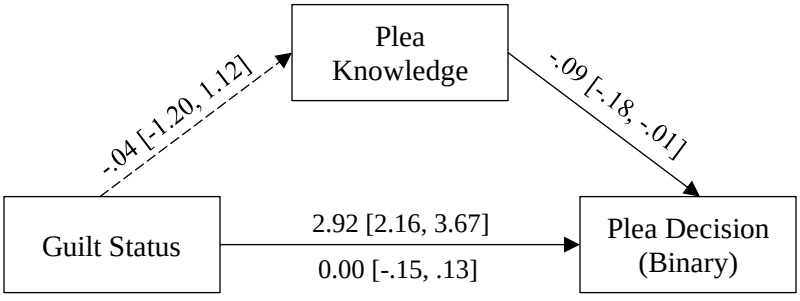
Because the effect of my stress manipulation was small, I opted to run supplemental correlational analyses to determine if there was any relationship between participants' overall stress levels (regardless of condition) and their reported likelihood of accepting a plea. For this, I correlated the scaled decision variable with three categories on the modified PANAS-X related to stress (stressed, anxious, and nervous), as well as a composite of the three. Here, there were no significant correlations between self-reported stress (or similar attributes) and likelihood of accepting a plea deal. See Table 5 for correlations.

Table 5: Correlations between the PANAS-X categories related to stress and the scaled likelihood of accepting the plea deal.

	Anxious	Nervous	Stressed	Aggregate	Likelihood of accepting plea
Anxious	1				
Nervous	.74**	1			
Stressed	.63**	.72**	1		
Aggregate	.89**	.92**	.87**	1	
Likelihood of accepting plea	0.07	0.05	0.05	0.07	1

Mediation

Additionally, I ran two partial mediation analyses to examine the possibility of an indirect effect through plea knowledge, one with the binary plea decision as an outcome, and the other with the scaled plea decision (*H1f*). Both analyses were conducted using the PROCESS macro for SPSS 27 (Hayes, 2022). In both cases, participants' plea knowledge did not serve as a partial mediator for the relationship between guilt status and plea decisions (see Figure 1 for mediation results).



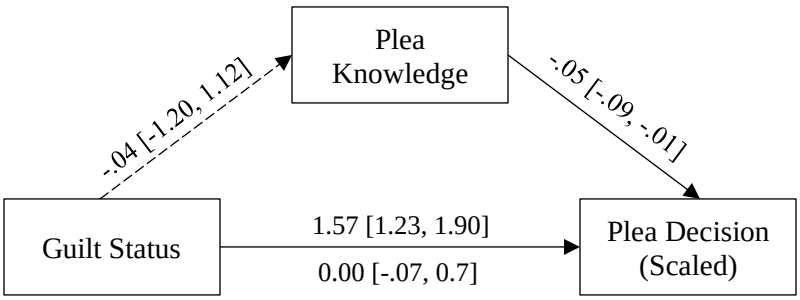


Figure 1: Results from analyses of plea knowledge as a mediator between guilt status and plea decision, binary and scaled.

Hypothesis 2: Confidence

To examine the impact of stress on participants' confidence in their decision (*H2a*), I conducted an ANOVA with stress and guilt conditions as predictors, and confidence rating as the dependent variable. Contrary to predictions, participants' confidence in their decision did not differ between stress conditions, F (1,184) = .24, MS_e = 1.32, p = .623, η^2 = .00. Though I had no *a priori* hypotheses about the effect of guilt on confidence, it was included in the model for thoroughness. Confidence also did not differ between guilt conditions, F (1, 184) = 1.47, MS_e = 1.32, p = .28, η^2 = .01, nor was there an interaction between guilt and stress, F (1, 184) = .01, MS_e = 1.32, p = .932, η^2 = .00.

Guilt, Decision, and Confidence

Additionally, I conducted an ANOVA to determine if participants' confidence in their decision differed by guilt status and whether or not they accepted the guilty plea. Though there was no main effect of guilt or plea decision on confidence, there was an interaction between guilt and plea decision (See Table 6 for full ANOVA results). Pairwise comparisons revealed that guilty participants were significantly less confident in their decision when choosing to decline the plea deal (M = 2.47, 95% CI: [1.99, 2.96], SE = .25) rather than accept it (M = 3.09, CI: [2.84, 3.35], SE = .13), p = .009. Additionally, innocent participants were less confident in their decision to accept a plea deal (M = 3.00, CI: [2.44, 3.56], SE = .28) than to reject it (M = 3.21, CI: [2.96, 3.47], SE = .13) though this effect was not significant, p = .495, so my hypothesis was only partially supported (*H2b; not pre-registered*).

Table 6: ANOVA results for exploratory analysis of the differential effect of guilt status on confidence by plea decision made

Source	SS	df	MS	F	p	eta
Intercept	1016.08	1	1016.08	791.59	<.001	0.81
Guilt	3.05	1	3.05	2.37	0.13	0.01
Plea decision	1.19	1	1.19	0.92	0.34	0.01
Guilt x Plea decision	5.03	1	5.03	3.92	0.05	0.02
Error	236.18	184	1.28			
Total	2010.00	188				

Hypothesis 3: Plea Knowledge

Analysis of the effect of stress on participants' plea knowledge was completed in several different ways. Originally, the intention of this hypothesis was to test whether stressed participants would be less able to comprehend and remember the specific terms of the plea deal they were offered. However, because none of my participants failed any of the manipulation checks that checked their understanding of the terms of the plea deal, I was not able to analyze whether understanding of the plea differed between conditions (*H3*).

Next, I assessed whether participant's demonstrated plea knowledge differed before and after the simulation, and whether this varied by stress condition. I conducted a within-subjects ANOVA, which confirmed that scores on the plea knowledge questionnaire were not significantly different before and after the simulation, F (1, 187) = 1.756, p = .19, η^2 = .01. Given the simulation was not designed to increase knowledge, no change was expected. Further, a mixed-effects ANOVA revealed that participants' scores before and after the simulation did not differ significantly by stress condition, F (1, 186) = .620, p = .43, η^2 = .00. Again, no change was expected.

Although the plea-bargaining simulation was not designed to serve as education on the plea process for participants, two of the items on the plea knowledge questionnaire were specifically mentioned in the simulation: knowledge of waiving the right to a trial, and knowledge of waiving the right to appeal. As these were two rights that may have been 'taught' to participants who were not previously aware of them, I conducted a series of chi-square analyses to determine if (a) participants were more likely to get these items correct after the simulation, and (b) whether participants who initially answered the question incorrectly were more likely to get it correct after the simulation in the non-stress group (vs the stress group).

Results showed that participants were more likely to answer correctly after the simulation for both the right to a trial question X^2 (1, 188) = 71.92, $p < .001$, and the right to appeal question, X^2 (1, 188)= 22.05, $p < .001$. Among participants who initially answered the question incorrectly, the non-stressed participants (27%) were marginally more likely to answer the question correctly the second time than the stressed participants (14%; X^2 (1, 188) = 3.74, p = .053). Though this specific analysis was not pre-registered, it provides evidence in support for Hypothesis 3. However, there was no significant difference in score change between stress conditions for the right to a trial question, X^2 (1, 188) = .252, p = .615.

Voluntariness

Finally, to examine the impact of guilt and stress on participants' feelings of how voluntary the choice to accept the plea was, I ran an ANOVA with guilt and stress as the predictors and average feelings of voluntariness (as indicated by the voluntariness questionnaire) as the outcome. This analysis revealed a main effect of guilt, such that innocent participants (M = 2.85, 95% CI: [2.68, 3.02], SE = .09) reported lower levels of voluntariness in their decision than guilty participants (M = 3.69, CI: [3.45, 3.78], SE = .08), F (1, 187) = 41.39, $p < .001$, $\eta^2 = .18$.

Contrary to expectations, there was no significant effect of stress (*H4a*) or interaction between guilt and stress (*H4b*) on ratings of voluntariness (see Table 8).

Table 7: Two-way ANOVA results for the effect of guilt and stress on voluntariness of plea decisions

	SS	*df*	*MS*	*F*	*p*	η^2
Intercept	1902.72	1	1902.72	2948.68	<.001	0.94
Guilt	26.71	1	26.71	41.39	<.001	0.18
Stress	0.22	1	0.22	0.34	0.56	0.00
Guilt x stress	0.26	1	0.26	0.40	0.53	0.00
Error	118.09	183	0.65			
Total	2103.60	187				

Additionally, I analyzed participants' responses to the general question of whether they felt pressure to accept the plea deal. Overall, 68% of participants reported feeling pressure to accept the plea deal. Innocent participants felt significantly more pressured (78%) to plead than guilty (60%) participants, X^2 (1, 187) = 6.77, p = .01. However, stressed participants did not feel any more pressured (69%) than non-stressed participants (69%), X^2 (1, 187) = .01, p = .93. I also examined participant's open-ended responses about the source of their perceived pressure. Among the participants who indicated feeling pressure to accept the guilty plea, 39% indicated feeling pressure from their defense attorney, 30% from the prosecution attorney, 9% from both attorneys, and 5% from themselves or another source.

Reasoning for Decision

I analyzed participants' open-ended responses for rationale. Overall, 51% of participants indicated their main reason for accepting or declining the plea offer was related to their factual guilt or innocence, while 38% stated their main reason was due to the discount the plea deal offered, and 10% gave other reasons for their decision.

Additionally, I conducted chi-square analyses to determine whether specific reasons were mentioned at a different rate across conditions. Across guilt conditions, innocent participants (n = 59) were significantly more likely to mention their guilt status as their primary reason than guilty participants (n = 37), X^2 (1, 188) = 13.39, $p < .001$. Similarly, guilty participants (n = 54) were more likely than innocent participants (n = 18) to mention the discount offered by the plea deal in their reasoning, X^2 (1, 188) = 25.59, $p < .001$. There was no statistical difference in frequency of stated reasons between stress conditions, X^2 (3, 187) = 1.22, $p = .75$.

Discussion

Previous research in plea-bargaining suggests that plea-bargaining is a complex process that many defendants do not fully understand before entering a guilty plea (Redlich & Summers, 2012). Because of this, the legal standard for a knowing and voluntary plea has been called into question in practice. The goal of this study was to determine whether guilt, stress, and prior knowledge of the plea-bargaining process can impact defendants' ability to make a knowing and voluntary plea. Results indicated that guilt and knowledge were significant predictors of plea decisions, but acute stress was not.

Guilt

Overall, guilt seems to be an undeniably important factor in the ultimate decision to plead guilty. This is unsurprising; studies have shown many times over that factually guilty participants will plead guilty more often than factually innocent participants (e.g., Helm, 2022; Tor et al., 2010; Wilford et al., 2021). Participants' guilt status in this study impacted their likelihood of pleading guilty (*H1a*) as well as the confidence in their decision (depending on their choice; *H1g*) and how voluntary they found their decision to be. It is important to note, however, that the rate of guilty pleas from innocent participants (i.e., false guilty pleas) was not zero: innocent participants chose to plead guilty 18% of the time.

These general results align with the proposed relationship between guilt and plea decisions in prospect theory (Wilford et al., 2019): it is likely that, overall, guilty participants saw a plea deal as an inherent gain (as they were more likely to be risk-averse and accept the plea deal), while innocent participants saw it as an inherent loss (as they were more likely to be risk-seeking and reject the plea deal).

Stress

This study also found little evidence to support the claim that stress is impacting plea decisions (*H1b*), even when accounting for the interaction between stress and guilt (*H1c/d*). Stress also did not impact decision confidence (*H2*), plea knowledge after the task (*H3*) or voluntariness (*H4*). However, a closer look into specific plea knowledge questions that were addressed in the plea simulation did reveal that non-stressed participants showed greater improvement in knowledge of defendants waiving their right to appeal after the simulation than stressed participants did. This suggests that it is possible this effect could be seen more fully in studies assessing specific acquisition of knowledge during the plea process (e.g., through education or training on the plea process), rather than overall knowledge of the process itself.

There are a few possible explanations for these nonsignificant findings. First, it is possible that the effect of stress was simply too small to create a measurable effect in this study. Despite the effect of stress before and after the TSST being statistically significant, the associated effect size suggests that participants overall rated a very small magnitude of change in stress levels due to the TSST. This was a particularly interesting finding, as many of the participants reported orally during the stress manipulation that they had been feeling very stressed because of the TSST. On the other hand, it is also possible that the self-report nature of the PANAS-X underestimated the effect of stress felt.

It is also possible that the TSST was not an appropriate way to induce stress for this study. Typically, the TSST is used to look at performance on tasks immediately after stress induction (e.g., Eagle et al., 2021), whereas this study was aiming to use the TSST to examine a complex decision which uses a 5–10-minute simulation before the decision is made. This could have negatively impacted the size of the stress effect participants may have experienced.

Additionally, prior literature suggests that emotional stressors may impact decision-making differently than non-emotional stressors (Molins et al., 2021). If this is the case, assessing the impact of stress on plea decisions in a laboratory setting may be more successful using different, more emotional stressors, as plea-bargaining is likely to be an emotionally stressful process for defendants.

Another possible explanation for the small effect size seen across stress conditions is due to the sample of participants collected. This sample was comprised entirely of college students, and participants reported low-moderate stress levels on average before the TSST was even introduced. Additionally, this sample may even be unique in some respects compared to a typical college sample, as UTEP's student population consists of students that typically live at home with their families, and many (41% in this sample) work at least part-time while in school. It's possible that these students experience a certain level of stress throughout their daily lives and were not as sensitive to the differential levels of stress induced in the two TSST conditions in this study.

Plea Knowledge

As mentioned above, prospect theory can help explain the impact of guilt on plea decisions in an aggregate sense, but it cannot explain why people make choices that are inconsistent with their guilt status (i.e., guilty participants rejecting a plea; innocent participants accepting a plea). In this study, participants who made decisions that were inconsistent with their guilt status were significantly less confident in their choices than the other participants; however, they still opted to make a choice that is incongruent with the predicted outcome. Stress did not sufficiently answer this question, but individual differences in plea bargaining knowledge might.

The results of this study indicate that defendants with lesser knowledge of the plea-bargaining process may be more likely to accept a guilty plea (*H1e*), an effect that may be particularly relevant for innocent defendants (*H1g*). This effect of plea knowledge is a direct threat to the standard of a knowing and intelligent plea – if defendants with less knowledge of the system are more likely to falsely plead guilty, then the system should do everything in its power to ensure that defendants are fully knowing when they enter a guilty plea.

The existing case law has made it clear that the legal precedent surrounding guilty pleas is to accept a very small amount of understanding of a plea deal (e.g., *Bradshaw v. Stumpf,* 2005). And with exceptionally short and non-comprehensive plea hearings (Redlich et al., 2022), we are left to worry that defendants are able to plead guilty without really understanding what they're agreeing to. Though this study cannot thoroughly assess this effect, it provides evidence that legal knowledge at the time of a guilty plea should be a high priority when assessing the validity of a guilty plea.

Additionally, though this study overall was not designed to address the efficacy of a plea-bargaining training or educational intervention on improving plea bargaining knowledge, evidence from the two waived rights that were directly mentioned in the plea-bargaining simulation (right to a trial and right to appeal) suggests this is a solution worth investigating further. It would be important to determine if plea knowledge is something that can be taught to defendants, or if defendants with high plea knowledge have a different, intrinsic characteristic that helps inform their plea decisions. Perhaps, if a training or intervention could improve a defendant's knowingness of a plea deal, this could help ensure the validity of a guilty plea.

Implications

The results of this study can also address the concern surrounding the voluntariness of a guilty plea. Though the current legal standard for what could be considered an involuntary plea is exceptionally high (e.g., *Bordenkircher v. Hayes*, 1978), it is still important to look closely at things that may impact how much control a defendant feels they have over a situation. More than half of the participants in this study reported feeling pressure to accept the plea deal offered to them, many of whom indicated that they felt the most pressure from the defense attorney. This was a particularly interesting finding, as the virtual plea simulation was designed to be as free from pressure or coercion as possible.

I also found a differential effect of guilt status on feelings of voluntariness in plea decisions. While participants overall offered moderate ratings of voluntariness in their decision, innocent participants rated their choice as significantly less voluntary than guilty participants did. Though the exact reasoning behind this effect is unknown, it is possible that guilty participants did not perceive their decision as less voluntary because they see the deal as an inherent gain. However, innocent participants who see a plea deal as a loss may find the plea deal itself inherently coercive, since being found guilty at trial would result in an even greater undeserved punishment.

Limitations and Future Directions

There are a few important limitations of this study that can help guide future studies in this area. First, although stress has previously been found to have a significant impact on decision-making, the effects seen in this study were almost all non-significant. Some potential reasons behind this limitation were discussed above (the effect size, the manipulation itself, the

participant sample), but it is important to note that the question of the impact of stress on plea decisions has not yet been answered and should be explored further in future studies.

Future studies should expand our understanding of plea deals in a few specific domains. Primarily, because there was a significant relationship between plea knowledge and plea decisions among innocent participants, future studies should aim to explore this relationship further, to gain a better understanding of when plea knowledge poses a threat to the validity of a guilty plea (rather than external factors), and what areas of plea knowledge pose the biggest threat to a plea's validity. Additionally, future studies should examine the effect of stress on the acquisition of knowledge throughout a plea negotiation, particularly the retention of information given to defendants by their defense attorneys. As the standard for a knowing and intelligent guilty plea is relatively low, future studies should generally aim to identify and eliminate barriers to understanding of direct and indirect consequences of pleading guilty. Finally, as the participant sample for this study consisted entirely of undergraduate students, the generalizability of this study is somewhat limited, and though this is not uncommon in this field of research, future studies which target a wider range of demographics can help make these findings more generalizable.

Conclusion

Overall, this study aimed to investigate the impact of a defendant's guilt status, stress, and existing plea knowledge on plea bargaining decisions and feelings of voluntariness. Although there were few significant effects of stress found in this study, analysis of plea 4decisions by guilt status and plea knowledge reveal that the validity of a guilty plea may be threatened when innocent defendants have less understanding of the consequences of pleading guilty. Additionally, innocent defendants may feel inherent pressure from their attorney to plead

guilty when the likelihood of conviction is perceived to be high and may see their decision as less voluntary. This study provides evidence that attorneys and judges should exercise more caution during plea colloquies when determining that a plea is knowing and voluntary.

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Appendix A

Trier Social Stress Test (TSST)
Adapted from Eagle et al., 2021

Prompt:
We are going to give you 2 minutes to prepare a 5-minute speech you will be performing for us. Your speech can be on a topic of your choosing but should be something that you have a strong opinion about. Most participants choose to speak on a controversial topic, like abortion or the second amendment, but you are free to choose any topic. Your speech cannot be shorter than 5 minutes. My research assistant and I will be taking notes and coding responses during your speech, because we will be using your arguments in this speech to evaluate your answers in the rest of the study, so it is important that you take this seriously and speak from your own point of view.

[Stress condition: *Participants are then given 2 minutes to prepare, and then are asked to give the speech to the experimenter and RA, both of whom take notes the entire time but seem emotionally neutral and disengaged. At exactly 5 minutes, the RA will cut off the participant and tell them it's time to move on to the next task*]

[Control: *Participants are then given 2 minutes to prepare, and give the speech alone in a room, without experimenter or video recording. Once they have finished their speech, they will indicate to the experimenter they have finished, and the study will proceed*]

Prompt:
For your next task, we would like for you to count backwards from 2023 by 17 out loud. We are going to see how far you can get in 5 minutes.

[Stress condition: Participant counts backwards and is interrupted by RA whenever a mistake is made. RA and experimenter remain disinterested and take notes while they count. This continues for 5 minutes]

[Control: Participant counts backwards without social stress, alone in the room. They are given 5 minutes to complete the task, and at 5 minutes, the experimenter will rejoin the room and proceed with the study]

Appendix B

Plea Bargaining Scenario

In the virtual plea-bargaining simulation, participants are asked to create an avatar in their likeness and are taken through a plea scenario from the alleged crime through the plea process.

First, participants are told they have received a summons for court and are being accused of being involved in a hit-and-run two weeks prior. The court shows CCTV footage of the participant allegedly hitting the car before driving away, but it is not immediately clear whether actual contact was made with the vehicle.

Next, participants are shown in jail awaiting their trial, and it is revealed whether they are guilty, based on their avatar's recollection of the event. Here, participants in the guilty condition will recall hitting the car, and participants in the innocent condition will recall narrowly avoiding the car. After recalling the incident, the avatar states "I must be guilty" or "I know I'm innocent", depending on their condition.

From there, the participant will be presented with a plea deal by their attorney. Their attorney informs them that at trial, the prosecution will be pursuing a 24-month sentence, but if they agree to plead guilty, they will only receive 12 months. The attorney also informs them that they have a "fairly high" likelihood of conviction at trial based on their previous similar cases.

Next, participants are asked if they would like to accept or decline the plea deal.

Appendix C

Modified PANAS-X

Indicate to what extent you feel this way RIGHT NOW

	Very Slightly or Not at All	Slightly	Moderately	Quite a bit	Extremely
Attentive	1	2	3	4	5
Surprised	1	2	3	4	5
Relaxed	1	2	3	4	5
Irritable	1	2	3	4	5
Fearless	1	2	3	4	5
Sad	1	2	3	4	5
Calm	1	2	3	4	5
Afraid	1	2	3	4	5
Tired	1	2	3	4	5
Amazed	1	2	3	4	5
Happy	1	2	3	4	5
Alert	1	2	3	4	5
Upset	1	2	3	4	5
Bold	1	2	3	4	5
Shy	1	2	3	4	5
Joyful	1	2	3	4	5
Nervous	1	2	3	4	5
Excited	1	2	3	4	5
Hostile	1	2	3	4	5
Jittery	1	2	3	4	5
Ashamed	1	2	3	4	5
At ease	1	2	3	4	5
Enthusiastic	1	2	3	4	5
Downhearted	1	2	3	4	5
Determined	1	2	3	4	5
Interested	1	2	3	4	5
Confident	1	2	3	4	5
Energetic	1	2	3	4	5
Concentrating	1	2	3	4	5
Anxious	1	2	3	4	5
Stressed	1	2	3	4	5
Distracted	1	2	3	4	5

Appendix D

Plea Decision / Manipulation Check

Please answer the following questions about the plea deal that was offered to you.

1. Do you accept the plea deal? (Accept/Decline)
2. How likely would you be to accept or decline the plea deal?

Definitely reject	Most likely would reject	Unsure, but probably would reject	Unsure, but probably would accept	Most likely would accept	Definitely accept

3. How confident are you in your decision to (accept/decline) the plea deal?

Not at all Confident	Somewhat Confident	Moderately Confident	Very Confident	Extremely Confident

Please answer the following questions about the plea deal that was just offered to you.

1. What crime were you charged with committing? (open-ended)
2. In the scenario, did you actually commit this crime?
    a. Yes, I was guilty
    b. No, I was innocent
3. What did the defense attorney say the maximum (penalty/sentence) of this crime was, if you chose to go to trial? (open-ended)
4. What did the defense attorney say the (penalty/sentence) of this crime was, if you chose to accept the plea deal? (open-ended)

Appendix E

Legal Knowledge Scale (adapted from Clough & Morera, in preparation)

Please read the following statements about the criminal justice system and answer to the best of your ability. Some of these things can happen and some things cannot. There is no penalty associated with "I don't know" responses.

	Please answer true, false, or I don't know.			How confident are you in your answer? (Select N/A if "I don't know" was selected.)					
	True	False	I don't know	Not at all confident	Somewhat confident	Fairly confident	Very confident	Extremely confident	N/A
Police officers need consent in order to search someone's belongings.				(1)	(2)	(3)	(4)	(5)	(-99)
Police officers are allowed to lie during interrogations.				(1)	(2)	(3)	(4)	(5)	(-99)
The police decide whether or not to file formal charges.				(1)	(2)	(3)	(4)	(5)	(-99)
Judges decide bail during the initial hearing.				(1)	(2)	(3)	(4)	(5)	(-99)
All defendants must pay bail.				(1)	(2)	(3)	(4)	(5)	(-99)
A grand jury decides if there is enough evidence for a case to go to trial.				(1)	(2)	(3)	(4)	(5)	(-99)
Defendants can choose to have a judge decide their case instead of a jury.				(1)	(2)	(3)	(4)	(5)	(-99)
Defendants who can't afford an attorney will be given a public defender.				(1)	(2)	(3)	(4)	(5)	(-99)
Defendants who plead guilty waive their right to appeal.				(1)	(2)	(3)	(4)	(5)	(-99)
A judge can reject a guilty plea.				(1)	(2)	(3)	(4)	(5)	(-99)
An acquittal is the judgment that a defendant has been proven guilty beyond a reasonable doubt.				(1)	(2)	(3)	(4)	(5)	(-99)
In most cases, a judge will determine the sentence.				(1)	(2)	(3)	(4)	(5)	(-99)
Parole is the same thing as probation.				(1)	(2)	(3)	(4)	(5)	(-99)
All cases involving minors (i.e., people under the age of 18) are handled in juvenile court.				(1)	(2)	(3)	(4)	(5)	(-99)

Appendix F

Plea Knowledge Questionnaire

Plea Knowledge questionnaire adapted from Redlich & Summers (2012) has been removed for distribution. Please reach out to the author for more information about this scale.

Appendix G

Plea Decision / Feelings of Coercion

Voluntariness questionnaire adapted from Redlich & Summers (2012) has been removed for distribution. Please reach out to the author for more information about this scale.

1. Did you feel pressure to accept the plea deal?
    a. Yes
    b. No
2. Did you feel like you had a choice to reject the plea?
    a. Yes
    b. No
3. [IF YES] Who did you feel pressure from to accept the plea?
    a. Prosecution
    b. Defense
    c. Other
4. [IF YES] Why did you feel pressured into accepting the plea deal?
5. What did you consider when deciding to [accept/reject] the plea deal? (open-ended)

Open-ended coding for Q5
Responses were coded in teams of 2 research assistants to determine the primary reason for accepting or declining a plea:

1. Guilt status (e.g., "I was innocent" or "I was guilty")
2. Plea discount (e.g., "6 months is better than 12")
3. Strength of evidence (e.g., "I didn't think the evidence was strong enough to convict me")
4. Other (specify)

Appendix H

Demographics

Please answer the following questions about yourself

1. How old are you? (enter the number)
2. Which of the following best describes your GENDER identity?
    a. Male
    b. Female
    c. Trans man
    d. Trans woman
    e. Nonbinary
    f. Gender Queer / Gender Fluid
    g. Other (please specify)
3. What is your sexual orientation?
    a. Straight / Heterosexual
    b. Gay / Lesbian / Homosexual
    c. Bisexual
    d. Pansexual
    e. Queer
    f. Asexual
    g. Other (Please specify)
4. Select the group that best describes you:
    a. White
    b. Black / African American
    c. Asian Indian
    d. Chinese
    e. Filipino
    f. Japanese
    g. Korean
    h. Vietnamese
    i. Other Asian (Fill in)
    j. Native American / American Indian / Alaskan Native (Fill in):
    k. Native Hawaiian or Pacific Islander
    l. Mixed (Example: Chicano and Native American) (Fill in):
    m. Other (Fill in)
5. Are you of Hispanic, Latino, or Spanish origin?
    a. No, not of Hispanic, Latino, or Spanish origin
    b. Yes, Mexican, Mexican American, Chicano
    c. Yes, Puerto Rican
    d. Yes, Cuban
    e. Yes, Central American (Fill in)
    f. Yes, South American (Fill in)
    g. Yes, Spanish (Spain)
6. Where would you place yourself on this political ideology scale?
7. What is your religious affiliation?
    a. Catholic
    b. Protestant (Methodist, Lutheran, Baptist, etc.)

    c. Jewish
    d. Evangelical / Born again Christian
    e. Latter-Day Saint (Mormon)
    f. Muslim
    g. Broadly Spiritual
    h. No Religion
    i. Other (Please write in)
8. What is your work status?
    a. Employed Full-time
    b. Employed Part-time
    c. Self-Employed / Freelance
    d. Interning
    e. Military/Forces
    f. Not able to work
    g. Retired
    h. Other (please fill in)
9. What is your household income?
    a. Under $20,000
    b. $20,001 - $40,000
    c. $40,001 - $60,000
    d. $60,001 - $80,000
    e. $80,001 - $100,000
    f. $100,001 or over
10. Have you or someone close to you ever had experience with the criminal justice system?
    a. Yes
    b. No
11. Have you or someone close to you ever experienced the plea-bargaining process?
    a. Yes
    b. No

Vita

Grace Hanzelin is a Legal Psychology doctoral student at the University of Texas at El Paso. She earned a Bachelor of Arts in Psychology with a minor in Religious Studies at Illinois Wesleyan Univeristy in Bloomington, IL in 2017, and a Master of Science in Criminology from the University of Pennsylvania in Philadelphia, PA in 2018. Her primary research interest is legal decision-making, specifically in the context of plea-bargaining, policy decisions, and juries. Grace also has a passion for higher education, and previously worked as an admissions counselor at Illinois Wesleyan University before pursuing her PhD.

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