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STUDIES

Predicting criminality with social perspective taking, attachment relationship, anger, impulsivity and depression



Prédire la criminalité : perspective sociale, relation d'attachement, colère, impulsivité et dépression

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Received 31 July 2018; accepted 15 March 2019

KEYWORDS

Adult attachment;
Anger;
Criminality;
Impulsivity;
Prediction;
Social perspective taking

Summary Criminality and what turns a person into a criminal has been a moral, legal and psychological debate. Existing literature has been faithful with exploring different sides to the nature of criminality, either by tracking criminals' history of personal experiences or investigating their brain functions. In a different approach, this paper administers a behavioral perspective to studying the criminal tendency of human beings by processing scales that are strictly unidimensional in order to predict a criminal's number of crimes committed and severity of such crimes. The researchers argue that approaches to criminality through personal history is fundamentally flawed because an abstract variable such as a person's past is impossible to be randomized, quantified, and measured ethically. By creating and measuring six psychological and behavioral factors (social perspective-taking (intelligence stage), attachment relationship, anger, impulsivity, depression, and lying tendency) with unidimensional scales, the researchers were able to identify current factors and interactions between factors that are able to predict a criminal's counts and severity with a reliable strength ($r=0.819$ and $r=0.993$).

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MOTS CLÉS

Attachement adulte ;
Colère ;
Criminalité ;
Impulsivité ;
Prédiction ;
Prendre une
perspective sociale

Résumé La criminalité, et ce qui transforme une personne en criminel, est un débat moral, juridique et psychologique. La littérature existante a exploré les différents aspects de la nature de la criminalité, que ce soit en retracant l'historique des expériences personnelles des criminels ou en examinant leurs fonctions cérébrales. Dans une approche différente, cet article utilise une perspective comportementale pour étudier la tendance criminelle de l'être humain, en traitant des échelles strictement unidimensionnelles afin de prédire le nombre de crimes commis par un criminel et la gravité de ces crimes. Les chercheurs soutiennent que la méthode de l'histoire personnelle est fondamentalement défectueuse, car une variable abstraite telle que le passé d'une personne ne peut pas être triée de façon aléatoire, ni quantifiée et mesurée d'une façon éthique. En créant et en mesurant six facteurs psychologiques et comportementaux (prise de perspective sociale (stade de l'intelligence), relation d'attachement, colère, impulsivité, dépression et tendance à mentir) avec des échelles unidimensionnelles, les chercheurs ont pu identifier les facteurs, ainsi que les interactions entre ces facteurs, capables de prédire le nombre de crimes commis par un criminel et la gravité de ceux-ci de façon fiable ($r = 0,819$ et $r = 0,993$).

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Risk assessment plays an important role in both the justice and forensic psychiatric systems.

Specifically, risk assessment involves pertinent decisions such as determining the length of sentencing, admission/discharge of the criminal or civil commitment, the preventative detention, parole, probation, and the length of community supervision. Many factors have been studied to determine their association with the violent risk of criminality, including socio-demographic information, family background, developmental problems, crime history, and clinical assessment variables [1]. These factors can be broadly categorized into static factors and dynamic factors. It is generally perceived that static factors cannot be changed, while dynamic factors change as the time goes by. Traditional risk assessment instruments focus more on static factors as their main purpose is to predict the "dangerousness" or "risk" of an individual. On the other hand, dynamic factors such as attitudes, impulsivity, anger, family and social circumstances, and availability of support, are taken into consideration when assessing an individual's future risk [2].

In order to increase the predictive validity, risk assessment instruments usually adopt factors as comprehensively as possible. However, studies have shown that some risk assessment instruments are not useful for predicting criminal severity and ultimately just increase the time it takes to complete the assessment. For example, Mills et al. [3] report that a number of items in the risk assessment instruments did not distinguish between violent recidivists and non-recidivists and that the presence of these items potentially reduced the predictive accuracy of the instruments. Coid et al. [4] found that most items in the Psychopathy Checklist-Revised (PCL-R), Violence Risk Appraisal Guide (VRAG) and Historical-Clinical-Risk Management-20 (HCR-20) were not independently predictive. Thus, further research on the predictive risk factors of violence and criminality is needed.

We are aware that a person's criminal behaviors are heavily influenced by various background factors and act as reasons for determining why an individual has a higher chance of committing crimes.

Substantive literature on the demographics predictors of criminality, such as level of education received, family background, socioeconomic status, employment status, substance dependency and previous criminal history, is available. However, informative data about these predictors are often difficult to collect because of their multidimensional nature. All of the variables are interconnected, which makes them inadequate as a good predictive factor. However, these multidimensional background details create the environment that shaped the criminal. Through measuring their present-day performances, we are able to extract a good picture of their overall well-being in which those background details are largely accounted for.

Social Perspective Taking (SPT) is the ability to interpret other people's mental states [5]. Studies suggest those high in perspective taking make better predictions of other people's behaviors and appropriately respond to them [6]. Lack of perspective taking is associated with problems in physical and mental health, social adjustment, and moral development. Additional clinical symptoms such as depression, autism spectrum disorders, and conduct disorder have been associated with low levels of perspective taking [7]. Social adjustment problems can arise when people find it difficult to understand, relate to, and bond with others. The inability to understand other people's words and actions can not only lead to conflict, but to loneliness, isolation, and poor self-esteem [7]. However, few studies have investigated the relationship between social perspective taking and criminal behavior. The present study will measure social perspective taking using a scale [8] based on Commons' Model of Hierarchical Complexity [9].

Previous studies suggest measures of impulsivity and anger can predict violence or criminal behavior [10]. The present study investigates the relationship between impulsivity and anger as predictors of criminality. Appelbaum et al. [11] found that controlling for the effect of anger and impulsivity eliminated the significant association between self-reported threat/control override symptoms and violence. Numerous studies have indicated a positive association between anger and aggressive behavior, suggesting that anger can lead to physical aggression and serves as a component of aggression [12]. Coid et al. [13] also found that anger due to delusional beliefs was a key factor in explaining the association between first episode psychosis and violence in a UK study. Beck [14] reported that people who easily become angry are prone to interpret other people's viewpoints or behavior negatively and respond aggressively. Hostile attribution bias, or the process by which an individual interprets ambiguous or possibly benign behavior exhibited by others as a personal attack, usually leads to aggression [15].

Existing literature postulates that impulsivity plays a significant role in violence, antisocial and criminal behavior [16–20]. Higher levels of impulsivity have traditionally been linked to aggressive behavior [21]. Greater impulsivity has also been found to distinguish violent from nonviolent juvenile offenders [22]. However, a recent systematic review of the relationship between impulsivity and violence has reported only 2 out of the 22 estimates obtained from bivariate analysis show evidence for an impulsivity-violence link [23]. Therefore, levels of impulsivity exhibited by criminals require further study.

The present study also selected adult attachment as a risk factor of criminality. Attachment relationships represent the availability and acceptance of external support system of a person in time of distress. Attachment is a deep and enduring emotional bond that connects one person to another across time and space [24], providing individuals with physical and emotional support and increasing their sense of security, particularly in times of stress or need [25]. The interaction of environmental (especially parental) and genetic factors in early development leads to individual differences in patterns of attachment behavior [26]. Attachment theory provides a useful framework for understanding violence as it acknowledges the importance of both interpersonal and developmental factors. Attachment has been shown to influence a wide array of biopsychosocial phenomena, including social functioning, coping, stress response, psychological well-being, health behavior, and morbidity [27–30]. Existing literature suggests that insecure attachment is strongly associated with all types of criminality [31].

Depression was another risk factor selected for the present study. Depressive symptoms include feelings of helplessness and hopelessness, loss of interest in daily activities, appetite or weight changes, sleep changes, anger or irritability, loss of energy, self-loathing, and reckless behavior. Evidence for an association between depression and criminality has been found [32]. As a result of these findings, depression was also selected as a risk factor for criminality in the present study.

Risk assessment is most effective when using actuarial methods of data combination rather than focusing on individual factors such as criminal history, age, and other simple,

well-known risk factors [33–35]. Also, the variable of someone's state of imprisonment is not a sufficient assessment of that person's criminal behavior. The variables of number and severity of crimes offer a more comprehensive, accurate, and holistic measurement of participants' criminal behaviors. The goal of this research is to use six factors (social perspective-taking, attachment, anger, impulsivity, depression, and lying) to predict number of crimes committed and the severity of such crimes. It is widely thought that the additive impact of these variables on people would make them more likely to commit a crime [33–35]. However, this study will show that the multiplicative impact or the interaction between these variables is more likely to promote criminal behaviors.

The researchers began by collecting data on the six factors mentioned above using six, separated, and single-dimensional measuring scales. Then, a correlation test was run between the measured data and the participants' number of crimes and severity of crimes to identify possible correspondent relationships.

Next, the data went under a multiple regression model so that those relationships between the independent variables and dependent variables could be tested for predictive characteristics. In the case a predictive variable(s) is found, it would be possible to (1) construct a new model for predicting criminal tendencies and (2) provide information for criminality prevention and correction. A positive correlation is expected to be found between participants' anger, impulsivity, and attachment scores with the number and severity of crimes. Identifying and isolating these factors will contribute in preventing and correcting criminal behaviors.

The prediction of number and severity of crimes is an important research topic within the context of ethics and public health. Criminal behavior can jeopardize public health. More severe crimes, and violent crimes, can result in the harm of individuals. The first step toward preventing violent and severe crimes is researching factors that may be able to predict criminal behavior. Here we propose that a necessary step is to predict the number of crimes a person commits and also their severity. Then with such predictions, one might have some notion as to what interventions should be addressed.

Methods

Participants

The data was collected at Worcester County Jail over three days. This prison only holds male inmates, with an average age of 37.3. All prisoners interested in participating the study were recruited. Prior to filling out the scales, written informed consent for all the participants were obtained. The participants got some coffee and dessert as compensation for completing the study.

Procedures

The present study consisted of three steps: first, the development of scales to assess the six factors that will be used to predict criminality (attachment, impulsivity, anger, depression, lying, and social perspective taking); second, a pilot

study was implemented to test and refine the six measures; and third, a formal study was conducted in order to analyze the six factors' individual ability to predict criminality as well as assess their interactions.

Two different methods were used to construct new scales. The first method was by making use of former studies. We obtained the data collected for established scales on which we performed statistical analysis to sort out items that were statistically significant and one-dimensional. The second method was by selecting items from a pool of items from different scales to create a new scale that then was tested through pilot studies and modified accordingly.

Data collection

Six people were assigned to administer this study, two of whom were professors in psychology; others were students majored in psychology and psychiatry. All the criminals in the Worcester County Jail who met the criteria were invited to participate. Participants were divided into small groups randomly to complete the study. One group included 20–30 participants and these participants filled out the scales together in a room with tables and stools. One professor and two students administered the study in each room. The professor and the students gave instructions and their interpretation to the participants.

Materials

In order to generate single-dimensional scales, we gathered well-known scales and compiled the selected items into one trial scale. To ensure that a set of questions in a single scale was unidimensional, we ran factor analysis on the item scores from the trial scale as a pre-study. The trial scale was distributed by Survey Monkey. Data and feedback from this trial scale were obtained. Next, factor analysis was run in order to isolate each scale and the independent variable tested by each scale (unidimensional). A Rasch analysis [36] was then run to test for the unidimensional ordering of items. Items with high loading values on the first factor were retained.

The Six Scales

Scale 1: Helper-Person Instrument for Social Perspective-Taking[©]

The first scale measures social perspective taking by asking respondents to read seven different scenarios in which a Helper is attempting to recommend the same treatment to the same Person [9]. Each scenario is matched to a different order from the Model of Hierarchical Complexity [8], so each subsequent style of treatment recommendation expands upon the previous one. The seven scenarios correlate with seven vignettes — Seven Stages of Social Perspective Taking Skill. Each Vignette describes a helper using their own method to construct a treatment plan for a person with a serious problem. The participants are required to judge each helper's method by rating the following 4

items on a 1-6-point Likert scale ranging from 1 to 6 with 1 indicating "never" and 6 indicating "always".

The instructions are described in Appendix 1. Fig. 1 shows how the Order of Hierarchical Complexity [37] closely correlates with the stages of Social Perspective-Taking Skill ($r = .977$).

Scale 2: Attachment Relationship Scale

The scale for attachment relationship was a modification of Shaver's Experiences in Close Relationships Scale [38], which measures the security of participants' relationships. The scale was adapted in three ways: first, items that were statements of positive, secure attachment styles were changed to be negative. In this way, it will be more convenient for us to score the items and further to make statistical analysis. Second, the terms "close relationship partner" and "romantic partner" were changed to be "close friends" in order to learn about the nature of the participants' familial relationships and friendships instead of romantic relationships. Relationships to friends and family members are a better indicator of the overall attachment style of the participants, rather than their role in romantic contexts. As a result, 16 items were retained in the new scale named "Attachment Relationship Scale". Third, abstract words such as "mind" were changed into more behavioral words such as "like." The question for the participants in this scale is: "How often do you generally think or act as the following statements?" The participants are required to rate each item by selecting a number from 1–6. A rating of 1 means the participants have never thought or acted as the statement while a rating of 6 means the participants have always thought or acted as the statement.

Scale 3: Impulsivity Scale

Items for impulsivity scale were adapted from the Multi-dimensional Anger Inventory [39], The Clinical Anger Scale [40], Dysfunctional Impulsivity Scale [41] and Impulsiveness, Venturesomeness and Empathy Scale [42]. Seventeen items were retained to construct a new scale, which was named "Impulsivity Scale". We obtained six items with a factor loading of more than 0.691. Participants were again asked "How often do you generally act like the following statements?" They rated each item using a Likert scale ranging from 1 to 6, with 1 indicating participants never acted in that manner and 6 indicating they always acted in that manner.

Scale 4: Anger Scale

Items for anger scale were adapted from Novaco Anger Inventory [43], State-Trait Anger Expression Inventory [44], Multidimensional Anger Inventory [39] and Clinical Anger Scale [40]. At last 40 items were retained to construct a new scale, which was named "Anger Scale". We obtained six items with a factor loading of more than 0.787 on the first factor. Participants were asked "How often do you generally feel or act like the following statements?" They were asked to rate each item using a Likert scale ranging from 1 to 6, with 1 indicating participants never felt/acted in that manner and 6 indicating they always felt/acted in that manner.

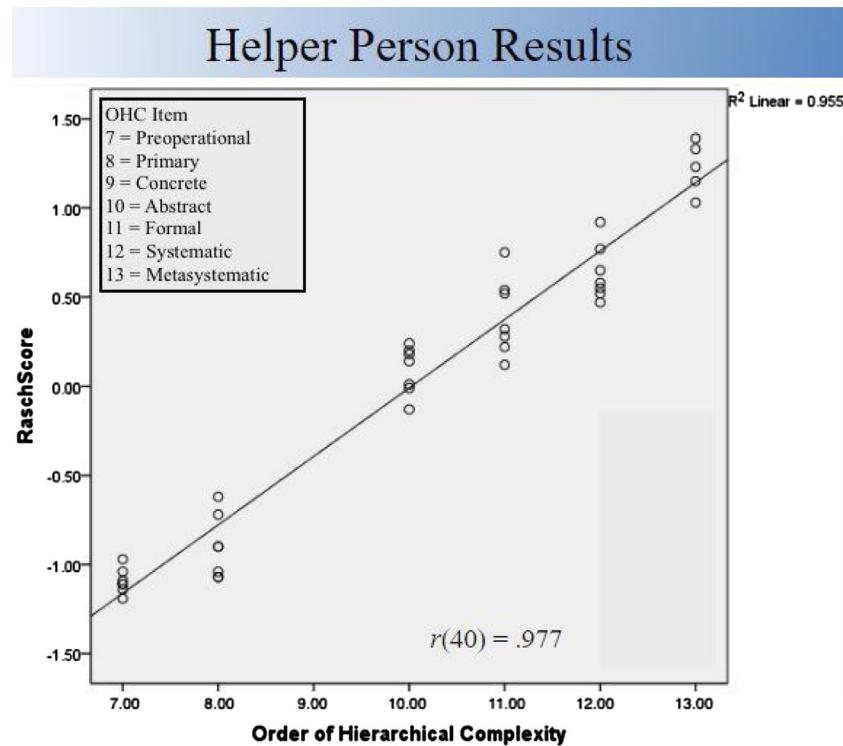


Figure 1. Rasch Score: Helper-Person.

Score Rasch : personne aidante.

We obtained six items with a factor loading of more than 0.787 on the first factor.

Scale 5: Depression Scale

This scale was constructed by Commons [45] with $n=128$. There are 10 items in this scale.

Participants were asked to rate "The way you had been feeling two weeks before and at the time you were arrested" on a Likert scale ranging from 1 to 6, with 1 indicating "never" and 6 indicating "always".

Scale 6: Lying Scale

The inmates themselves suggested that lying is one of the major behaviors that were associated with being arrested. A lying scale was adapted from a number of pre-existing criteria and the EPQ-R scale [46] and then tested. This scale included 9 items and was constructed from a number of existing criteria that suggest lying tendencies. Participants were asked to rate "How often do you do the following?" on a Likert scale ranging from 1 to 6, with 1 indicating participants never acted in that manner and 6 indicating they always acted in that manner.

All six scales can be found in the [Appendices 2 to 6](#).

Methods to score the severity of crimes

Severity of crimes was graded using the Federal Bureau of Investigation (FBI) Uniform Crime Reporting Handbook [47].

Offenses were categorized into two parts: Part I had seven levels with Criminal Homicides being Level 1 and Arson being Level 8, and Part II included all other offenses. With both parts of the FBI classification, the scale of criminal offenses ranged from 1 to 26, with the lowest numbers referring to the most severe crimes and the highest numbers referring to the least severe crimes ([Appendix 7](#)).

Participants were asked to select all the crimes they had committed according to this list. Scores were assigned to participants by adding up their responses to the scales. Then, these scores were reversed, such that lower scores signified less severe criminal activity, and higher scores signified more severe criminal activity.

Hypothesis concerning criminality

The researchers hypothesized that a prisoner's lower Social Perspective Taking results (indicating lower intelligence stage) and high results in all the other five scales will predict higher criminal characteristics, namely the number and severity of the crimes one committed ([Table 1](#)). According to the construction of these scales (besides SPT), the higher a person score on one, the more troubled they are in that specific area. For example, we could assume that if a prisoner scored high on the Attachment scale, he is more likely to show avoidant and anxious behavior, resulting in more issues in forming attachment relationships with other people. The more areas that he has troubles with, the more likely it is that he commits crimes, and crimes with dire consequences.

Table 1 Hypothesis of the association between six factors and crimes.
Hypothèses d'association entre six facteurs et les crimes.

Factors	High number of crimes More severe crimes
Social perspective taking	Lower stages
Attachment relationship	High, more likely to show avoidant and anxious behavior
Anger	High, more likely to be intensely angry
Impulsivity	High, more likely to be impulsive
Depression	High
Lying	High

Table 2 Prisoners' demographic information.
Informations démographiques sur les prisonniers.

Index	n	Min	Max	Mean	SD
Age	155	19.00	69.00	37.30	11.66
Education	166	6.00	15.00	11.35	1.72
Relationship with parents	146	1.00	6.00	4.52	1.57
Job Satisfaction	157	1.00	6.00	4.32	1.51
Relationship with partners	128	1.00	6.00	4.00	1.68
Satisfaction with life	162	1.00	6.00	3.72	1.52

Interaction terms in the multiple regression

The interaction terms for the six independent variables are the product of Rasch person scores of two or more independent variables. If the six independent variable were enough, a simple linear additive regression would predict how many crimes a criminal has committed and their severity. The rule of eliminating all variables and interactions with *t* values less than 1.2 was applied.

Results

Demographic

There were 170 participants ($M_{age} = 37.50$, $SD_{age} = 11.71$). All the participants are male as the prison where we collected data only holds male inmates. Demographical information of participants are listed in the [Table 2](#).

Correlation and regression analysis between factors and number of crimes

Correlation and regression analyses were performed on collected data to identify the relationship between the inmates' performance on the six scales (Social Perspective-Taking, attachment relationship, impulsivity, depression, anger, and lying tendency) and recorded number of crimes as well as level of such crimes on the FBI scale. The statistical results for the predictive value of our factors was as follows: for predicting the number of crimes, the *r* is 0.819; for the severity of crime, the *r* is 0.993. All were statistically significant.

The first multi-regression analysis showed four interactions that are statistically significant in predicting the number of crimes after other variables in the model was controlled [$r = 0.819$, $R^2 = 0.670$, $F(7, 36) = 10.464$, $P < 0.001$]. The significance on the Attachment result indicates that the more anxious and insecure a person is with his close relationships, the more likely it is that he has committed more crimes ($\beta = .836$). However, the more depressed a prisoner is, the lower the number of crimes committed are in his record ($\beta = -.327$). Crime counts also correlated negatively with the interactions between anger problems and intelligence stage ($\beta = -1.22$). For example, a person who is angrier but operates at a higher intelligence stage had a smaller crime count. The same could be applied to the interaction between anger and lying tendency. If a person gets angry more easily but lies less often, then his crime count is expected to be lower ($\beta = -.991$). [Tables 3–5](#) demonstrate these statistical findings. Beta (β) is the correlation between the predictor variables and dependent outcome variables. These were both positive and negative.

To deal with missing data for two-way interaction variables, the following is done. Suppose that interaction variable "Helper-person*Lie" had a missing data point, we create a new variable from the mean of other data in the same category, Helper-person*Lie*M (M stands for Missing variable).

Correlation and regression analysis between factors and severity of crimes

Concerning severity of crimes, the overall multi-regression model was statistically significant and produced an *r* of 0.993 ([Tables 6 and 7](#)). Significant predictors of crime severity included anger ($\beta = -.551$), attachment ($\beta = -1.928$), intelligence stage (Helper-person) ($\beta = .273$), depression

Table 3 Multi-regression analysis for number of crime.
Analyse de régression multiple pour le nombre de crimes.

Model	Independent variable	Unstandardized coefficients		Standardized coefficients Beta (β)	<i>t</i>	Sig.
		B	Std error			
1	Constant	.591	.362		1.631	.112
	Attachement	1.341	.264	.836	5.074	.000
	Depression*Missing	-1.573	.503	-.327	-3.128	.003
	Anger*Helper-person*Missing	-10.024	1.621	-1.220	-6.183	.000
	Anger*Lie	-2.843	.494	-.991	-5.751	.000

Dependent variable: number of crimes.

Table 4 Coefficients for number of crimes.
Coefficients pour le nombre de crimes.

Model	R	R ²	Adjusted R ²	Std. error of the estimate
1	.819a	.670	.606	1.17278

Dependent variable: number of crimes.

Table 5 Model summary for number of crimes.
Résumé du modèle pour le nombre des crimes.

Model		Sum of squares	df	Mean square	F	Sig
1	Regression	100.746	7	14.392	10.464	.000
	Residual	49.515	36	1.375		
	Total	150.261	43			

Table 6 Coefficients for Severity of Crimes.
Coefficients pour la sévérité des crimes.

Model	R	R ²	Adjusted R ²	Std. error of the estimate
1	.993a	.986	.979	.37286

Dependent variable: severity of crimes.

Table 7 Model summary for severity of crimes.
Résumé du modèle pour la sévérité des crimes.

Model		Sum of squares	df	Mean square	F	Sig
1	Regression	365.609	20	18.280	131.493	.000
	Residual	5.144	37	.139		
	Total	370.753	57			

($\beta = 1.023$), and impulsivity ($\beta = .273$). Cross interactions between these factors and lying tendency also appear significant (See Table 8).

To deal with missing data for two-way interaction variables, the following is done. Suppose that interaction variable "Helper-person*Lie" had a missing data point, we create a new variable from the mean of other data in the same category, Helper-person*Lie*M (M stands for Missing variable).

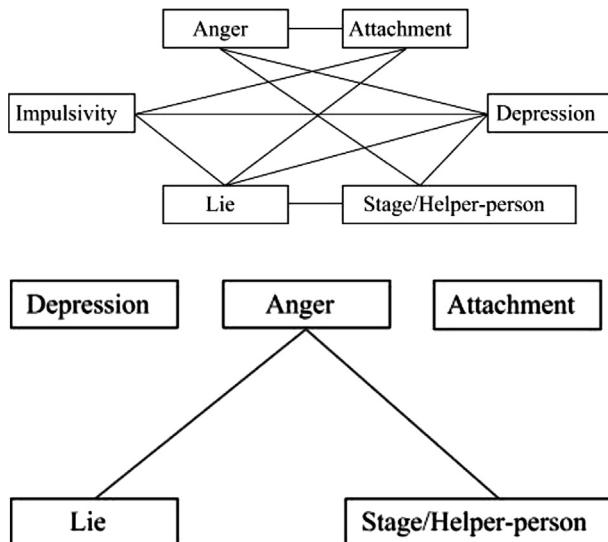
Discussion

The strong predictive variables in Figs. 2 and 3 below show a complicated, interconnected nature of behavioral characteristics in predicting criminality. A single factor could be strong in predictive strength but not as strong as the strength created from the relationship between variables, especially in predicting crime severity. This finding supports

Table 8 Multi-regression analysis for severity of crimes.
Analyse à régression multiple pour la sévérité des crimes.

Model	Independent variable	Unstandardized coefficients		Standardized coefficients Beta (β)	t	Sig.
		B	Std error			
1	(Constant)	.329	.075		4.389	.000
2	Anger*Missing	-10.017	.642	-.551	-15.613	.000
3	Attachment	-4.217	.101	-1.928	-41.938	.000
4	Attachment*Missing	-4.807	.411	-.332	-11.696	.000
5	Depression	.310	.050	.206	6.211	.000
6	Depression*Missing	6.720	.206	1.023	32.625	.000
7	Helper-person	.469	.069	.173	6.767	.000
8	Helper-person*Missing	1.727	.159	.273	10.856	.000
9	Impulsivity*Missing	11.414	.589	.686	19.376	.000
10	Anger*Attachment	-.729	.028	-1.040	-25.980	.000
11	Anger*Depression	.432	.023	.748	18.646	.000
12	Anger*Helper-person	-.272	.024	-.284	-11.166	.000
13	Attachment*Impulsivity	.428	.033	.036	12.905	.000
14	Attachment*Lie	10.429	.322	.519	32.396	.000
15	Depression*Helper-person	-1.248	.043	1.396	-29.217	.000
16	Depression*Impulsivity	.416	.028	-1.038	14.911	.000
17	Depression*Lie	4.070	.139	.611	29.314	.000
18	Helper-person*Lie	2.549	.145	1.168	17.570	.000
19	Impulsivity*Lie*Missing	-29.136	.717	.539	-40.654	.000

Dependent variable: severity of crimes.



Figures 2 and 3. Variables interactions in predicting severity of crimes.

Les interactions des variables pour prédire la sévérité des crimes.

our argument that the interaction between variables has a greater contribution to crime count/severity among all the variables, because they suggest more details of each individual, without relying on non-controllable, non-measurable background data.

In predicting the number of crimes, one of the strongest predictors was attachment relationship.

Those who scored high on the attachment scale tend to encounter more troubles establishing long-term attachment

relationship, which can be categorized as an asocial behavior. Interestingly, anger inversely interacted with intelligence stage as significant predictors for number of crimes. This demonstrates that if a person is more quick-tempered and operates at a lower intelligence stage, he is more likely to commit more crimes. This inverse relationship suggests if a person is more prone to being angry, he lacks self-control to regulate his anger. Lying more and being more intelligent, on the other hand, are characteristics that require more self-control and more thinking before action. This inverse relationship between anger, lying and intelligence revealed the importance of level of impulsivity, even though impulsivity as a measured factor was not statistically significant.

The regression model for crime severity highlighted two most influential contributing factors: impulsivity and attachment (in interaction with lying), which means that people who are impulsive with poor skills at forming attachment relationships tend to commit the most severe crimes. This finding fuels a new aspect to studying criminality and the distinction between low-level and high-level crimes. Existing literature and investigations have covered many factors leading to criminality but few have mentioned impulsivity as a leading causation. Impulsivity is explored, however, by Gottfredson and Hirschi [48] using the phrase "low self-control". This study successfully established a connection between impulsivity and a criminal's severity of crimes. In addition to our similar findings from the prediction of number of crimes, impulsivity and attachment appear to be the most important factors in our measurement of criminality.

Confounding variables such as background details were strictly ruled out in order to preserve the unidimensional characteristic of the variables. Why? Because there exists no ethical way of controlling for background elements. The

New South Wales (NSW) Bureau of Crimes and Statistical Research listed twenty factors that formulate the causation of crimes [49] yet most of which are background factors, which are impossible to measure without randomized studies. Even though a person's upbringing has heavily influenced his current circumstances and decision making processes, it is impossible to measure any background detail cleanly without randomized control trial. However, by measuring his current characteristics, we can gain access to not all but most of the effects that any background elements might have inflicted on a person and will continue to influence that person's life.

What is the significance in measuring number of crimes and severity of crimes?

Crimes reject norms and can cause harm to people within a society. The purpose of criminal justice systems is to protect people from harm and maintain social harmony, resulting in the overarching goal of minimizing crime frequency and severity. Prisons serve as punishment for the rejection of social norms, but clearly do not stop people from committing crimes. Understanding the causes of criminal behavior will make it possible to understand how to reduce crime frequency and severity.

Criminal behavior does not have a singular definition, but rather describes a wide range of offences.

The measurement of criminal severity does not depend on the number of crimes committed. A person who commits numerous petty small crimes because of situational difficulties, such as poverty or drug dependency, should have overall low crime severity because of the lack of desire to harm others. On the other hand, a person whose only and first offence is forcible rape or murder should be considered to have higher crime severity and higher overall criminal tendency.

It is important that these six behavioral characteristics, especially impulsivity and attachment relationship, were identified to be predictive of a person's criminal tendency because these issues are treatable. Performances in stage of perspective taking [50] may be raised by having people learn to act in plays, predicting what effects their behavior will have on others, and relating how they feel when being treated with the way they are planning to treat others. Depression may be treated with Cognitive-Behavior Therapy. Impulsivity may be treated using Applied Behavioral Analytic interventions. These findings are valuable to the prevention and treatment of criminals in a practical and imminent way. While a criminal's past experiences or trauma cannot be altered, interventions can certainly be made to alter their current performances on these six factors during rehabilitation. Optimistically, these actions would help reduce the number and severity of crimes in the long run.

For future directions, we look forward to improving the reliability of the data by expanding our inmate male sample. It is hypothesized that in the circumstance of a bigger, more diverse pool of data, the predictive value " r " will decrease but the strongest predictive factors remain to be impulsivity and attachment relationship. Further

research should experiment with constructing new scales that are behavioral and unidimensional.

Acknowledgement

Thanks to my Harvard Medical School advisor Michael Lampert Commons and to the team of researchers that helped me collect the data: Patrice Marie Miller, Dristi Adhikari, Sagun Giri, William Joseph Harrigan. I would also like to thank Juan LaLlave for his work translating participants' responses from Spanish into English. All the instruments are copyrighted by the Dare Association, Inc., 2019, Cambridge, Massachusetts. This work is supported by the China Postdoctoral Science Foundation (2018M643488).

Disclosure of interest

The authors declare that they have no competing interest.

Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at <https://doi.org/10.1016/j.jemep.2019.03.004>.

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