Personality and Social
Psychology Bulletin
2015, Vol. 41(12) 1723–1738

DOI: 10.1177/0146167215610520
pspb.sagepub.com

# The Double-Edged Sword of Genetic Accounts of Criminality: Causal Attributions From Genetic Ascriptions Affect Legal Decision Making

**Benjamin Y. Cheung[1] and Steven J. Heine[1]**

**Abstract**

Much debate exists surrounding the applicability of genetic information in the courtroom, making the psychological processes underlying how people consider this information important to explore. This article addresses how people think about different kinds of causal explanations in legal decision-making contexts. Three studies involving a total of 600 Mechanical Turk and university participants found that genetic, versus environmental, explanations of criminal behavior lead people to view the applicability of various defense claims differently, perceive the perpetrator's mental state differently, and draw different causal attributions. Moreover, mediation and path analyses highlight the double-edged nature of genetic attributions—they simultaneously reduce people's perception of the perpetrator's sense of control while increasing people's tendencies to attribute the cause to internal factors and to expect the perpetrator to reoffend. These countervailing relations, in turn, predict sentencing in opposite directions, although no overall differences in sentencing or ultimate verdicts were found.

**Keywords**

genetic essentialism, attribution theory, legal decision making, psychological essentialism

Received March 25, 2015; revision accepted September 14, 2015

On an episode of *Law and Order: Special Victims Unit* (Green, & Platt, 2007), a sex-addicted teenager was charged with rape, but his attorney claimed that the teenager had a history of sexual impulsivity due to a congenital condition that minimized his ability to exert self-control. The teenager then plea-bargained his sentence down to admission into a treatment facility without jail time. He subsequently was raped by the facility's janitor with a history of sexual violence, whose own defense was "I couldn't help it. My brain is wired wrong—just like that kid, right?"

## Making Sense of Genetic Evidence in the Courtroom

This *Law and Order* episode illustrates an important question that recent psychological research has been trying to answer (e.g., Dar-Nimrod & Heine, 2011; Monterosso, Royzman, & Schwartz, 2005). Why are people so strongly influenced by attributions to biological causes? This is particularly important in legal contexts, with courtrooms witnessing the use of biological explanations to mitigate responsibility for various crimes. Indeed, formal biological theories of crime have existed for over a century (e.g., Lombroso, 1876/2007). More recently, innovations in genomics research have provided the public with the perceived prospect of decoding the genetic aspect of criminality (Caspi et al., 2002; Friedland, 1998). While a single gene for criminality likely does not exist (Alper, 1998), candidate genes have been identified that significantly predict various crime-related behaviors, including alcoholism (Pandey, Roy, Zhang, & Xu, 2004), cocaine addiction (Bilbaoa et al., 2008), and violence (Brunner, Nelen, Breakefield, Ropers, & van Oost, 1993). Evidence of such genetic predispositions has been used as mitigating factors in criminal defenses since the 1990s (Denno, 2006). As more candidate genes will likely be discovered that are associated with a wider array of behaviors, it is important to understand how people make sense of such kinds of genetic causes. Do people view genetic evidence as more mitigating

[1]University of British Columbia, Vancouver, Canada

**Corresponding Author:**
Benjamin Y. Cheung, University of British Columbia, 2136 West Mall, Vancouver, British Columbia, Canada V6T 1Z4.
Email: bycheung@psych.ubc.ca

of criminal responsibility than they view other kinds of evidence? Legal scholars have long debated the implications of genetics for legal decision making (Hoffmann & Rothenberg, 2007; Johnson, 1998; Jones, 2003). The current debate mostly relates to whether genetic predispositions objectively affect volition and free will, and whether this impact should affect how the judicial system punishes offenders. One issue that this debate misses is how people *actually* perceive genetic evidence.

## Impact of Genetic Attributions on Cognitions

People frequently perceive genetic information in biased ways. Nelkin and Lindee (1995) contended that our cultural environment is saturated with simplistic and fatalistic messages about genes, imbuing genes with undue inferential power. Dar-Nimrod and Heine (2011) further proposed that people engage in a specific set of biased and fatalistic cognitions called genetic essentialist biases, when they encounter genetic explanations of behavior. For instance, encountering genetic attributions leads people to view the associated phenotype as necessarily following from the genotype. Although there are monogenic phenomena that follow this deterministic relationship (e.g., autosomal dominant genetic disorders such as Huntington's disease), it is inappropriate to generalize from these cases as the vast majority of genetic effects are far more complex, involving the interaction of numerous genes, whose expression is governed by environmental experiences and other epigenetic influences (e.g., Jablonka & Lamb, 2006). In these far more numerous cases, assuming immutability in the genotype–phenotype relation would be inaccurate. As an example of the biased effects of genetic attributions, people who learn about genetic influences of mental illnesses come to associate the illnesses with less controllability and more persistence, while simultaneously leading to more sympathetic views of the afflicted (Lebowitz, Ahn, & Nolen-Hoeksema, 2013; Phelan, 2005; Walker & Read, 2002).

### *Implications for Legal Decision Making*

A critical feature of genetic essentialist biases is their link to a perceived lack of control (e.g., Dar-Nimrod, Heine, Cheung, & Schaller, 2011). This has important implications for legal decision making due to the preponderance of free will and volition assumed by the criminal justice system (Coffey, 1993). Given that the presumption of self-control is paramount for judging responsibility, genetic attributions of criminal behavior should accordingly lead to weaker perceptions of criminal responsibility and also to more lenient punishments. Despite much discussion within legal circles regarding whether such perceptions *should* occur as a result of genetic explanations (Berryessa & Cho, 2013; Johnson, 1998; Rose, 2000), few studies have examined whether they *do* occur. Anecdotal evidence from court cases around the world demonstrates the impact of genetic evidence on judges and jurors. For example, partly on account of evidence based on Caspi et al.'s (2002) behavioral genetics work, two independent Italian courts reduced the sentences of two different defendants charged with murder—a reduction of 1 year in one case and a reduction from life imprisonment to 20 years in another case (Forzano et al., 2010; Owens, 2011). Beyond anecdotal evidence, studies find that reducing beliefs in free will and increasing perception of a neural basis of human behavior both lead to reduced retributive punishment (Shariff et al., 2014). More germane to our research, state trial judges issued shorter sentences to a hypothetical perpetrator with a biomechanical explanation for their psychopathy, perceiving the biomechanical cause as a mitigating factor (although the researchers did not examine whether other kinds of explanations would be viewed as equally mitigating; Aspinwall, Brown, & Tabery, 2012). Moreover, these judges also found biomechanical explanations to be aggravating, suggesting a higher likelihood of reoffending (i.e., higher recidivism). How the general public negotiates these countervailing expectations has not been well-understood.

Other studies found that biological explanations decreased perceptions of culpability for hypothetical criminals relative to experiential explanations (Dar-Nimrod et al., 2011; Monterosso et al., 2005). These studies contribute to the growing debate about whether biological explanations of crime may influence people's judgments in ways that other explanations do not (see Appelbaum & Scurich, 2014; Raad & Appelbaum, 2015), and such differences may have important implications for legal decision making.

## Overview of Studies

Our three studies strive to identify the degree to which genetic explanations affect various aspects of legal decision making relative to other kinds of explanations. This article examines a broader set of legal decisions compared with past research that are either explicitly expressed (e.g., preferred verdict) or internally held (e.g., attributions of the perpetrator), and seeks to identify mediators that underlie these effects. Importantly, as Aspinwall et al.'s (2012) results suggest, genetic attributions may possess a double-edged nature. Thus, we hypothesize that genetic explanations for criminals, relative to environmental explanations, will lead to both mitigating perceptions such as more lenient perceptions of culpability, and aggravating perceptions such as greater expected recidivism. These studies include various novel measures rarely used in past research on essentialist biases in decision making, such as preferred verdicts, mitigating defenses, and expected recidivism. We are particularly interested in comparisons between genetic and environmental explanations as this allows us to determine whether genetic explanations differ from other types of explanations. Our three studies culminated in an aggregate dataset with an appropriate sample size to conduct a path analysis (Preacher & Coffman, 2006), directly examining the impact of the potential simultaneously double-edged nature of genetic attributions on punitiveness.

## Study 1

### *Method*

***Participants.*** In our initial study, we anticipated that we would have medium effect sizes. With a target power level of 0.80, an α-level of .05, and a total of three groups and one covariate (described below), we required approximately 130 participants (Faul, Erdfelder, Lang, & Buchner, 2007). We subsequently recruited 132 American participants (40% males; $M_{age}$ = 35.48, *SD* = 12.71) from Amazon's Mechanical Turk (MTurk). The sample consisted of 76% Euro-Americans, 9% East Asians, 11% "Others," 4% unspecified (due to the small number of participants who were not of European descent, we could not test for interactions involving culture). Furthermore, because political orientation is associated with legal decision making (see Cochran, Boots, & Chamlin, 2006), participants also indicated this using a 5-point scale (1 = *very liberal*, 5 = *very conservative; M* = 2.59, *SD* = 0.97). Participants received US$0.25 for participating in the study.

***Materials.*** The study consisted of the following materials, in order:

***Experimental manipulation***. The manipulation consisted of one of three randomly assigned vignettes about a college student, Patrick, who fatally stabbed another person after an altercation. The three vignettes differed only in terms of the explanation given for his behavior: the Genetic vignette described Patrick's (fictitious) genetic predisposition for responding to provocations with violence; the Environmental vignette described Patrick's rearing environment that predisposed him to violence; and the Control vignette offered no explanation. Importantly, the magnitude of the purported effect of each explanation was identical; both causes were described as leading to a fourfold increase in the likelihood of violence.

***Perceptions of culpability***. To measure the extent to which people perceived Patrick's culpability for his crime, we asked the following questions.

*Defense claims*. Participants rated the applicability of three defense claims (Insanity, Diminished Capacity, Intoxication) for Patrick on a 7-point scale (0 = *not at all applicable*, 6 = *perfectly applicable*). Each defense claim was accompanied by corresponding definitions based on legal texts (American Law Institute, 1962; Brody, Acker, & Logan, 2001; Padfield, 2008). Insanity and Diminished Capacity were included as they constitute a full and partial defense, respectively (Baum, 2013), allowing us to examine people's perception of the applicability of different degrees of defense claims. Intoxication was included to ensure that participants would not simply deem any defense claim to be more or less applicable (intoxication was unrelated to information from the vignette). We expected that the Insanity and Diminished Capacity defenses would be deemed more applicable in the Genetic condition than the other conditions, but not for the Intoxication defense.

*Verdicts.* Participants made the same judgment regarding four verdicts (First degree murder, Second degree murder, Manslaughter, Not guilty) as they did with the defense claims discussed above, using the same 7-point scale. Each verdict was presented with an accompanying definition based on those that appear in the U.S. Code (18 U.S.C. § 1111-1112).

*Sentencing.* Participants read that Patrick had been convicted of manslaughter, and they were to assign an appropriate prison sentence using an 11-point scale (1 = *5 years*, 11 = *>50 years*). Based on previous studies (e.g., Aspinwall et al., 2012; Dar-Nimrod et al., 2011), we expected that participants in the Genetic condition would assign a shorter prison sentence compared with participants in the other conditions.

*Perpetrator-relevant perceptions.* Finally, participants indicated how criminally responsible they felt that Patrick was on an 11-point scale (0 = *not at all criminally responsible*, 10 = *completely criminally responsible*). Participants also used a 7-point scale to rate the degree to which Patrick (a) had conscious control over his actions (0 = *not at all*, 6 = *complete control*), (b) intended to kill the victim (0 = *not at all*, 6 = *full intention*), (c) had knowledge that his actions would lead to the victim's death (0 = *not at all*, 6 = *full knowledge*), and (d) would reoffend if he were released back into the public (0 = *not at all likely*, 6 = *completely likely*). Past research (e.g., Aspinwall et al., 2012) suggests that participants should perceive less criminal responsibility, less conscious control, less intention to kill, and greater recidivism in the Genetic condition compared with the other conditions. In contrast, the perpetrator's knowledge that his actions would kill the victim was not expected to differ across conditions as the kind of explanation should be irrelevant to knowledge. Moreover, based on previous findings, particularly regarding the perceived double-edged nature of biological explanations of human behavior (e.g., Dar-Nimrod et al., 2011), we also predicted that perceptions of conscious control and recidivism on the part of the perpetrator should mediate differences between groups in terms of prescribed prison sentences.

### *Results*

We performed one-way ANCOVAs using Conditions (Genetic, Environmental, Control) as the independent variable with political orientation as the covariate (conservativism may be

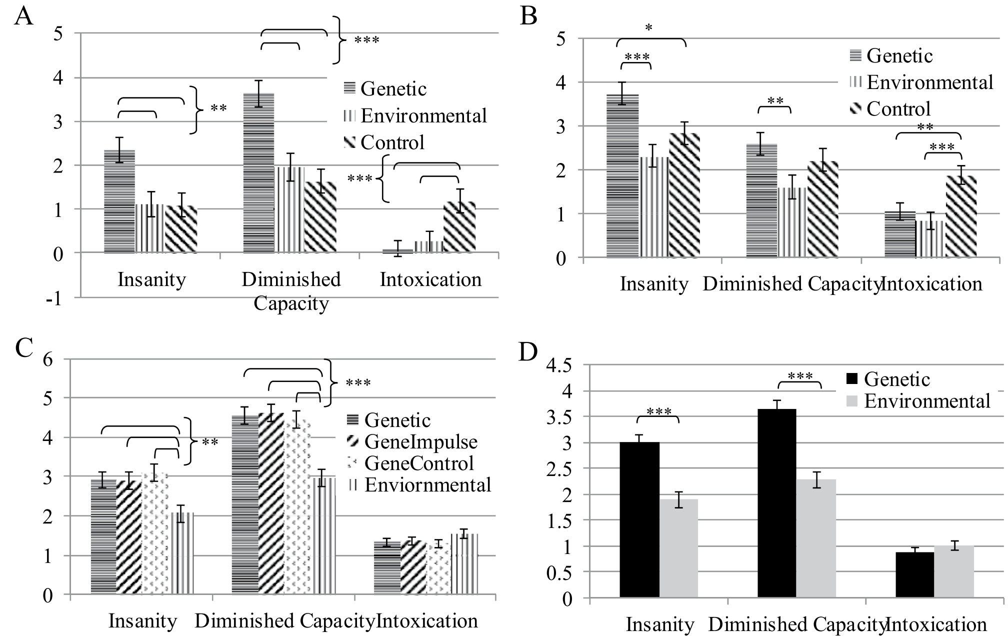


**Figure 1.** Adjusted means by condition for the perceived appropriateness of each criminal defense from (A) Study 1, (B) Study 2, and (C) Study 3, and Panel D reflects the adjusted means from the aggregate dataset.
*$p < .05$. **$p < .01$. ***$p < .001$.

associated with overall heightened punitiveness). Adjusted means were compared using least significant difference (LSD) multiple comparisons. All adjusted means and effect sizes from all pairwise comparisons can be found in the online supplemental materials (OSMs).

*Defense claims.* There was a main effect of Condition on the applicability of the insanity defense, $F(2, 123) = 6.57$, $p = .002$, $\eta_p^2 = 0.10$, 95% confidence interval (CI) = [0.01, 0.19] (see Figure 1A). This defense was preferred more in the Genetic condition ($M = 2.35$, $SE = 0.28$) than in the Environmental ($M = 1.11$, $SE = 0.29$), $p = .003$, $d = 0.67$, 95% CI = [0.23, 1.11], and Control conditions ($M = 1.10$, $SE = 0.28$), $p = .002$, $d = 0.68$, 95% CI = [0.25, 1.11]. The latter two were not significantly different, $p = .972$.

There was a main effect of Condition on the diminished capacity defense, $F(2, 123) = 12.40$, $p < .001$, $\eta_p^2 = 0.17$, 95% CI = [0.06, 0.27]. This defense was preferred more in the Genetic condition ($M = 3.64$, $SE = 0.30$) than in the Environmental ($M = 1.96$, $SE = 0.32$), $p < .001$, $d = 0.84$, 95% CI = [0.39, 1.28], and Control conditions ($M = 1.64$, $SE = 0.31$), $p < .001$, $d = 1.00$, 95% CI = [0.55, 1.44]. The latter two were not significantly different, $p = .469$.

There was a main effect of Condition on the intoxication defense, $F(2, 123) = 12.68$, $p < .001$, $\eta_p^2 = 0.17$, 95% CI = [0.06, 0.28]. It was significantly preferred more in the Control condition ($M = 1.19$, $SE = 0.17$) than in the Genetic ($M = 0.10$, $SE = 0.16$), $p < .001$, $d = -1.01$, 95% CI = [−1.45, −0.56], and Environmental conditions ($M = 0.26$, $SE = 0.17$), $p < .001$, $d = -0.86$, 95% CI = [−1.30, −0.40]. The latter two were not significantly different, $p = .494$. We suspect that because the Control condition offered no explanations, participants assumed intoxication was involved.

*Verdicts.* There was no effect of Condition on perceived appropriateness of any verdicts, $F$s < 2.50, $p$s > .100, $\eta_p^2$s < 0.04.

*Sentencing.* There were no effect of Condition, $F(2, 123) = 0.25$, $p = .780$, $\eta_p^2$s = 0.00, 95% CI = [0.00, 0.04].

*Perpetrator-relevant perceptions.* There was a significant effect of Condition on perceived control, $F(2, 123) = 3.14$, $p = .047$, $\eta_p^2 = 0.05$, 95% CI = [0.00, 0.13]. It was marginally lower in the Genetic condition ($M = 4.19$, $SE = 0.21$) than in the Environmental condition ($M = 4.76$, $SE = 0.22$), $p = .065$, $d = -0.41$, 95% CI = [−0.84, 0.03], but significantly lower than the Control condition ($M = 4.90$, $SE = 0.21$), $p = .019$, $d = -0.51$, 95% CI = [−0.93, −0.08]. The latter two were not significantly different, $p = .647$.

There was a significant effect of Condition on recidivism, $F(2, 123) = 5.70$, $p = .004$, $\eta_p^2 = 0.08$, 95% CI = [0.01, 0.18]. It was significantly higher in the Genetic condition ($M = 4.47$, $SE = 0.24$) than in the Control condition ($M = 3.32$, $SE = 0.24$), $p = .001$, $d = 0.72$, 95% CI = [0.28, 1.15], but not compared with the Environmental condition ($M = 4.04$, $SE = 0.25$), $p = .221$.

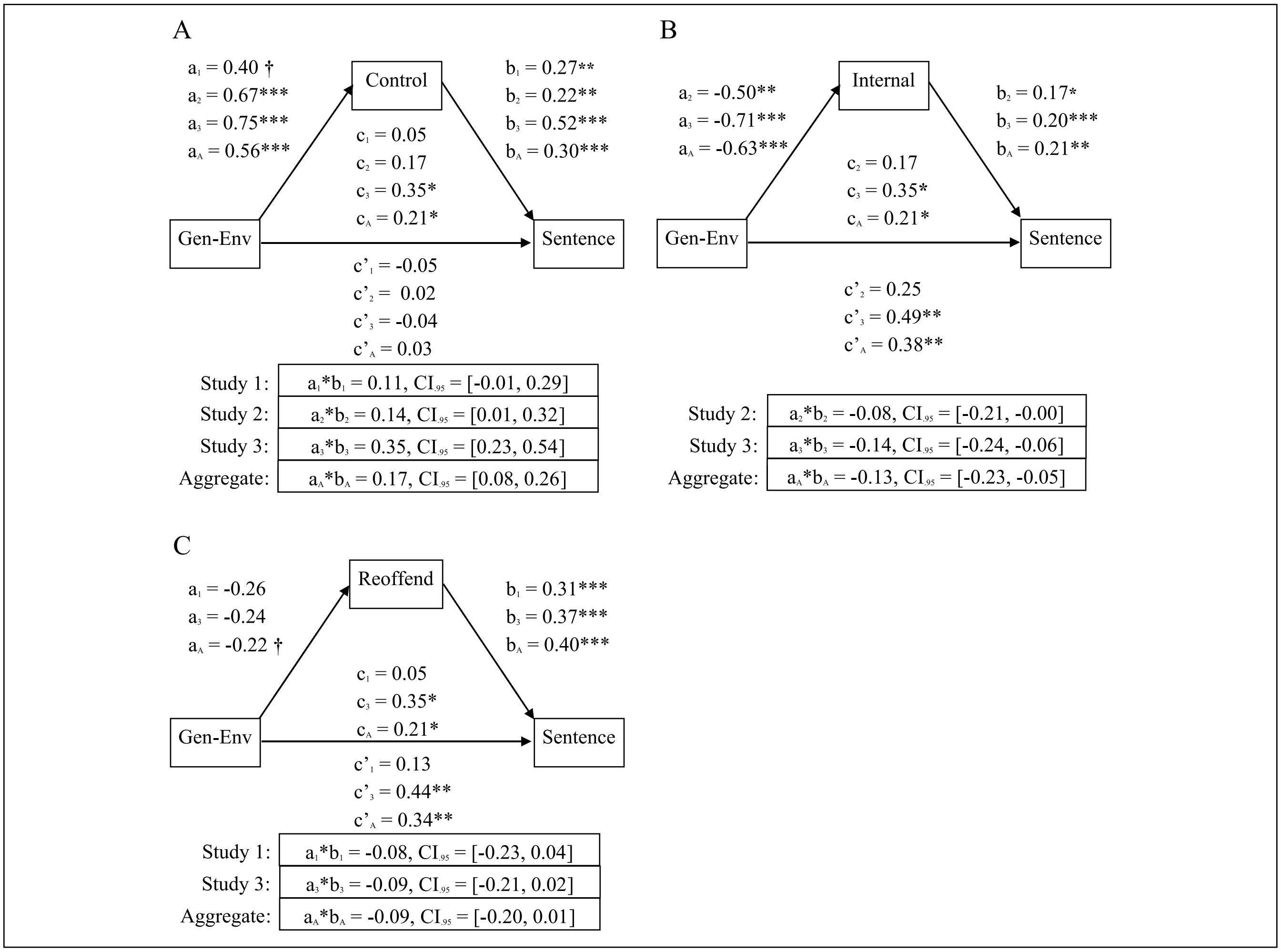


**Figure 2.** Mediation diagrams predicting differences in prison sentence between genetic and environmental conditions from all three studies, and aggregate dataset, showing βs.

*Note.* Gen-Env denotes the contrast between Genetic and Environmental conditions. Panel A shows mediations through Conscious Control; Panel B shows mediations through Internal Attributions; Panel C shows mediations through Expected Reoffending. Subscripts 1, 2, 3, and A correspond to Studies 1, 2, 3, and Aggregate data, respectively. CI = confidence interval.

$^{\dagger}p < .10$. $^{*}p < .05$. $^{**}p < .01$. $^{***}p < .001$.

The latter two differed significantly, $p = .043$, $d = 0.45$, 95% CI = [0.01, 0.88].

There were no effects of Condition on perceived criminal responsibility, intent to kill, and knowledge that actions would have killed, $F$s < 2.00, $p$s > .300, $\eta_p^2$s < 0.02.

*Mediation analysis.*[1] Despite sentencing not being affected by Condition, such results may mask informative mechanisms for theory building and confirmation (see Rucker, Preacher, Tormala, & Petty, 2011; Zhao, Lynch, & Chen, 2010), especially when there are a priori expectations of underlying mechanisms. Furthermore, the traditional Baron and Kenny (1986) requirement for a significant direct effect for mediation leads to an underpowered approach for testing mediation (Edwards & Lambert, 2007; MacKinnon, Fairchild, & Fritz, 2007); therefore, we focused on the indirect effects in determining mediation. We performed a mediation analysis in accordance with Dar-Nimrod et al. (2011), testing for an indirect effect of different conditions on sentencing through perceived control. Figure 2A shows a marginal tendency for participants in the Environmental condition to perceive Patrick as having more conscious control over his behavior than participants in the Genetic condition, $\beta = .40$, $t(123) = 1.86$, $p = .065$, 95% CI = [−0.03, 0.83]. This, in turn, predicts a lengthier sentence, $\beta = .27$, $t(122) = 3.09$, $p = .002$, 95% CI = [0.09, 0.45]. The indirect effect is in the predicted direction, $\beta = .11$, 95% CI = [−0.01, 0.29]. Compared with the non-mediated direct effect, $\beta = .05$, $t(123) = 0.24$, $p = .808$, 95% CI = [−0.41, 0.52], this mediated direct effect remains non-significant, $\beta = -.05$, $t(122) = -0.26$, $p = .794$, 95% CI = [−0.50, 0.39].

Another mediation analysis tested the double-edged nature of genes, revealing that the Genetic condition was not significantly associated with perceived recidivism compared with the Environmental condition, $\beta = -.26$, $t(123) = -1.23$, $p = .221$, 95% CI = [−0.67, 0.14], but perceived recidivism predicted lengthier prison sentences, $\beta = .31$, $t(122) = 3.58$, $p < .001$, 95% CI = [0.15, 0.47]. The indirect effect is in the predicted direction, $\beta = -.08$, 95% CI = [−0.23, 0.04]. The mediated direct effect remains non-significant, $\beta = .13$, $t(122) = 0.65$, $p = .518$, 95% CI = [−0.30, 0.56], but was nominally larger than the non-mediated direct effect, potentially suggesting a suppression effect (see Figure 2C). We investigate this further in subsequent studies.

### Discussion

Study 1 found evidence that exposure to genetic explanations of criminal behavior affected various aspects of legal decision making—Such explanations led to higher perceived applicability of both the Insanity and Diminished Capacity defenses (but not the Intoxication defense), compared with environmental explanations. This is the first demonstration of genetic ascriptions' effect on people's endorsement of various mitigating accounts for a crime. This suggests that people view genes to be responsible for one's actions by liberating them from their own responsibility. Moreover, participants in the Genetic condition tended to differ from those in the Control condition, which tended to be similar to those in the Environmental condition.

Genetic explanations also led people to ascribe less control to the perpetrator than people's default and environmental explanations, mirroring previous research (Dar-Nimrod et al., 2011). As predicted, perceptions of the perpetrator's knowledge of the consequences of his actions did not differ, as the genetic explanation affected neither the perpetrator's intelligence nor knowledge. Unexpectedly, analyses did not reveal a significant effect of condition on perceived intentions. It may be that all participants perceived the perpetrator as having the same degree of intention to kill, but the genetic predisposition rendered the perpetrator less able to control his impulses. We explore this latter possibility in Study 3.

Counter to our expectations, explanations of criminal behavior did not affect perceived criminal responsibility, verdicts, and sentencing, despite affecting perceived control. We had expected that such perceptions would lead to more lenient sentences and preferences for less serious verdicts. Subsequent mediation analyses revealed that, as expected, there are marginal indirect effects of behavioral explanations on sentencing through perceived conscious control and perceived recidivism, but in *opposite* directions. Specifically, genetic ascriptions lead to nominally lower perceptions of perceived conscious control of one's behavior, predicting shorter prison sentences. While genetic ascriptions did not lead to significantly higher perceived recidivism, it predicted lengthier prison sentences, resulting in a marginal indirect effect. These two mediators work in opposition to each other and provide empirical evidence for the double-edged perceptions given by justices in Aspinwall et al.'s (2012) study. We further investigate this in subsequent studies.

## Study 2

We conducted Study 2 to try to replicate, and test the robustness of, Study 1's results, and to explore additional effects of genetic explanations. In particular, we explored the relevance of attribution theory (Abramson, Seligman, & Teasdale, 1978; Weiner et al., 1971) to how genetic explanations affect legal decision making.

Attribution theory assumes four dimensions relevant to how people understand the causes of behavior: *causal locus, causal stability, causal control*, and *causal specificity* (Abramson et al., 1978; Anderson, Krull, & Weiner, 1996; Weiner, 1985). *Causal locus* refers to whether the behavioral cause is internal or external to the person. *Causal stability* is whether the behavioral cause would always exert its influence on the outcome behavior. *Causal control* refers to whether one has control over the cause of the behavior. Finally, *causal specificity* is whether the behavioral cause only affects a specific domain rather than being domain-general. Given theoretical expectations about people's tendencies to essentialize genes (Nelkin & Lindee, 1995), genetic causes should be perceived as more internal, stable, specific, and less controllable, than environmental causes.

Researchers have previously applied attribution theory to legal decision making. For example, more internal attributions of a crime led participants to view the criminal behavior as being more stable across time, which was associated with greater expected recidivism (Carroll & Payne, 1977), leading to lengthier prison sentences (Tam, Shu, Ng, & Tong, 2013). Note that this is the opposite direction of what past research has found with perceived biological causes of criminality (e.g., Aspinwall et al., 2012), despite genetic causes being seen as more internal than environmental causes (Dar-Nimrod & Heine, 2011). This suggests that attribution theory may be key for understanding the double-edged nature of genetic ascriptions.

### Method

*Participants.* We increased our sample size, subsequently recruiting 165 undergraduate students from the University of British Columbia (23% males; $M_{age} = 21.48$, $SD = 4.89$). The sample consisted of 38% Euro-Canadians, 33% East Asians, and 28% "Others," although no culture-condition interactions were significant, leading us to collapse across ethnic groups. Participants' political orientation was assessed using the same measure as Study 1 ($M = 2.47$, $SD = 0.98$). Participants received course credit for their participation. As in Study 1, we conducted one-way ANCOVAs with political orientation as the covariate.

*Materials.* The study used the same measures as in Study 1,[2] with the addition of the Attributional Style Questionnaire (Peterson et al., 1982) that was adapted for our specific vignettes. Furthermore, the original questionnaire only included questions for *causal locus, stability*, and *specificity* (for ease of interpretation, the causal specificity question was reverse-coded so that higher scores refer to greater causal specificity). We thus added a question regarding the *causal control* to reflect the four dimensions of Weiner's attribution theory ("In the future, whenever Patrick is provoked in a fashion similar to what occurred in the scenario, will Patrick be able to control how much the cause of his behavior will influence him?"). We also asked participants about their belief in the general malleability of the causal factor to which they were assigned (*causal malleability*) ("Is the effect of the cause of Patrick's behavior something that can be changed or corrected [i.e., such that the cause of Patrick's behavior will no longer affect Patrick's behavior]?"). All questions were on a 1 to 7 scale, with higher scores indicating greater internal, stable, specific, controllable, and malleable attributions, separately. In addition, based on work suggesting that internal causes are associated with lengthier prison sentences (e.g., Tam et al., 2013), causal locus should mediate group differences in the length of prescribed prison sentences.

## Results

*Defense claims.* There was a main effect of Condition on the applicability of the insanity defense, $F(2, 160) = 8.11$, $p < .001$, $\eta_p^2 = 0.09$, 95% CI = [0.02, 0.18] (see Figure 1B). It was endorsed more in the Genetic condition ($M = 3.76$, $SE = 0.26$) than in the Environmental ($M = 2.31$, $SE = 0.26$), $p < .001$, $d = 0.76$, 95% CI = [0.37, 1.14], and Control conditions ($M = 2.85$, $SE = 0.26$), $p = .013$, $d = 0.48$, 95% CI = [0.10, 0.85]. The latter two were not significantly different, $p = .144$.

There was also a main effect of Condition for the diminished capacity defense, $F(2, 160) = 3.69$, $p = .027$, $\eta_p^2 = 0.04$, 95% CI = [0.00, 0.11]. It was preferred more in the Genetic condition ($M = 2.59$, $SE = 0.26$) than in the Environmental condition ($M = 1.61$, $SE = 0.26$), $p = .008$, $d = 0.51$, 95% CI = [0.13, 0.89], but not in the Control condition ($M = 2.22$, $SE = 0.26$), $p = .307$. The latter two were marginally different, $p = .099$, $d = -0.32$, 95% CI = [−0.70, 0.06].

There was a main effect of Condition for the intoxication defense, $F(2, 159) = 7.43$, $p < .001$, $\eta_p^2 = 0.08$, 95% CI = [0.02, 0.17]. It was significantly endorsed more in the Control condition ($M = 1.88$, $SE = 0.20$) than in the Genetic ($M = 1.05$, $SE = 0.20$), $p = .004$, $d = -0.56$, 95% CI = [−0.94, −0.17], and Environmental conditions ($M = 0.83$, $SE = 0.20$), $p < .001$, $d = -0.70$, 95% CI = [−1.09, −0.31]. The latter two were not significantly different, $p = .450$.

*Verdicts.* There was no effect of Condition, $F$s < 1.20, $p$s > .300, $\eta_p^2$s < 0.01

*Sentencing.* There were no effect of Condition, $F(2, 160) = 0.44$, $p = .657$, $\eta_p^2$s = 0.00, 95% CI = [0.00, 0.04].

*Perpetrator-relevant perceptions.* There was a significant effect of Condition on perceived control, $F(2, 160) = 6.95$, $p = .001$, $\eta_p^2 = 0.08$, 95% CI = [0.01, 0.16]. It was significantly lower in the Genetic condition ($M = 3.46$, $SE = 0.18$) than in the Environmental ($M = 4.39$, $SE = 0.18$), $p < .001$, $d = -0.69$, 95% CI = [−1.07, −0.30], and Control conditions ($M = 4.11$, $SE = 0.18$), $p = .012$, $d = -0.48$, 95% CI = [−0.86, −0.10]. The latter two were not significantly different, $p = .282$.

Condition significantly affected perceived intent to kill, $F(2, 160) = 3.26$, $p = .041$, $\eta_p^2 = 0.04$, 95% CI = [0.00, 0.10]. It was significantly lower in the Genetic condition ($M = 2.46$, $SE = 0.20$) than in the Environmental ($M = 3.04$, $SE = 0.21$), $p = .045$, $d = -0.38$, 95% CI = [−0.76, −0.01], and Control conditions ($M = 3.14$, $SE = 0.21$), $p = .020$, $d = -0.45$, 95% CI = [−0.83, −0.07]. The latter two were not significantly different, $p = .739$.

There were no effects of Condition on perceived criminal responsibility and knowledge that actions would have killed, $F$s < 2.00, $p$s > .200, $\eta_p^2$s < 0.02.

*Causal attributions.* Condition significantly affected causal locus, $F(2, 160) = 5.05$, $p = .007$, $\eta_p^2 = 0.06$, 95% CI = [0.00, 0.13]. It is significantly more internal (higher) in the Genetic condition ($M = 5.39$, $SE = 0.16$) than in the Environmental ($M = 4.77$, $SE = 0.17$), $p = .008$, $d = 0.51$, 95% CI = [0.13, 0.89], and Control conditions ($M = 4.74$, $SE = 0.17$), $p = .005$, $d = 0.54$, 95% CI = [0.16, 0.92]. The latter two were not significantly different, $p = .879$.

Condition significantly affected causal stability, $F(2, 160) = 6.28$, $p = .002$, $\eta_p^2 = 0.07$, 95% CI = [0.01, 0.15]. It is significantly more stable (higher) in the Genetic condition ($M = 5.66$, $SE = 0.13$) than in the Control condition ($M = 5.00$, $SE = 0.13$), $p = .001$, $d = 0.67$, 95% CI = [0.28, 1.05], but not in the Environmental condition ($M = 5.41$, $SE = 0.13$), $p = .187$. The latter two differed significantly from each other, $p = .032$, $d = 0.42$, 95% CI = [0.04, 0.80].

Condition significantly affected causal specificity, $F(2, 160) = 6.53$, $p = .002$, $\eta_p^2 = 0.07$, 95% CI = [0.01, 0.16]. Participants saw greater causal specificity in the Genetics condition ($M = 2.47$, $SE = 0.15$) than in the Environmental condition ($M = 1.86$, $SE = 0.16$), $p = .007$, $d = 0.52$, 95% CI = [0.14, 0.90], but not in the Control condition ($M = 2.63$, $SE = 0.16$), $p = .484$. The latter two differed significantly from each other, $p = .001$, $d = -0.66$, 95% CI = [−1.04, −0.27].

Interestingly, condition did not affect causal control, $F(2, 160) = 0.82$, $p = .441$, $\eta_p^2 = 0.01$, 95% CI = [0.00, 0.05], suggesting that people did not think that the effect of the difference causes were more/less controllable in any given situation.

Condition significantly affected causal malleability, $F(2, 160) = 6.49$, $p = .002$, $\eta_p^2 = 0.07$, 95% CI = [0.01, 0.15]. Participants saw less causal malleability in the Genetics condition ($M = 4.37$, $SE = 0.18$) than in the Environmental condition ($M = 5.24$, $SE = 0.18$), $p = .001$, $d = -0.64$, 95% CI = [−1.02, −0.25], but not in the Control condition ($M = 4.50$, $SE = 0.18$), $p = .621$. The latter two differed significantly from each other, $p = .005$, $d = 0.50$, 95% CI = [0.16, 0.93].

*Mediation analyses.* Similar to Study 1, we examined the indirect effect of behavioral explanations on sentencing through perceived conscious control, focusing on the Genetic-Environment contrast. The results replicated Study 1, such that participants in the environmental condition ascribed greater conscious control to Patrick, $\beta = .67$, $t(160) = 3.62$, $p < .001$, 95% CI = [0.30, 1.03], which, in turn, predicted a lengthier prison sentence, $\beta = .22$, $t(159) = 2.79$, $p = .006$, 95% CI = [0.01, 0.42]. This indirect effect was significant, $\beta = .14$, 95% CI = [0.01, 0.32], although the mediated direct effect remains non-significant, $\beta = .02$, $t(159) = 0.09$, $p = .929$, 95% CI = [−0.37, 0.42], from the non-mediated direct effect, $\beta = .17$, $t(160) = 0.87$, $p = .383$, 95% CI = [−0.23, 0.56] (see Figure 2A).

Another mediation analysis also revealed the predicted indirect effect of behavioral explanations on sentencing through internal attributions. The results suggested that participants in the Environmental condition perceived the cause of Patrick's behavior to be less internal than participants in the Genetic condition, $\beta = -.50$, $t(160) = -2.66$, $p = .008$, 95% CI = [−0.84, −0.16]. On the contrary, more internal causal attributions were associated with lengthier sentences, $\beta = .17$, $t(159) = 2.13$, $p = .035$, 95% CI = [0.01, 0.34]. The indirect effect was significant, $\beta = -.08$, 95% CI = [−0.21, −0.00]. The mediated direct effect remained non-significant, $\beta = .25$, $t(159) = 1.30$, $p = .194$, 95% CI = [−0.13, 0.64], although it *increased* from the non-mediated direct effect, $\beta = .17$, suggesting a suppression effect (see Figure 2B).

## Discussion

Replicating Study 1, participants perceived both the Insanity and the Diminished Capacity defenses to be more applicable after reading a genetic explanation for Patrick's behavior compared with an environmental explanation—this was not the case with the Intoxication defense. Again, this did not translated into different verdicts, suggesting that there are additional factors beyond simply explaining violent behavior as etiologically genetic or environmental.

Also like Study 1, judgments and perceptions in the Genetic, but not the Environmental, condition tended to deviate from the Control condition. In contrast, both experimental conditions tended to deviate from the Control condition with causal attributions, suggesting that explicitly referencing any cause affects one's causal attributions. Notably, causal attributions for all groups tended to cluster at the scales' extremes, suggesting general agreement in the attributional profile of different causes. Despite this, genetic explanations still seem to have a statistically different profile than environmental ones—one that is more internal and specific, and less malleable, resembling the profile found by Dar-Nimrod, Cheung, Ruby, and Heine (2014) regarding obesity perceptions.

Differences in the perceived applicability of criminal defenses again did not lead to differences in sentencing and perceived criminal responsibility; however, the mediation analyses in the present study uncovered two mechanisms that explain the lack of significant differences in sentencing across conditions. Study 2 revealed a significant indirect effect of participants' condition on the length of prescribed prison sentences through perceived conscious control and internal attributions. That is, genetic explanations led to less perceived conscious control, resulting in shorter sentences. Conversely, genetic explanations also led to stronger internal attributions, resulting in lengthier sentences, similar to previous research (e.g., Carroll & Payne, 1977; Sanderson, Zanna, & Darley, 2000; Tam et al., 2013). This tension between shorter sentences due to less perceived conscious control and lengthier sentences due to stronger internal attributions may explain why there is no direct effect of behavioral explanation on sentence length. Moreover, the mediated direct effect through internal attribution is larger than the non-mediated direct effect, potentially showing a positive cooperative suppression effect (Conger, 1974; Krus & Wilkinson, 1986), which we attempt to replicate in Study 3. Overall, seeing a genetic cause behind violent behaviors led participants to view the behaviors as less controllable and the cause as more internal. In conjunction with the mediation in Study 1 regarding perceived recidivism, genetic attributions appear to be seen as double-edged swords that can be simultaneously mitigating and aggravating.

# Study 3

The findings from Studies 1 and 2 are consistent—genetic accounts, compared with environmental explanations, lead people to consider different defenses and other aspects of the legal decision-making process differently; however, it is not clear whether genetic ascriptions affect people's judgments because they expect perpetrators to have *stronger impulses* toward violence or have *less control of their impulses*. Study 3 sought to clarify this issue and to replicate findings from Studies 1 and 2.

## Method

*Participants.* Because this study has an extra condition (described below), and that some of our previous effects had rather wide CIs, we boosted this study's sample size to 303 American participants from MTurk, with an effective sample size of 298 participants who passed our comprehension check questions (42% males; $M_{age} = 34.62$, $SD = 11.26$). The sample consisted of 68% Euro-Americans, 7% African Americans, 3% Asian Americans, 22% "Others." Participants' political orientation was assessed using the same measure as before ($M = 2.63$, $SD = 1.05$). We again conducted one-way ANCOVAs with political orientation as the covariate.

*Materials.* The study used the same Genetic and Environmental scenarios as in Studies 1 and 2, with the addition of two other scenarios (creating four conditions). In the Gene-Impulse scenario, participants learned that Patrick's gene had created a stronger impulse to act violently compared with people without that gene. In the Gene-Control scenario, participants learned that Patrick's gene had decreased his ability to control his violent impulses relative to people without that gene. Participants answered the same questions regarding the perceived appropriateness of criminal defenses, appropriate sentence length, and perceptions of conscious control, criminal intent, and criminal responsibility on the part of Patrick. We changed our sentence length measure from a scale with 5-year increments to one with 1-year increments. This brought our measure more in line with other work that have demonstrated significant differences involving genetic manipulations (e.g., Aspinwall et al., 2012; Dar-Nimrod et al., 2011). Participants also received the same attribution style questions used in Study 2. We also reinserted the corrected question about perceived recidivism from Study 1 (see Footnote 2), but the remainder of the questions were left out of Study 3 as the two previous studies demonstrated strongly that we should not expect differences between the Genetic and Environmental conditions for them. Given Study 3's research question, the Control condition from previous studies was not relevant and was dropped.

## Results

*Defense claims.* There was a main effect of Condition on the applicability of the insanity defense, $F(3, 290) = 4.53$, $p = .004$, $\eta_p^2 = 0.04$, 95% CI = [0.00, 0.09]. It was endorsed less in the Environmental condition ($M = 2.06$, $SE = 0.22$) than in the Genetic ($M = 2.92$, $SE = 0.21$), $p = .005$, $d = 0.46$, 95% CI = [0.13, 0.78], Gene-Impulse ($M = 2.89$, $SE = 0.23$), $p = .009$, $d = 0.44$, 95% CI = [0.11, 0.77], and Gene-Control conditions ($M = 3.09$, $SE = 0.22$), $p = .001$, $d = 0.55$, 95% CI = [0.22, 0.88]. The latter three were not significantly different, $p$s > .500.

There was a main effect of Condition for the diminished capacity defense, $F(3, 289) = 12.82$, $p < .001$, $\eta_p^2 = 0.12$, 95% CI = [0.05, 0.18]. It was endorsed less in the Environmental condition ($M = 2.96$, $SE = 0.22$) than in the Genetic ($M = 4.56$, $SE = 0.22$), $p < .001$, $d = 0.83$, 95% CI = [0.50, 1.16], Gene-Impulse ($M = 4.62$, $SE = 0.23$), $p < .001$, $d = 0.87$, 95% CI = [0.53, 1.21], and Gene-Control conditions ($M = 4.45$, $SE = 0.22$), $p < .001$, $d = 0.78$, 95% CI = [0.44, 1.11]. The latter three were not significantly different, $p$s > .500.

There was no main effect of Condition on the intoxication defense, $F(3, 289) = 1.10$, $p = .349$, $\eta_p^2 = 0.01$, 95% CI = [0.00, 0.04].

*Sentencing.* Unlike Studies 1 and 2, but replicating other research (e.g., Aspinwall et al., 2012; Dar-Nimrod et al., 2011), there was a main effect of Condition, $F(3, 291) = 7.48$, $p < .001$, $\eta_p^2 = 0.07$, 95% CI = [0.02, 0.13]. It was significantly longer in the Environmental condition ($M = 29.70$, $SE = 1.70$) than in the Genetic ($M = 23.96$, $SE = 1.68$), $p = .017$, $d = -0.39$, 95% CI = [−0.71, −0.07], Gene-Impulse ($M = 18.76$, $SE = 1.77$), $p < .001$, $d = -0.74$, 95% CI = [−1.08, −0.40], and Gene-Control conditions ($M = 21.09$, $SE = 1.73$), $p < .001$, $d = -0.58$, 95% CI = [−0.91, −0.25]. The only other significantly different contrast was between the Genetic and Gene-Impulse conditions, $p = .034$, $d = 0.35$, 95% CI = [0.02, 0.68]. The remaining contrasts were not significant, $p$s > .200.

*Perpetrator-relevant perceptions.* Replicating previous studies, there was a significant effect of Condition on perceived control, $F(3, 290) = 10.82$, $p < .001$, $\eta_p^2 = 0.10$, 95% CI = [0.04, 0.16]. It was significantly higher in the Environmental condition ($M = 6.16$, $SE = 0.15$) than in the Genetic ($M = 5.10$, $SE = 0.15$), $p < .001$, $d = -0.78$, 95% CI = [−1.11, −0.45], Gene-Impulse ($M = 5.17$, $SE = 0.16$), $p < .001$, $d = -0.74$, 95% CI = [−1.07, −0.40], and Gene-Control conditions ($M = 5.14$, $SE = 0.16$), $p < .001$, $d = -0.76$, 95% CI = [−1.09, −0.42]. The latter three were not significantly different, $p$s > .700.

Condition did not affect perceived recidivism or intention to kill, $F$s < 2.00, $p$s > .200, $\eta_p^2$s = 0.01.

Condition significantly affected criminal responsibility, $F(3, 291) = 4.31$, $p = .005$, $\eta_p^2 = 0.04$, 95% CI = [0.00, 0.09]. It was significantly higher in the Environmental condition ($M = 6.37$, $SE = 0.14$) than in the Genetic ($M = 5.83$, $SE = 0.14$), $p = .005$, $d = -0.45$, 95% CI = [−0.77, −0.13], Gene-Impulse ($M = 5.75$, $SE = 0.14$), $p = .002$, $d = -0.51$, 95% CI = [−0.84, −0.18], and Gene-Control conditions ($M = 5.81$, $SE = 0.14$), $p = .005$, $d = -0.47$, 95% CI = [−0.79, −0.14]. The latter three were not significantly different, $p$s > .700.

*Causal attributions.* Condition significantly affected causal locus, $F(3, 290) = 8.65$, $p < .001$, $\eta_p^2 = 0.08$, 95% CI = [0.03, 0.14]. It is significantly more external (lower) in the Environmental condition ($M = 4.72$, $SE = 0.17$) than in the Genetic condition ($M = 5.80$, $SE = 0.17$), $p < .001$, $d = 0.74$, 95% CI = [0.41, 1.06], Gene-Impulse ($M = 5.57$, $SE = 0.17$), $p = .001$, $d = 0.58$, 95% CI = [0.24, 0.91], and Gene-Control conditions ($M = 5.73$, $SE = 0.17$), $p < .001$, $d = 0.69$, 95% CI = [0.35, 1.02]. The latter three were not significantly different, $p$s > .300.

Condition did not affect causal stability, $F(3, 291) = 0.67$, $p = .568$, $\eta_p^2 = .01$, 95% CI = [0.00, 0.03].

Condition significantly affected causal specificity, $F(3, 289) = 11.50$, $p < .001$, $\eta_p^2 = 0.11$, 95% CI = [0.04, 0.17]. Participants saw less causal specificity in the Environmental condition ($M = 2.25$, $SE = 0.18$) than in the Genetic ($M = 3.08$, $SE = 0.18$), $p = .001$, $d = 0.54$, 95% CI = [0.21, 0.86], Gene-Impulse ($M = 3.74$, $SE = 0.19$), $p < .001$, $d = 0.96$, 95% CI = [0.62, 1.30], and Gene-Control conditions ($M = 3.22$, $SE = 0.18$), $p < .001$, $d = 0.63$, 95% CI = [0.30, 0.96]. The Gene-Impulse condition also elicited greater causal specificity than the Genetic, $p = .011$, $d = -0.43$, 95% CI = [−0.75, −0.10], and Gene-Control conditions, $p = .047$, $d = 0.33$, 95% CI = [0.00, 0.66]. The latter two did not differ significantly, $p = .572$.

Condition did not affect causal control, $F(3, 289) = 0.60$, $p = .613$, $\eta_p^2 = 0.01$, 95% CI = [0.00, 0.02].

Condition marginally affected causal malleability, $F(3, 290) = 2.15$, $p = .095$, $\eta_p^2 = 0.02$, 95% CI = [0.00, 0.06]. Participants saw greater causal malleability in the Environmental condition ($M = 4.68$, $SE = 0.17$) than in the Gene-Impulse condition ($M = 4.06$, $SE = 0.18$), $p = .014$, $d = -0.41$, 95% CI = [−0.74, −0.08], but not in the other conditions, nor do the other conditions differ from each other, $ps > .100$.

*Mediation analyses.* Mirroring Studies 1 and 2, we performed a mediation analysis on the Genetic–Environmental contrast predicting sentencing through perceived conscious control. Participants in the Environmental condition perceived greater conscious control than those in the Genetic condition, $\beta = .75$, $t(286) = 4.82$, $p < .001$, 95% CI = [0.46, 1.04]. This, in turn, predicted lengthier sentences, $\beta = .52$, $t(285) = 10.08$, $p < .001$, 95% CI = [0.43, 0.60]. The indirect effect was significant, $\beta = .35$, 95% CI = [0.23, 0.54]. Compared with the non-mediated direct effect, $\beta = .35$, $t(287) = 2.30$, $p = .022$, 95% CI = [0.04, 0.67], the mediated direct effect becomes non-significant, $\beta = -.04$, $t(285) = -0.28$, $p = .779$, 95% CI = [−0.33, 0.25], indicating full mediation (see Figure 2A).

Another mediation analysis examining the indirect effect of the Genetic–Environmental contrast on sentencing through internal attributions replicated Study 2's results. Participants in the Environmental condition made fewer internal attributions than those in the Genetic condition, $\beta = -.71$, $t(286) = -4.50$, $p < .001$, 95% CI = [−1.01, −0.39]. Having stronger internal attributions also predicted lengthier sentences, $\beta = .20$, $t(285) = 3.54$, $p < .001$, 95% CI = [0.09, 0.31]. The indirect effect was significant, $\beta = -.14$, 95% CI = [−0.24, −0.06]. The mediated direct effect, $\beta = .49$, $t(285) = 3.10$, $p = .002$, 95% CI = [0.18, 0.79], was larger than the non-mediated direct effect, $\beta = .35$, also replicating the suppression effect found in Study 2 (see Figure 2B).

Reflecting our findings from Study 1, the Genetic–Environmental contrast on perceived recidivism was not significant $\beta = -.24$, $t(287) = -1.57$, $p = .117$, 95% CI = [−0.54, 0.05], but perceived recidivism, again, predicted lengthier sentences, $\beta = .37$, $t(286) = 6.73$, $p < .001$, 95% CI = [0.24, 0.48]. The indirect effect was in the predicted direction, $\beta = -.09$, 95% CI = [−0.21, 0.02]. The mediated direct effect, $\beta = .44$, $t(286) = 3.08$, $p = .002$, 95% CI = [0.16, 0.73], became larger than the non-mediated direct effect, $\beta = .35$, as reported above, also replicating the suppression effect found in Study 1 (see Figure 2C).

### Discussion

Results from Study 3 replicated all significant effects of Condition between the Genetic and Environmental conditions in Studies 1 and 2. Most importantly, we demonstrated a reliable mediation between Genetic versus Environmental explanations and prescribed sentence length through perceived conscious control, internal attributions, and marginally significantly through perceived recidivism. The latter two analyses also showed a replicable suppression effect across our studies (see Paulhus, Robins, Trzesniewski, & Tracy, 2004). One main difference between this study and the two previous studies is that a change in methodology regarding how participants recommended a sentence yielded a significant difference between the Genetic and Environmental conditions in prescribed prison sentence length, more in line with past research (e.g., Aspinwall et al., 2012; Dar-Nimrod et al., 2011). This suggests the importance of methodological concerns when examining sentencing practices.

Moreover, the fact that our Gene-Impulse and Gene-Control conditions did not generally yield significant differences from the Genetic condition suggests several possibilities. When people encounter genetic behavioral explanations, they do not consider what mechanisms link genotypes to phenotypes, instead defaulting to a simplistic "cause-and-effect" schematic of genetic effects on behavior. Another possibility is that people consider one or both of these mechanisms by default, rendering the three genetic conditions mostly equivalent. It is of note, though, that when significant contrasts emerge between these conditions, it was always between the Genetic and the Gene-Impulse conditions, suggesting a greater likelihood that people pair genetic explanations with a lack of control rather than experiencing a greater impulse.

## Additional Analyses From Aggregate Dataset

To better estimate the effect sizes of the difference between the Genetic and Environmental conditions in terms of all of our criterion variables, we aggregated participants' data in these two conditions into one aggregate dataset across the three studies. This resulted in a sample size of 350 participants for our one-way ANCOVAs, with political orientation as the covariate (see Table 1 for all effect sizes from the aggregate dataset).

*Defense claims.* There was a main effect of Condition for the insanity defense, $F(1, 340) = 27.83$, $p < .001$, $\eta_p^2 = 0.08$, 95% CI = [0.03, 0.13] (see Figure 1D). It was significantly higher in the Genetic condition ($M = 3.01$, $SE = 0.15$) than in the Environmental condition ($M = 1.90$, $SE = 0.15$), $d = 0.57$, 95% CI = [0.35, 0.79].

There was a main effect of Condition for the diminished capacity defense, $F(1, 339) = 35.30$, $p < .001$, $\eta_p^2 = 0.09$,

**Table 1.** Cohen's *d*s and 95% CI From Aggregate Dataset Comparing Genetic Condition and Environmental Condition.

| Dependent variables | $p < .10$ results in . . . | Overall *d* | 95% CI |
|---|---|---|---|
| Insanity defense | **Study 1, Study 2 Study 3** | 0.57*** | [0.35, 0.79] |
| Diminished capacity defense | **Study 1, Study 2, Study 3** | 0.64*** | [0.42, 0.86] |
| Intoxication defense | *ns* | −0.10 | [−0.32, 0.11] |
| First degree murder | *ns* | −0.10 | [−0.38, 0.19] |
| Second degree murder | *ns* | −0.09 | [−0.37, 0.19] |
| Manslaughter | *ns* | 0.16 | [−0.12, 0.44] |
| Not guilty | *ns* | −0.06 | [−0.34, 0.22] |
| Sentencing | **Study 3** | −0.22* | [−0.43, −0.00] |
| Criminal responsibility | **Study 3** | −0.19† | [−0.40, 0.02] |
| Conscious control | Study 1, **Study 2, Study 3** | −0.58*** | [−0.80, −0.37] |
| Intent to kill | **Study 2** | −0.25** | [−0.46, −0.04] |
| Knowledge of consequences | *ns* | −0.15 | [−0.43, 0.13] |
| Recidivism | Study 3 | 0.23† | [−0.03, 0.49] |
| Causal locus | **Study 2, Study 3** | 0.67*** | [0.42, 0.92] |
| Causal stability | *ns* | 0.23† | [−0.01, 0.47] |
| Causal specificity | **Study 2, Study 3** | 0.59*** | [0.34, 0.84] |
| Causal control | *ns* | −0.06 | [−0.30, 0.18] |
| Causal malleability | **Study 2** | −0.42*** | [−0.67, −0.18] |

*Note.* Studies in which *p*s < .10 are noted. Bolded studies indicate $p < .05$. Positive *d*s refer to larger values in the genetic condition. CI = confidence interval.
†$p < .10$. *$p < .05$. **$p < .01$. ***$p < .001$.

95% CI = [0.04, 0.16]. It was significantly higher in the Genetic condition ($M$ = 3.65, $SE$ = 0.16) than in the Environmental condition ($M$ = 2.28, $SE$ = 0.16), $d$ = 0.64, 95% CI = [0.42, 0.86].

There was no main effect of Condition for the intoxication defense, $F(1, 338) = 0.91$, $p = .341$, $\eta_p^2 = 0.00$, 95% CI = [0.00, 0.02].

*Verdicts.* There were no main effects of Condition, $F$s < 2.00, $p$s > .200, $\eta_p^2$s < .01

*Sentencing.* Condition significantly affected sentencing, $F(1, 340) = 4.01$, $p = .046$, $\eta_p^2 = 0.01$, 95% CI = [0.00, 0.05]. Sentences were longer in the Environmental condition ($M$ = 25.97, $SE$ = 1.13) than in the Genetic condition ($M$ = 22.79, $SE$ = 1.12), $d$ = −0.22, 95% CI = [−0.43, −0.00].

*Perpetrator-relevant perceptions.* Condition significantly affected perceived control, $F(1, 338) = 29.09$, $p < .001$, $\eta_p^2 = 0.08$, 95% CI = [0.03, 0.14]. It was significantly higher in the Environmental condition ($M$ = 5.26, $SE$ = 0.12) than in the Genetic condition ($M$ = 4.37, $SE$ = 0.12), $d$ = −0.58, 95% CI = [−0.80, −0.37].

Condition significantly affected intent to kill, $F(1, 339) = 5.33$, $p = .022$, $\eta_p^2 = 0.01$, 95% CI = [0.00, 0.05]. It was significantly higher in the Environmental condition ($M$ = 3.87, $SE$ = 0.14) than in the Genetic condition ($M$ = 3.40, $SE$ = 0.14), $d$ = −0.25, 95% CI = [−0.46, −0.04].

Condition did not affect knowledge, $F(1, 191) = 1.10$, $p = .295$, $\eta_p^2 = 0.01$, 95% CI = [0.00, 0.04].

Condition marginally affected criminal responsibility, $F(1, 340) = 3.05$, $p = .082$, $\eta_p^2 = 0.01$, 95% CI = [0.00, 0.04]. It was higher in the Environmental condition ($M$ = 7.45, $SE$ = 0.14) than in the Genetic condition ($M$ = 7.10, $SE$ = 0.14), $d$ = −0.19, 95% CI = [−0.40, 0.02].

Condition marginally affected perceived recidivism, $F(1, 230) = 3.04$, $p = .083$, $\eta_p^2 = 0.01$, 95% CI = [0.00, 0.06]. It was higher in the Genetic condition ($M$ = 5.36, $SE$ = 0.13) than in the Environmental condition ($M$ = 5.02, $SE$ = 0.14), $d$ = 0.23, 95% CI = [−0.03, 0.49].

*Causal attributions.* Condition significantly affected causal locus, $F(1, 255) = 28.65$, $p < .001$, $\eta_p^2 = 0.10$, 95% CI = [0.04, 0.17]. It was more internal (higher) in the Genetic condition ($M$ = 5.66, $SE$ = 0.12) than in the Environmental condition ($M$ = 4.75, $SE$ = 0.12), $d$ = 0.67, 95% CI = [0.42, 0.92].

Condition marginally affected causal stability, $F(1, 256) = 3.45$, $p = .065$, $\eta_p^2 = 0.01$, 95% CI = [0.00, 0.05]. It was more stable in the Genetic condition ($M$ = 5.62, $SE$ = 0.10) than in the Environmental condition ($M$ = 5.36, $SE$ = 0.10), $d$ = 0.23, 95% CI = [−0.01, 0.47].

Condition significantly affected causal specificity, $F(1, 254) = 22.19$, $p < .001$, $\eta_p^2 = 0.08$, 95% CI = [0.03, 0.15]. It was more specific in the Genetic condition ($M$ = 2.80, $SE$ = 0.11) than in the Environmental condition ($M$ = 2.07, $SE$ = 0.11), $d$ = 0.59, 95% CI = [0.34, 0.84].

Condition did not affect causal control, $F(1, 255) = 0.24$, $p = .624$, $\eta_p^2 = 0.00$, 95% CI = [0.00, 0.02].

Condition significantly affected causal malleability $F(1, 256) = 11.66$, $p = .001$, $\eta_p^2 = 0.04$, 95% CI = [0.01, 0.10].

It was more malleable in the Environmental condition ($M$ = 4.92, $SE$ = 0.12) than in the Genetic condition ($M$ = 4.33, $SE$ = 0.12), $d$ = −0.42, 95% CI = [−0.67, −0.18].

*Mediation analyses.* Across all three studies, the Environmental condition was associated with higher ascriptions of conscious control compared with the Genetic condition, β = .56, $t$(338) = 5.39, $p$ < .001, 95% CI = [0.36, 0.76], which predicts lengthier sentences, β = .30, $t$(337) = 5.69, $p$ < .001, 95% CI = [0.18, 0.41]. The indirect effect is significant, β = .17, 95% CI = [0.08, 0.26]. Compared with the non-mediated direct effect, β = .21, $t$(340) = 2.00, $p$ = .041, 95% CI = [0.00, 0.42], the mediated direct effect is no longer significant, β = .03, $t$(334) = 0.25, $p$ = .799, 95% CI = [−0.18, 0.23], indicating full mediation (see Figure 2A).

Another mediation analysis found that the Genetic condition leads to stronger internal causal attributions than the Environmental condition, β = −.63, $t$(255) = −5.35, $p$ < .001, 95% CI = [−0.87, −0.40], which predicts lengthier sentences, β = .21, $t$(254) = 3.33, $p$ = .001, 95% CI = [0.08, 0.34]. The indirect effect is significant, β = −.13, 95% CI = [−0.23, −0.05], while the mediated direct effect is even more significant, β = .38, $t$(254) = 3.10, $p$ = .002, 95% CI = [0.14, 0.61], than the non-mediated direct effect, β = .21, indicating a reliable suppression effect (see Figure 2B).

Finally, a mediation analysis revealed that the perceived recidivism is also important in explaining how the Genetic condition may affect prison sentences differently than the Environmental condition. Specifically, there was a marginal trend for the Genetic condition to elicit greater perceived recidivism than the Environmental condition, β = −.22, $t$(230) = −1.74, $p$ = .083, 95% CI = [−0.48, 0.02]. This, in turn, predicted lengthier sentences overall, β = .40, $t$(229) = 6.37, $p$ < .001, 95% CI = [0.28, 0.51]. The indirect effect of recidivism was in the predicted direction, β = −.09, 95% CI = [−0.20, 0.01]. Similar to the mediation analyses involving internal attributions, this mediation analysis demonstrates another reliable suppression effect, with the mediated direct effect, β = .34, $t$(229) = 2.74, $p$ = .006, 95% CI = [0.11, 0.57], being stronger than the non-mediated direct effect, β = .21 (see Figure 2C).

*Path analysis.* We conducted a path analysis using the "lavaan" package in R (Rosseel, 2012) to determine the effect of all three mediators in simultaneously explaining variation in prison sentence length between participants in the Genetic and Environmental conditions. Furthermore, because Aspinwall et al.'s (2012) study revealed that both the mitigating factor of lower perceived conscious control and the aggravating factor of higher perceived recidivism appear to be phenomenologically related, we also predicted a pathway leading from the mitigating factor to the aggravating factor. This model is shown in Figure 3. The correlation matrix for all predictors (including covariates) can be found in Table 2. Our model demonstrates that internal attributions, perceived conscious control, and perceived recidivism, all mediate the path from the contrast between the Genetic and Environmental conditions and prison sentence length, $\chi^2(2)$ = 7.62, $p$ = .022, comparative fit index (CFI) = 0.97, root mean square error of approximation (RMSEA) = 0.09, standardized root mean square residual (SRMR) = 0.03.

## General Discussion

We examined whether genetic explanations of criminal behavior affect legal decision making differently than environmental explanations of criminal behavior, resulting in findings that carry important implications.

One particularly important implication of these studies pertains to mens rea, a legal concept pertaining to one's malicious intent and volition to commit a crime, and is necessary for a conviction (American Law Institute, 1962). Perceiving someone's actions as being beyond their control likely leads to the perception that the perpetrator lacked mens rea. Indeed, many defense claims, some of which we adopted for our study, are meant to mitigate mens rea by arguing for lack of intention and/or control. In line with previous work (Dar-Nimrod & Heine, 2011), our studies support the idea that genetic explanations more robustly affect mens rea-related attributions differently than other kinds of explanations. It is important to keep in mind that the means for participants' acceptance of defenses were generally below the midpoints of the scales, suggesting that participants did not perceive them to be *highly* applicable; however, the pattern of differences across conditions informs our hypotheses. As such, across all three studies, genetic explanations reliably increased the perceived applicability of both the Insanity and Diminished Capacity defenses compared with environmental explanations involving one's upbringing. Related to these findings, compared with environmental explanations, genetic explanations overall lowered one's perceptions of the perpetrator's control over his actions as well as his perceived intention to harm the victim; but they do not affect perceptions of whether the perpetrator knew the potential outcome of his actions. Altogether, these results suggest that genetic explanations diminish one's agency—despite knowing that his actions could have killed the victim, he neither was able to control his behavior nor did he really intend to kill the victim. Both of these beliefs may partially mitigate a person's perceived guilt. Unfortunately, our research cannot determine whether people understand genetic causes as affecting one's impulses or one's ability to inhibit their impulses. Additional research is needed.

Despite the impact of genetic explanations on general perceptions of mens rea, they do not appear to explicitly affect perceptions of criminal responsibility or ultimate verdicts compared with environmental explanations. Across the three studies, only Study 3 revealed lower levels of criminal responsibility in response to a genetic explanation compared with either an environmental explanation or people's default perception.

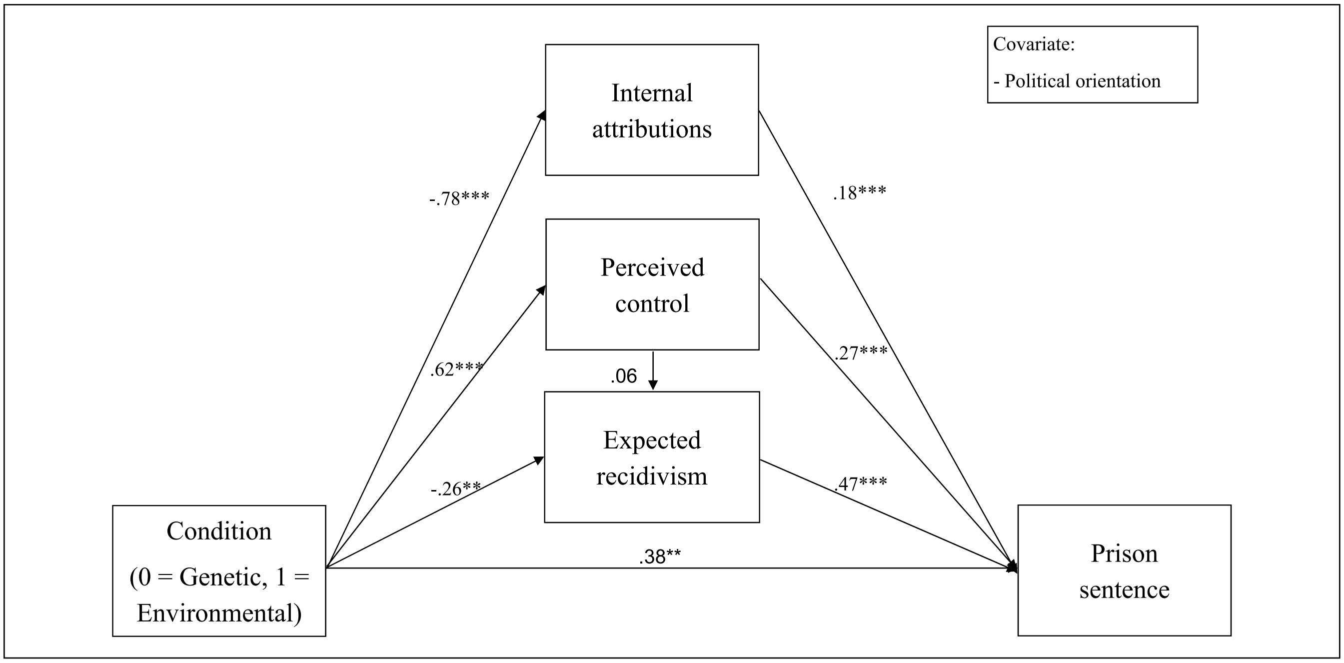


**Figure 3.** Path diagram depicting βs from model with internal attributions, perceived control, and expected recidivism, mediating relationship between condition and prison sentence.
*$p < .05$. **$p < .01$. ***$p < .001$.

**Table 2.** Correlation Matrix for All Variables Included in Our Path Analysis.

| | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| 1. Condition contrast | | | | | | |
| 2. Internal attributions | −.34*** | 1.00 | | | | |
| 3. Conscious control | .37*** | −.00 | 1.00 | | | |
| 4. Recidivism | −.13* | .16** | .03 | 1.00 | | |
| 5. Sentence | .17** | .20*** | .33*** | .39*** | 1.00 | |
| 8. Political orientation | .08 | .10† | .19*** | .14** | .27*** | 1.00 |

*Note.* The Condition contrast has the Genetic condition coded as 0, and the Environmental condition coded as 1.
†$p < .10$. *$p < .05$. **$p < .01$. ***$p < .001$.

Furthermore, participants' perceptions of final verdicts were not affected across the three studies, suggesting that genetic explanations may not affect ultimate legal judgments. While this may, prima facie, appear to be the case, the prescribed sentence length provides important insight into potentially latent mechanisms. Specifically, our studies revealed three mechanisms. First, genetic, versus environmental, explanations led to lower perceptions of conscious behavioral control, which predicted lighter prison sentences. However, genetic explanations triggered more internal causal attributions and expectations of reoffending than environmental explanations, subsequently predicting lengthier prison sentences, potentially mapping onto distinctions between retributive versus rehabilitative punishment due to one's implicit theories of behavior (Plaks, Levy, & Dweck, 2009). Genetic evidence may, thus, force people to concurrently consider and reconcile this opposing combination of mitigating and aggravating points, which may not necessarily neutralize each other (having done so in Studies 1 and 2, but not in Study 3). These findings are reminiscent of studies examining the effect of neuroimaging evidence (Schweitzer et al., 2011), potentially stemming from genetic evidence being seen as being a double-edged sword (Dar-Nimrod & Heine, 2011). Overall, our path analysis supports these ideas, revealing that all three mediators simultaneously affect people's deliberation over sentencing as a result of being exposed to genetic versus environmental explanations.

Also important is the finding that genetic explanations led to different types of causal attributions than environmental explanations. Overall, genetic causes are seen as being more internal, more stable, more domain-specific, and less malleable than environmental causes, but not more controllable. This different pattern of attributions may help future researchers develop new hypotheses for how genetic and environmental explanations may affect legal decision making.

The replication of most of our findings across three studies suggest that genetic explanations cause people to think differently than environmental explanations do, particularly in legal contexts, by reliably affecting certain aspects of the legal decision-making process, such as the applicability of defense claims, certain mens rea-relevant perceptions, and sentencing. Furthermore, the penchant for genetic explanations, more than environmental explanations, to differ from responses in the control condition suggests that in many cases, genetic explanations are the engines that drive the shifts in people's thinking away from their default ways of making sense of criminal responsibility.

Future work should compare genetic explanations to a wider range of alternative behavioral explanations, such as neurological explanations of criminal behavior (Gazzaniga, 2011), to determine the extent to which genes hold special explanatory power. Given that work by Appelbaum, Scurich, and Raad (2015) suggests that biological explanations may be equally essentialized, our results potentially highlight key differences that are more applicable to delineations of "nature"-type versus "nurture"-type explanations.

## Limitations

Our three studies required participants to make legal decisions based on limited facts presented in a brief vignette. It remains uncertain whether such effects are generalizable to trial settings during which jurors encounter days' worth of testimony and information. Furthermore, as jury decisions are usually made in groups, they may also be subject to the influence of group processes such as polarization (Isenberg, 1986) and groupthink (Janis, 1972), neither of which we examined here.

There may also be external validity concerns as our online and college samples are not representative of their respective populations; however, given that some results mimic those from a large representative sample (Appelbaum et al., 2015), our results should be generalizable. In addition, as this research was all conducted with North Americans, it is unclear whether the results would generalize to other cultures. Some research indicates that East Asians are less likely to attend to dispositions (Choi, Nisbett, & Norenzayan, 1999) and to have weaker entity theories of self (Heine et al., 2001) than North Americans, suggesting that East Asians might be affected by genetic attributions less, although we could not test for the effect of ethnicity in our studies.

Furthermore, the use of single items as dependent variables may lead to unstable results, suggesting issues with reliability (see Wanous & Reichers, 1996); however, many single items are used to replace lengthier scales while retaining good psychometric properties (e.g., Rammstedt & Rammsayer, 2002; Robins, Hendin, & Trzesniewski, 2001). This, in conjunction with the fact that our results replicate across studies (both significant and non-significant), leads us to believe that our measures captured meaningful variance attributable to our conditions.

### Acknowledgments

The authors wish to thank Lotta Peussa, Crystal S. J. Byun, and Grace Truong for their immense contributions to this project.

### Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

### Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This study is supported by Social Sciences and Humanities Research Council.

### Notes

1. Due to our focus on the Genetic and Environmental conditions, we dummy-coded the data with the former as the reference group (i.e., 0). All continuous variables were standardized. All confidence intervals (CIs) and mediation coefficients were determined through resampling based on 50,000 resamples (e.g., Kelley, 2005). The CIs were resampled using the percentile bootstrap (see Biesanz, Falk, & Savalei, 2010).
2. A mistake in copying the recidivism question to Study 2 was discovered after data collection ended. As a result, we did not analyze this question.

### Supplemental Material

The online supplemental material is available at http://pspb.sagepub.com/supplemental.

### References

Abramson, L. A., Seligman, M. E., & Teasdale, J. D. (1978). Learned helplessness in humans: Critique and reformulation. *Journal of Abnormal Psychology*, *87*, 49-74. doi:10.1037/0021-843X.87.1.49

Alper, J. S. (1998). Genes, free will, and criminal responsibility. *Social Science & Medicine*, *46*, 1599-1611. doi:10.1016/S0277-9536(97)10136-8

American Law Institute. (1962). *Model penal code*. Philadelphia, PA: The Executive Office, The American Law Institute.

Anderson, C. A., Krull, D. S., & Weiner, B. (1996). Explanations: Processes and consequences. In E. T. Higgins & A. W. Kruglanski (Eds.), *Social psychology: Handbook of basic principles* (pp. 271-296). New York, NY: Guilford Press.

Appelbaum, P. S., & Scurich, N. (2014). Impact of behavioral genetic evidence on the adjudication of criminal behavior. *Journal of the American Academy of Psychiatry and the Law*, *42*, 91-100.

Appelbaum, P. S., Scurich, N., & Raad, R. (2015). Effects of behavioral genetic evidence on perceptions of criminal responsibility and appropriate punishment. *Psychology, Public Policy, and Law*, *21*, 134-144. doi:10.1037/law0000039

Aspinwall, L. G., Brown, T. R., & Tabery, J. (2012). The double-edged sword: Does biomechanism increase or decrease judges' sentencing of psychopaths? *Science*, *337*, 846-849. doi:10.1126/science.1219569

Baron, R. M., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*, *51*, 1173-1182. doi:10.1037/0022-3514.51.6.1173

Baum, M. L. (2013). The monoamine oxidase A (MAOA) genetic predisposition to impulsive violence: Is it relevant to criminal trials? *Neuroethics*, *6*, 287-306. doi:10.1007/s12152-011-9108-6

Berryessa, C. M., & Cho, M. K. (2013). Ethical, legal, social, and policy implications of behavioral genetics. *Annual Review of Genomics and Human Genetics*, *14*, 515-534. doi:10.1146/annurev-genom-090711-163743

Biesanz, J. C., Falk, C. F., & Savalei, V. (2010). Assessing mediational models: Testing and interval estimation for indirect effects. *Multivariate Behavioral Research*, *45*, 661-701. doi:10.1080/00273171.2010.498292

Bilbaoa, A., Parkitnab, J. R., Engblomb, D., Perreau-Lenza, S., Sanchis-Seguraa, C., Schneidera, M., . . . Spanagel, R. (2008). Loss of the Ca2+/calmodulin-dependent protein kinase type IV in dopaminoceptive neurons enhances behavioral effects of cocaine. *Proceedings of the National Academy of Sciences*, *105*, 17549-17554. doi:10.1073/pnas.0803959105

Brody, D. C., Acker, J. R., & Logan, W. A. (2001). *Criminal law*. Gaithersburg, MD: Aspen Publishers.

Brunner, H. G., Nelen, M., Breakefield, X. O., Ropers, H. H., & van Oost, B. A. (1993). Abnormal behavior associated with a point mutation in the structural gene for monoamine oxidase A. *Science*, *262*, 578-580. doi:10.1126/science.8211186

Carroll, J. S., & Payne, J. W. (1977). Crime seriousness, recidivism risk, and causal attributions in judgments of prison term by students and experts. *Journal of Applied Psychology*, *62*, 595-602. doi:10.1037/0021-9010.62.5.595

Caspi, A., McClay, J., Moffitt, T. E., Mill, J., Martin, J., Craig, I. W., . . . Poulton, R. (2002). Role of genotype in the cycle of violence in maltreated children. *Science*, *297*, 851-854. doi:10.1126/science.1072290

Choi, I., Nisbett, R. E., & Norenzayan, A. (1999). Causal attribution across cultures: Variation and universality. *Psychological Bulletin*, *125*, 47-63. doi:10.1037/0033-2909.125.1.47

Cochran, J. K., Boots, D. P., & Chamlin, M. B. (2006). Political identity and support for capital punishment: A test of attribution theory. *Journal of Crime & Justice*, *29*, 45-79.

Coffey, M. P. (1993). The genetic defense: Excuse or explanation. *William & Mary Law Review*, *35*, 353-399.

Conger, A. J. (1974). A revised definition for suppressor variables: A guide to their identification and interpretation. *Educational and Psychological Measurement*, *34*, 35-46. doi:10.1177/001316447403400105

Dar-Nimrod, I., Cheung, B. Y., Ruby, M. B., & Heine, S. J. (2014). Can merely learning about obesity genes affect eating behavior? *Appetite*, *81*, 269-276. doi:10.1016/j.appet.2014.06.109

Dar-Nimrod, I., & Heine, S. J. (2011). Genetic essentialism: On the deceptive determinism of DNA. *Psychological Bulletin*, *137*, 800-818. doi:10.1037/a0021860

Dar-Nimrod, I., Heine, S. J., Cheung, B. Y., & Schaller, M. (2011). Do scientific theories affect men's evaluations of sex crimes? *Aggressive Behavior*, *37*, 440-449. doi:10.1002/ab.20401

Denno, D. W. (2006). Revisiting the legal link between genetics and crime. *Law and Contemporary Problems*, *69*, 209-257.

Edwards, J. R., & Lambert, L. S. (2007). Methods for integrating moderation and mediation: A general analytical framework using moderated path analysis. *Psychological Methods*, *12*, 1-22. doi:10.1037/1082-989X.12.1.1

Faul, F., Erdfelder, E., Lang, A.-G., & Buchner, A. (2007). G*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods*, *39*, 175-191. doi:10.3758/BF03193146

Forzano, F., Borry, P., Cambon-Thomsen, A., Hodgson, S. V., Tibben, A., de Vries, P., . . . Cornel, M. (2010). Italian appeal court: A genetic predisposition to commit murder? *European Journal of Human Genetics*, *18*, 519-521. doi:10.1038/ejhg.2010.31

Friedland, S. I. (1998). The criminal law implications of the Human Genome Project: Reimagining a genetically oriented criminal justice system. *Kentucky Law Journal*, *86*, 303-341.

Gazzaniga, M. (2011). *Who's in charge? Free will and the science of the brain*. New York, NY: HarperCollins.

Greene, J. (Writer), & Platt, D. (Director). (October 9, 2007). Impulsive [Television series episode]. In N. Baer (Producer), *Law & order: Special victims unit*. Universal City, CA: Universal Media Studios.

Heine, S. J., Kitayama, S., Lehman, D. R., Takata, T., Ide, E., Leung, C., & Matsumoto, H. (2001). Divergent consequences of success and failure in Japan and North America: An investigation of self-improving motivations and malleable selves. *Journal of Personality and Social Psychology*, *81*, 599-615. doi:10.1037/0022-3514.81.4.599

Hoffmann, D. E., & Rothenberg, K. H. (2007). Judging genes: Implications of the second generation of genetic tests in the courtroom. *Maryland Law Review*, *66*, 858-922.

Isenberg, D. J. (1986). Group polarization: A critical review and meta-analysis. *Journal of Personality and Social Psychology*, *50*, 1141-1151. doi:10.1037/0022-3514.50.6.1141

Jablonka, E., & Lamb, M. J. (2006). *Evolution in four dimensions: Genetic, epigenetic, behavioral, and symbolic variation in the history of life*. Cambridge, MA: MIT Press.

Janis, I. L. (1972). *Victims of groupthink*. New York, NY: Houghton Mifflin.

Johnson, M. (1998). Genetic technology and its impact on culpability for criminal actions. *Cleveland State Law Review*, *46*, 443-470.

Jones, M. (2003). Overcoming the myth of free will in criminal law: The true impact of the genetic revolution. *Duke Law Journal*, *52*, 1031-1053.

Kelley, K. (2005). The effects of nonnormal distributions on confidence intervals around standardized mean difference: Bootstrap and parametric confidence intervals. *Educational and Psychological Measurement*, *65*, 51-69. doi:10.1177/0013164404264850

Krus, D. J., & Wilkinson, S. M. (1986). Demonstration of properties of a suppressor variable. *Behavioral Research Methods, Instruments, & Computers*, *18*, 21-24. doi:10.3758/BF03200988

Lebowitz, M. S., Ahn, W.-K., & Nolen-Hoeksema, S. (2013). Fixable or fate? Perceptions of the biology of depression. *Journal of Consulting and Clinical Psychology*, *81*, 518-527. doi:10.1037/a0031730

Lombroso, C. (2007). *Criminal man* (M. Gibson & N. H. Rafter, Trans.). Durham, NC: Duke University Press. (Original work published 1876)

MacKinnon, D. P., Fairchild, A. J., & Fritz, M. S. (2007). Mediation analysis. *Annual Review of Psychology*, *58*, 593-614. doi:10.1146/annurev.psych.58.110405.085542

Monterosso, J., Royzman, E. B., & Schwartz, B. (2005). Explaining away responsibility: Effects of scientific explanation on perceived culpability. *Ethics & Behavior*, *15*, 139-158. doi:10.1207/s15327019eb1502_4

Nelkin, D., & Lindee, M. S. (1995). *The DNA mystique: The gene as a cultural icon*. New York, NY: W.H. Freeman.

Owens, B. (2011). *Italian court reduces murder sentence based on neuroimaging data*. Retrieved from http://blogs.nature.com/news/2011/09/italian_court_reduces_murder_s.html

Padfield, N. (2008). *Criminal law* (6th ed.). New York, NY: Oxford University Press.

Pandey, S. C., Roy, A., Zhang, H., & Xu, T. (2004). Partial deletion of the cAMP response element-binding protein gene promotes alcohol-drinking behaviors. *Journal of Neuroscience*, *24*, 5022-5030. doi:10.1523/JNEUROSCI.5557-03.2004

Paulhus, D. L., Robins, R. W., Trzesniewski, K. H., & Tracy, J. L. (2004). Two replicable suppressor situations in personality research. *Multivariate Behavioral Research*, *39*, 303-328. doi:10.1207/s15327906mbr3902_7

Peterson, C., Semmel, A., von Baeyer, C., Abramson, L. Y., Metalsky, G. I., & Seligman, M. E. (1982). The Attributional Style Questionnaire. *Cognitive Therapy and Research*, *6*, 287-299. doi:10.1007/BF01173577

Phelan, J. (2005). Geneticization of deviant behavior and consequences for stigma: The case of mental illness. *Journal of Health and Social Behavior*, *46*, 307-322. doi:10.1177/002214650504600401

Plaks, J. E., Levy, S. R., & Dweck, C. S. (2009). Lay theories of personality: Cornerstones of meaning in social cognition. *Social & Personality Psychology Compass*, *3*, 1069-1081. doi:10.1111/j.1751-9004.2009.00222.x

Preacher, K. J., & Coffman, D. L. (2006). *Computing power and minimum sample size for RMSEA*. Available from http://quantpsy.org/

Raad, R., & Appelbaum, P. S. (2015). Impact of behavioral genetic evidence on the perceptions and dispositions of child abuse victims. *Public Health Genomics*, *18*, 11-19. doi:10.1159/000364994

Rammstedt, B., & Rammsayer, T. H. (2002). Gender differences in self-estimated intelligence and their relation to gender-role orientation. *European Journal of Personality*, *16*, 369-382. doi:10.1002/per.454

Robins, R. W., Hendin, H. M., & Trzesniewski, K. H. (2001). Measuring global self-esteem: Construct validation of a single-item measure and the Rosenberg Self-Esteem Scale. *Personality and Social Psychology Bulletin*, *27*, 151-161. doi:10.1177/0146167201272002

Rose, N. (2000). The biology of culpability: Pathological identity and crime control in a biological culture. *Theoretical Criminology*, *4*, 5-34.

Rosseel, Y. (2012). lavaan: An R package for structural equation modeling. *Journal of Statistical Software*, *48*(2), 1-36.

Rucker, D. D., Preacher, K. J., Tormala, Z. L., & Petty, R. E. (2011). Mediation analysis in social psychology: Current practices and new recommendations. *Social & Personality Psychology Compass*, *5*, 359-371. doi:10.1111/j.1751-9004.2011.00355.x

Sanderson, C. A., Zanna, A. S., & Darley, J. M. (2000). Making the punishment fit the crime and the criminal: Attributions of dangerousness as a mediator of liability. *Journal of Applied Social Psychology*, *30*, 1137-1159. doi:10.1111/j.1559-1816.2000.tb02514.x

Schweitzer, N. J., Saks, M. J., Murphy, E. R., Roskies, A. L., Sinnott-Armstrong, W., & Gaudet, L. M. (2011). Neuroimages as evidence in a mens rea defense: No impact. *Psychology, Public Policy, and Law*, *17*, 357-393. doi:10.1037/a0023581

Shariff, A. F., Greene, J. D., Karremans, J. C., Luguri, J., Clark, C., Schooler, J. W., . . . Vohs, K. D. (2014). Free will and punishment: A mechanistic view of human nature reduces retribution. *Psychological Science*, *25*, 1563-1570. doi:10.1177/0956797614534693

Tam, K.-P., Shu, T.-M., Ng, H. K.-S., & Tong, Y.-Y. (2013). Belief about immutability of moral character and punitiveness toward criminal offenders. *Journal of Applied Social Psychology*, *43*, 603-611. doi:10.1111/j.1559–1816.2013.01041.x

Walker, I., & Read, J. (2002). The differential effectiveness of psychosocial and biogenetic causal explanations in reducing negative attitudes toward “mental illness.” *Psychiatry: Interpersonal and Biological Processes*, *65*, 313-325. doi:10.1521/psyc.65.4.313.20238

Wanous, J. P., & Reichers, A. E. (1996). Estimating the reliability of a single-item measure. *Psychological Reports*, *78*, 631-634. doi:10.2466/pr0.1996.78.2.631

Weiner, B. (1985). An attributional theory of achievement motivation and emotion. *Psychological Review*, *92*, 548-573. doi:10.1037/0033-295X.92.4.548

Weiner, B., Frieze, I., Kulka, A., Reed, L., Rest, S., & Rosenbaum, R. M. (1971). *Perceiving the causes of success and failure*. Morristown, NJ: General Learning Press.

Zhao, X., Lynch, J. G., & Chen, Q. (2010). Reconsidering Baron and Kenny: Myths and truths about mediation analysis. *Journal of Consumer Research*, *37*, 197-206. doi:10.1086/651257