Causal Impact of Moral Agency on Recidivism in Juvenile Delinquency

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Introduction

Crime is a multifaceted social construct rooted in the interplay of psychological, sociological, legal, and historical dimensions. Due to this complex web of influences, the etiology of crime remains elusive, posing significant obstacles for policymakers and legal professionals to deter crimes. While penal measures have long been central to upholding justice and/or social order, addressing crime solely through punitive approaches risks overlooking the underlying motivations behind criminal behavior. A deeper understanding of delinquent drivers and their interactions can facilitate more comprehensive and extensive preventive and rehabilitative crime-prevention strategies to mitigate crime, deter recidivism, and promote long-term, pro-social behavioral change.

Psychological and sociological theories of crime are the two most broadly-recognized theoretical models of criminal behavior. Psychological theories of crime rely on mental processes, emotional factors, and personality traits to explain crime: for instance, cognitive theories posit that criminal behavior stems from a deviation in moral reasoning and/or mental development. Research suggests that several moral cognition factors, such as moral disengagement, moral neutralization (i.e. justifying amoral beliefs), and hostile attribution bias, can predict adolescent delinquency (Walters, 2020). In addition, improved moral cognition is shown to be inversely related to recidivism (Van Vugt et al, 2011).

Nevertheless, the assumption that law-abiding behavior is rationally normative ignores that people, especially those from marginalized groups, have significantly different psycho-socioeconomic backgrounds and relationships with the criminal justice system and social control institutions, which can mediate their decision-making processes when it comes to following conventional ethical norms. This gap in the psychological approach is filled by sociological theories of crime, which rationalize how social structures and relationships influence a person's likelihood of committing crimes. For example, Hirschi's informal social control theory proposes that individuals are less likely to commit crimes when they have strong connections to their community since they experience significant social pressure - through informal mechanisms like disapproval, gossip, or social isolation - to conform to societal norms (Hirschi, 1969). Meanwhile, Sutherland's Differential Association, another prominent criminological theory, states that people learn criminal values and motives through social interactions (Sutherland et al.

1992). In reality, both psychological and sociological criminology perspectives are examined in tandem to provide a comprehensive picture of crime causation.

My research goal in this project is two-fold. First, I aim to explore the causal impact of moral agency on criminal behavior, specifically within the context of recidivism among juvenile delinquents, where I define moral agency as the capability of moral decision-making and the willingness to be accountable for one's behavior under a normative ethical framework. By quantifying the causal impact of changes in moral agency on reoffending likelihood, I can examine cognitive theories of crime and potentially inform cognitive-behavioral treatment (CBT) strategies that target moral reasoning in juvenile probation. Second, I seek to investigate how internal moral frameworks intersect with social and systemic factors in influencing criminal behavior by conducting a moderation analysis to examine the link between moral agency and recidivism under different social conditions, informed by the two sociological theories of crime I have discussed.

Data and Methods

Data Context

My dataset is collected from the Florida Department of Juvenile Justice's (FDJJ) Information System, which includes 7,117 juvenile probationers in Florida who have completed community supervision between July 2015 and June 2018. The FDJJ has a community-based placement program for youth with diversion and day treatment programs, probation supervision, and family therapy to aid the youth's transition to the community. I decided to focus on juvenile delinquents' behavior post-supervision in my analysis since I expect correctional CBT treatment to have a stronger impact on moral decision-making among youth, compared to adults, due to their developmental stage.

The data comprises FDJJ's demographical and criminal record data for each adolescent probationer as well as their C-PACT pre-screen evaluation results, which include information on their behavior at school and family settings, attitudes toward aggression and law, etc. The C-PACT is a semi-structured interview conducted by trained staff with corroboration by the adolescents' families, teachers, etc. whenever possible. Each youth in the dataset underwent 4 C-PACT assessments to assess their recidivizing risk throughout their time under community supervision, with each assessment being 90 or 180 days apart depending on the adolescent's classified risk-to-reoffend. In addition, the researchers compiling this dataset also created an

index to quantify the youth neighborhood's social disorganization level based on their reported neighborhood's poverty rate, median family income, unemployment, etc. (Wolff, 2023).

Data Processing

My treatment variable has binary values, with the treatment group comprising juvenile delinquents with an increased moral agency score between their 1st and 4th C-PACT assessment, and the control group having those with a decrease or no change in their scoring. Each person's moral agency score is calculated based on 4 categorical variables taken from the C-PACT: (1) attitude toward responsible law-abiding behavior, (2) whether they accept responsibility for anti-social behavior, (3) their belief in verbal aggression to resolve conflict, and (4) their belief in physical aggression to resolve conflict. Each level within these 4 categories is quantified on a continuum depending on their alignment with the normative moral framework: more specifically, responses that are most aligned with conventional moral norms are assigned a score of 5, whereas the most deviant responses are given a score of 1. After this recoding, the numerical values for each variable are added up to derive a "moral agency" score in the first and fourth (and final) assessments.

To evaluate the reliability of my quantification of the 4 elements that made up my moral agency score, I calculate the Cronbach's alpha of the numerified responses, which is a measure to estimate the inter-rater reliability of the items making up an instrument. According to this method, a reliable instrument should demonstrate a high degree of covariance among the items relative to the overall variance. My Cronbach's alpha is 0.722, suggesting acceptable internal consistency among the 4 items.

Since my outcome variable measures recidivism after the youth completed community placement, the variables I utilize in my analysis only contain the result of their final assessment since it is taken closest to the time of their release. To reliably measure the influence of changing moral agency, I also filter out all cases with a perfect moral agency score in both the 1st and 4th evaluations, leaving 5736 cases remaining for my causal analysis.

Causal Graph
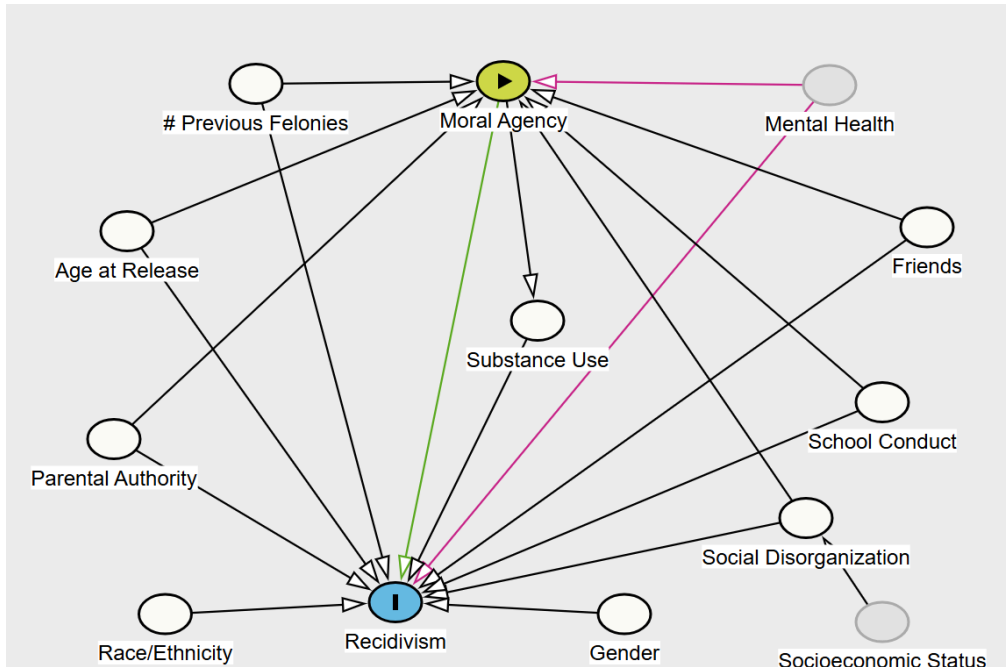
As mentioned in the previous section, my treatment variable indicates whether or not a youth displays improvement in their moral agency between their initial and final C-PACT assessments. Meanwhile, the outcome variable I select is whether or not an adolescent is readjudicated within 365 days after their probation release. By limiting the outcome variable to only those who have engaged in delinquency in my examination of criminal behavior, I hope to isolate a more reliable causal estimate of changing moral agency on crime.

While the dataset contains information on both the youth's rearrest, readjudication, and reincarceration after discharge, I decided to use readjudication as my outcome to partially negate the impact of racial profiling and other discriminatory practices during the criminal arrest process, while retaining a large enough sample of those who ended up reoffending compared to the reincarceration variable (whose reoffending percentage accounts for only 10.5% of the dataset as opposed to those who were readjudicated at 35.9% of the data).

To block non-causal paths in my causal analysis, I use 9 variables that can potentially influence the relationship between moral agency and reoffense. These are the youth's (1) gender, (2) race/ethnicity, (3) age at release, (4) number of previous felonies, (5) current friends, (6) school conduct, (7) level of parental authority and control, (8) neighborhood's social disorganization level, and (9) substance usage. Except for gender and race/ethnicity, which I hypothesize to only directly impact the risk of recidivism through various mechanisms (i.e. racial minorities are more likely to be arrested, and thus convicted), all other non-exposure variables

act as a mediator (i.e. substance usage) or confounder (all other variables) in the non-causal paths. As an example, the youth's age at release may influence their cognitive development, which will in turn impact their moral decision-making and acquisition of normative ethical values during community supervision. In addition, age at release also affects the way the youth is perceived in the criminal justice pipeline and thus influencing their chance of getting arrested or convicted. As a result, it acts as a confounder to the relationship I'm exploring and needs to be accounted for in the analysis.

Notably, while I do not have information on the juvenile delinquents' socioeconomic status in my dataset, their socioeconomic background is likely to be highly correlated with their neighborhood's social disorganization index since the index accounts for the neighborhood's median income and educational attainment, etc. Therefore, I can account for the adolescents' socioeconomic status by including their neighborhood's concentrated disadvantage in my analysis. The only unobserved confounding variable in my analysis is the mental health status of the juvenile delinquents. In my Methods section, I will discuss my sensitivity analysis approach to examine the needed magnitude for mental health conditions (and other potential unobserved confounders) to be able to explain away the link between moral agency and recidivism.

Methods

Full matching

In matching, we select observations from a comparison group (in this case, juvenile delinquents who display no or negative change in moral agency) that is as similar as possible to our treated group (i.e. those who display positive moral agency change) along a set of matching variables, which are the variables needed to block non-causal paths indicated above. Since matching removes variation between the control and treatment groups with regard to the matching variables, it allows us to isolate the causal effect of the treatment.

For my analysis, I use optimal full matching, which allows me to employ all available data points in my analysis. Full matching creates matched sets in which each set contains at least one treated and one control case while minimizing the average of the distances between each treated and each control individual within a set. To calculate this distance, I use a Generalized Linear Model (GLM). Finally, the matching estimand I estimate is the average treatment effect (ATE) of improved moral agency on reoffending risk. This estimand represents the causal effect

across an entire population, making it suitable for my research question since I want to evaluate the general effectiveness of moral agency training on criminal behavior.

Doubly Robust Estimation: Augmented Inverse Probability Weighting (AIPW)

Since full matching relies on the accuracy of the propensity score model to create matched sets, there is a risk that my propensity score model is misspecified. To address that concern, I examine the causal relationship between moral agency and recidivism using doubly robust estimation.

Doubly robust estimation combines the outcome model and the propensity score model, which predicts the probability of treatment, to estimate the causal effect of an exposure on an outcome. The estimator is doubly robust since it is consistent as long as either model is correctly specified. In my project, I apply Augmented Inverse Probability Weighting (AIPW), which is a doubly robust estimator that combines both the properties of the regression-based estimator and the inverse probability weighted (IPW) estimator. To do so, I specify a list of different SuperLearner machine learning algorithms (`"SL.glm"`, `"SL.glm.interaction"`, `"SL.randomForest"`, `"SL.ranger"`) in R for the AIPW object to select which model it should specify based on its cross-fitting results, along with a separate set of covariates for the outcome and exposure model. Both models share mostly similar covariates, although the outcome model includes gender and race/ethnicity, which only impact the outcome and not the treatment variable, as seen in the causal graph.

Moderation Analysis

The moderation analysis answers the second part of my research question, which is to explore how moral decision-making exerts influence on criminal behavior among youth with different sociological conditions. Moderation analysis entails determining whether a treatment effect displays meaningful differences across levels of a moderator variable, with a goal to achieving balance within each subgroup of the moderator. In my moderation analysis, I perform matching in the full dataset, utilizing the same GLM distance calculation while requiring exact matching on two moderating variables: school conduct and friends. A more detailed description of my moderation analysis approach can be found in this link.

I select school conduct and friends as moderators per the two sociological theories of crime discussed in the Introduction: Hirschi's informal social control theory and Sutherland's

Differential Association theory, respectively. The reason I select school conduct as a proxy for the youth's attachment to their community (and thus an indicator of lowered criminal behavior) is good school behavior suggests both conformation and close ties to the educational system in terms of frequent attendance, class participation, etc. Meanwhile, whether or not a person's friend group is anti-social or pro-social would modulate the extent of their learned delinquent behavior, making it a fitting moderator to examine the Differential Association theory.

My propensity score model involves moderator-by-covariate interactions to enable some variations across subgroups on some covariates. In my moderation analysis of school conduct, the propensity score includes interactions between school conduct with friends, parental authority, and substance use variables. Meanwhile, the moderation analysis with friends involves the number of felonies, race/ethnicity, and gender variables in the moderator-by-covariate interactions.

Sensitivity Analysis

Since unmeasured confounders may lead to bias in my causal analysis, I apply sensitivity analysis to test whether my causal effect results are robust to violations of assumptions in my causal model. In this project, I calculate the E-value, which quantifies how robust my causal association is to unmeasured confounding, to investigate how strongly associated these confounders, specifically mental health conditions, have to be with moral agency and readjudication risk to explain away the causal relationship.

Results

Full matching

Balance statistics: since I implement full matching, the matched sample size is sufficiently large for analysis. Matching also demonstrates a significant impact on the covariates' balance, with significant imbalances between treatment groups pre-matching. However, the terms become much more balanced post-matching, with all covariates staying within the 0.1 absolute standardized mean difference (SMD) threshold. Moreover, the ranges of propensity scores in which the treated and control units have non-zero density are identical, which doesn't raise any concerns about common support violations.
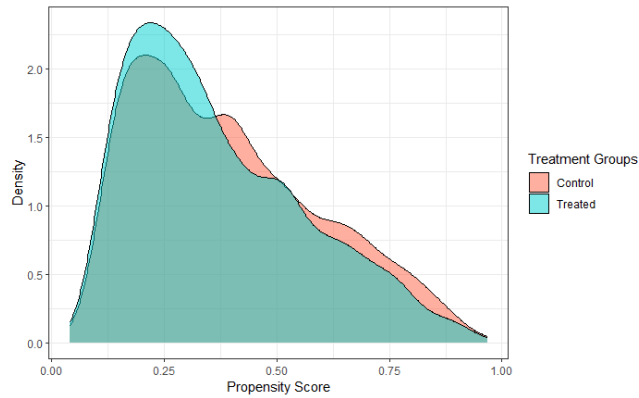
Result: the average treatment effect (ATE) estimates the effect of change in moral agency on recidivism amongst juvenile delinquents in the general population.

Estimate	Pr(>|z|)	S	2.5 %	97.5 %
<chr>	<chr>	<chr>	<chr>	<chr>
0.991	0.852	0.2	0.906	1.09

We estimate that improvement in moral agency score lowers the risk of reoffending amongst the general Floridian juvenile delinquents population, with their risk of recidivism being 0.991 times as high as those who do not display improvement in moral agency. Since this exponentiated estimate is very close to 1, the 95% confidence interval contains 1, and the result has a very high p-value at 0.85, the result is statistically insignificant. Therefore, based on this result, we can't be confident that moral agency improvement has a causal impact on reoffending likelihood in the general population.

Doubly Robust Estimation: Augmented Inverse Probability Weighting (AIPW)
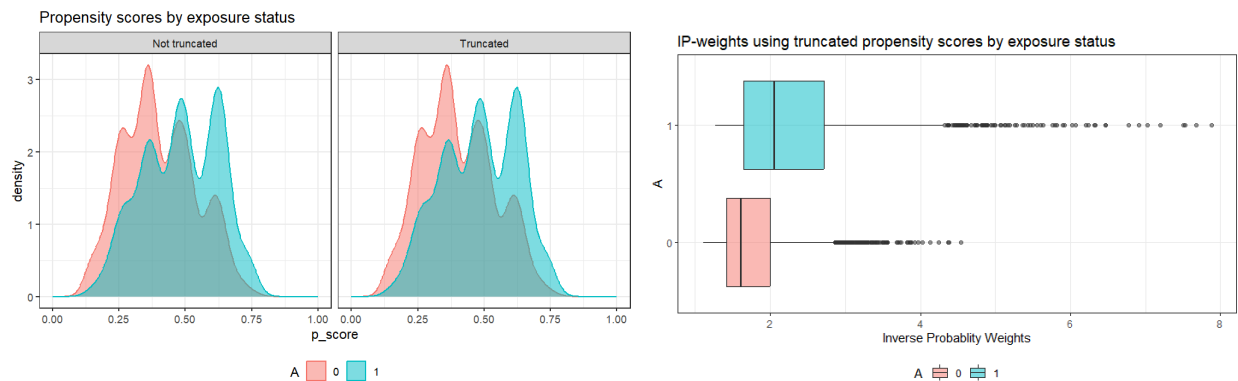
Balance statistics: the ranges of truncated propensity scores in the treated and control units do not raise any concerns about common support violations. The IP-weight ranges are relatively similar between the two groups (median at around 2) with no extreme weights (above 10 or much less than 1), so the AIPW model has an acceptable balance.

	Estimate	SE	95% LCL	95% UCL	N
Risk of exposure	0.3849	0.0100	0.365	0.405	2514
Risk of control	0.3881	0.0086	0.371	0.405	3222
Risk Difference	-0.0032	0.0126	-0.028	0.022	5736
Risk Ratio	0.9917	0.0313	0.933	1.054	5736
Odds Ratio	0.9865	0.0510	0.893	1.090	5736

Result: the result of my doubly robust estimation model is very similar to my matching result, with the reoffending risk among the general Floridian juvenile delinquents population who display improved moral agency being 0.99 times as high as those who do not display improvement. The result is statistically insignificant with a 95% confidence interval passing 1. Since my matching and AIPW methods produce similar causal estimates, I have confidence that my matching result has good reliability. Given this, I proceed to use matching for my moderation analysis in the next section.

Moderation Analysis

Moderator: School Conduct. Balance statistics: the covariate balance plot suggests that the exact matched object has a relatively good overall balance, with the absolute SMDs of covariates within the 0.1 threshold point. Although the balance statistics table shows that a few covariates are not balanced (their standardized mean differences exceed the 0.05 threshold) within each subgroup of school conduct, the majority of covariates within each subgroup have good balance, and the resulting matched sample size is adequate for reliable analysis.

CONDUCT	Estimate	Pr(>|z|)	S	2.5 %	97.5 %
<chr>	<chr>	<chr>	<chr>	<chr>	<chr>
Reported good conduct	0.711	0.0401	4.6	0.513	0.985
No reported problem	1.043	0.4767	1.1	0.929	1.172
Reported problem in school conduct	0.976	0.6626	0.6	0.875	1.089

Result: Adolescents with good school conduct at the time of their final assessment have a statistically significant difference in their treatment effects: among youth with alleged good school conduct, the reoffending risk of those with improved moral agency score is 0.71 times the risk of adolescents who do not display improvement in moral agency. Since the p-value is small (0.04) and the 95% CI doesn't overlap 1, we have some confidence that improved moral agency reduces reoffense among juvenile delinquents with good school conduct. The result suggests that community placement programs attempting to improve moral decision-making in juvenile delinquents are likely to be more effective in reducing reoffending risk among those who follow school regulations and exhibit closer ties with educational institutions.

Moderator: Friends. Balance statistics: the covariate balance plot suggests that the exact matched object on Friends has a relatively good overall balance, with all covariates' SMDs staying within the 0.1 threshold. Most subgroups of the moderator have good balance, with no covariate exceeding the 0.05 threshold, except for the "Exclusively Antisocial/Gang Member" subgroup, likely because this subgroup has the smallest sample size. Overall, the balance statistics and matched sample sizes within each subgroup are still relatively good according to the balance statistics table and absolute SMD plot.

FRIENDS	Estimate	Pr(>|z|)	S	2.5 %	97.5 %
<chr>	<chr>	<chr>	<chr>	<chr>	<chr>
(0) Exclusively Prosocial Friends	1.034	0.576	0.8	0.919	1.16
(1) No consistent friends	0.862	0.171	2.5	0.696	1.07
(2) Mix of Prosocial/Antisocial Friends	0.999	0.991	0.0	0.882	1.13
(3) Exclusively Antisocial/Gang Member	1.079	0.650	0.6	0.776	1.50

Result: across all subgroups of Friends, the estimates are close to 1, the p-values are greater than 0.05, and the 95% CIs all contain 1, so the result is statistically insignificant and there doesn't seem to be differences in the causal effect of moral agency on recidivism across the types of friends the adolescents socialize with.

Sensitivity Analysis

To limit the scope of my sensitivity analysis to statistically significant results (discussed in the Results section), I only conduct sensitivity analysis on the link between moral agency and recidivism among adolescents with good school conduct.

	point	lower	upper
RR	0.71100	0.513	0.985000
E-values	2.16257	NA	1.139568

The result indicates that if the estimate of the relative risk is 0.711, an E-value of 2.16 means that mental health problems will have to be 2.16 times more common in reoffenders than non-reoffenders who display good school conduct to explain away the causal association. Meanwhile, if the RR estimate is 0.98 (upper end of CI), the E-value of 1.13 suggests that mental health problems will have to be 2.16 times more common in reoffenders than non-reoffenders with good school conduct. Since this upper-CI E-value, which represents the smallest amount of unmeasured confounders that could explain away our results, is close to 1, there is a possibility that unmeasured confounders like mental health conditions can account for the causal relationship between improved moral agency and recidivism among juvenile delinquents with good school behavior. However, I also expect mental health to have a slight to moderate correlation with substance use patterns in adolescents, which are controlled for in my causal analysis, so there's still possibly a true causal relationship between change in moral agency and lowered recidivism rate among adolescents with good school discipline.

Discussion

In conclusion, contrary to what psychological theories of crime predict, the analysis result demonstrates neither a statistically significant causal association between improved moral agency and reduced recidivism in juvenile delinquents, nor are there any significant differences in the causal effect of moral agency on reoffense across the types of friends the adolescents socialize with. However, a youth's school conduct has a statistically significant moderating effect on the impact of moral agency on reoffending risk, suggesting the important crime-deterring role of education and school as an informal social control institution.

Nevertheless, there are some limitations to this project. First, as demonstrated by the sensitivity analysis result, the youth's mental health condition is an unobserved confounder that

might negate the found causal association between improvement in moral agency and reduced recidivism among adolescents with good school conduct. Second, the data is mostly self-reported due to the interviewing method adopted by the C-PACT questionnaire, so there might be a degree of bias in the treatment variable when a subject's improvement in moral agency is not reflective of real cognitive and behavioral changes. In addition, the binarized treatment variable is potentially reductive since it fails to take into account the magnitude of the change in moral agency. Finally, because the dataset doesn't include recidivism data after the 365-day follow-up period, the analysis cannot account for more long-term behavioral changes caused by an improvement in moral agency.

Regarding future directions, a compelling development for the project will be to account for both the magnitude and direction of moral agency changes in the treatment variable to quantify the impact of moral improvement on criminal behavior. In addition, I want to replicate this analysis with more comprehensive data, especially mental health data for the youth in the dataset, as well as a recidivism measure that spans longer than the current one-year period.

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