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Juvenile delinquency risk factors: Individual, social, opportunity or all of these together?

Abstract

There is extensive literature on risk factors leading to criminal behavior. However, most of these studies have been conducted in European and Anglo-Saxon countries, and there are few analogous studies in Latin America. Our main aim was to analyze whether the criminal risk level estimated from the interaction between antisocial motivation and criminal opportunities helps to differentiate between adolescents with and without delinquent behavior (as proposed in the Triple Risk for Delinquency Model). We measured both official and self-reported antisocial behavior in a sample of 211 young people in Argentina. The results show a significant association between delinquency and personal, social and opportunity risk factors. Also, it was possible to differentiate between adolescents with and without official and self-reported antisocial behavior with high sensitivity and specificity, based on the estimation of criminal risk levels. We discuss the relevance and implications of these findings within the particular context of this study.

Keywords: Triple Risk for Delinquency Model; Juvenile Delinquency; Criminal Risk; Criminal Motivation; Criminal Opportunities.

1. Introduction

Violence and juvenile delinquency cause great social concern throughout the world (Krug, Mercy, Dahlberg, & Zwi, 2002; Marshall & Enzmann, 2012), including Latin America, where there are countries with the highest crime rates on the planet. Although Argentina may be considered one of the safest Latin American countries, it still has much higher delinquency rates than those of North America, Europe and Oceania. In the case of victims or aggressors who are children and young people, these rates triple (UNODC, 2013).

Every year in Argentina, about 4,000 adolescents from 14 to 17 years old are institutionalized for committing crimes (UNICEF & SeNAF, 2015). Of these, around 15% are from the province of Córdoba, the context of this study (which has a rate of institutionalized juvenile delinquents of around 477/100,000). Many are sentenced for robberies (up to 80%), but also for injuries, sexual assault and homicide (Centro de Estudios y Proyectos Judiciales, 2016).

However, the juvenile crimes reported in official records represent only a part of the total number of offences committed by young people. To know more precisely the overall magnitude of juvenile delinquency, complementary methods such as self-report questionnaires must be used. Both official crime figures and self-report figures have advantages and disadvantages. Official data reveal the most serious crimes, but a high proportion infractions remain undetected. Self-report questionnaires, on the other hand, show up many more antisocial behaviors, but are unlikely to detect the most serious crimes. The best way to estimate the prevalence of juvenile delinquency is thus to combine official figures and self-report methods (Farrington & Toffi, 2011). This has been done in this study.

Longitudinal and cross-sectional research studies have helped to understand criminal risk factors and how they vary throughout life (Enzmann et al., 2018; Farrington, Gaffney, & Ttofi, 2017; Jolliffe, Farrington, Piquero, MacLeod, & van de Weijer, 2017). Risk factors are individual, social and environmental elements whose presence increases the probability of criminal behavior (Case & Haines, 2009; Farrington, Ttofi, Crago, & Coid, 2015; Lai, Zeng, & Chu, 2015; Redondo Illescas, 2015).

Individual risk factors may include personal propensities, habits, cognitions, attitudes and emotions (Assink et al., 2015; Pyle, Flower, Fall, & Williams, 2015). Some individual variables have been especially associated with juvenile delinquency, including high impulsivity or lack of self-control (Bolger, Meldrum, & Barnes, 2018; Just et al., 2017; Portnoy et al., 2014), anti-social beliefs (Antunes & Ahlin, 2017), and addiction to alcohol and other toxic substances (Brown & Shillington, 2017; Chassin, Masion, Nichter, & Pandika, 2016; Hillege, Brand, Mulder, Vermeiren, & van Domburgh, 2017; Racz et al., 2016).

Social risk factors combine all possible criminal influences arising from the family, school, friends, and the social environment. These particularly include affective and educational deficiencies in the family and school (Clarke, 2017; Moitra, Mukherjee, & Chatterjee, 2018; Ohara & Matsuura, 2016) as well as the possible links of youths with delinquent friends (Junger-Tas et al., 2012; Slagt, Dubas, Deković, Haselager, & van Aken, 2015; Thomas, 2015).

Finally, environmental risk factors are all those situations and opportunities that precede crimes and may facilitate and stimulate them (e.g., unprotected properties, vulnerable victims, living in criminogenic neighborhoods) (Graif, 2015; Sciandra et al., 2013).

To help to explain and prevent crime, a current research priority is the analysis of the risk factors related to juvenile delinquency. This analysis is not, however, a simple task, because individual, social and environmental risk factors usually do not operate in isolation, but cumulatively and interactively (Baskin-Sommers et al., 2016; Humphrey & Gibbs Van Brunschot, 2018; Jolliffe et al., 2017; Mann et al., 2016; Meinert & Reinecke, 2018; Yun, Kim, & Park, 2016). Studies with juvenile samples from the United States (Baskin-Sommers et al., 2016; Hautala, Sittner, & Whitbeck, 2016; Hay & Forrest, 2008), Great Britain (Wikström & Svensson, 2008), Germany (Meinert & Reinecke, 2018; Seddig, 2014), Sweden (Wikström & Svensson, 2008), Finland (Salmi & Kivivuori, 2006) and the Netherlands (Janssen, Eichelsheim, Deković, & Bruinsma, 2016) have all described the combined influence of risk factors on delinquency.

Empirical evidence also indicates that a single risk factor is unlikely to explain criminal behavior, but rather that various internal and external factors jointly affect young people (Baskin-Sommers et al., 2016; Humphrey & Gibbs Van Brunschot, 2018; Mann et al., 2016; Seddig, 2014; Yun et al., 2016). Moreover, in multivariate analysis, the interaction of risk factors has shown a greater predictive power than the effect of each individual risk factor. Interaction thus seems to mark the most powerful process of procriminal influence (Parent, Laurier, Guay, & Fedette, 2016).

The concept of multifactoriality and the interaction of sources of criminal risk underlies the Triple Risk for Delinquency Model (TRD, Redondo Illescas, 2008, 2015). Redondo considers that, to better explain criminal behavior, it is necessary to examine the interaction between three complementary types of criminogenic influences or sources: a) personal risk factors, which may hinder personal development and socialization processes (e.g., low self-control, poor interpersonal skills, antisocial beliefs, drug dependence); b) deficiencies in prosocial support, which may also hamper the youth's

socialization processes (e.g., family deprivation, school disengagement, delinquent friends); and c) exposure to environmental risk factors or criminal opportunities (e.g., aggressive provocations, unprotected properties, living in degraded or criminogenic neighborhoods). The model suggests that if personal risk factors and a lack of prosocial support continuously interact to influence youths, this will determine their possible "criminal motivation" (CM) or their individual propensity towards crime. This criminal motivation will later interact with any "criminal opportunities" (CO) the subject is exposed to.

Thus, combining "criminal motivation" (low/high) and exposure to "criminal opportunities" (infrequent/frequent), three main theoretical predictions can be made: *a)* when both risk influences are low, a low criminal risk is expected; *b)* when one of them is low but the other is high, an intermediate/moderate risk of crime may be expected; and *c)* when both levels of risk are high, a high level of criminal risk should be expected (Redondo Illescas, 2015).

Pérez Ramírez (2012) empirically analyzed the predictions of the TRD Model (Redondo Illescas, 2008, 2015) through a sample of more than 2,000 young men from the British Cohort Study. The interaction (multiplication) between "antisocial beliefs" (personal risk factor) and "having delinquent friends" (prosocial deficiency) led him to define the construct "criminal motivation". This was later combined with the variable "criminal opportunity". As expected from the TRD Model, among individuals with low criminal motivation and infrequent exposure to criminal opportunities, there was a low proportion of offenders (21%); among those with either high criminal motivation or frequent exposure to criminal opportunities, he found a medium percentage of offenders (39% and 53%, respectively); and, finally, the highest proportion of young offenders

(69%) was in the small group of the youth population with both high criminal motivation and high exposure to criminal opportunities.

Studies on delinquency risk factors and their interaction are mainly from European and Anglo-Saxon contexts, and there have been few similar analyses in Latin America, or specifically in Argentina. Some studies in Argentina assessed the relationship between delinquency or aggressive behavior and particular risk factors such as self-control (Nardecchia, Casari, & Briccola, 2016), substance abuse (Cosacov & Croccia, 2007; Pierobon, Barak, Hazrati, & Jacobsen, 2013) or parental styles (Richaud et al., 2013). But we found no studies exploring the interaction and reciprocal reinforcement between different risk factors. Our aim in this study is to provide evidence to help fill this gap in knowledge.

Evidence-based rehabilitation interventions for young people are scarce in Argentina. One in four young people who come into contact with the justice system are directly deprived of their liberty, and decision makers are proposing to reduce the age of imputability as one of the main solutions for juvenile delinquency (Bruno, Misuraca, & Monath, 2018). Theory-guided study of risk factors and their interaction is therefore of fundamental importance. Previous studies have shown that the types of antisocial behaviors and their risk factors in the region are not dissimilar to those presented by adolescents in other regions (Arbach, Santuoro, Lumello, & Garrido, 2013; Bobbio, Arbach, & Vazsonyi, 2018; Rodríguez, 2011). We could therefore expect that the risk factors we selected from the current research literature might also explain the antisocial behavior of Argentinean youth. It is at least a very valuable starting point for developing evidence-based public policy in a context where the empirical research of delinquency has been scarce. Understanding how these predictors operate in this population would

help to generate more informed and comprehensive risk management and preventive strategies.

2. Objective

Our main aim was to analyze whether the risk level estimated from the interaction of antisocial motivation and criminal opportunities is useful to differentiate between adolescents with and without official and self-reported juvenile delinquent behavior. We therefore set two complementary objectives: a) to analyze the relation between various risk factors (of a personal, social and environmental nature) with each criterion in order to identify those with stronger associations; and b) to estimate the adolescents' risk level based on the interaction between their antisocial motivation (which is a product of personal and social risks) and their exposure to criminal opportunities.

3. Methodology

3.1 Participants

An accidental (non-probabilistic) sample of 257 male adolescents aged 13 to 20 years from the province of Córdoba (Argentina) was evaluated. Of these, 89 subjects (35%) were young offenders resident in a juvenile detention center. The rest were adolescents from four secondary schools in the city of Córdoba and neighboring towns.

After the inspection of lost values, 46 subjects who had left more than 10% of any scale unanswered were removed from the sample. Thus, the final sample was composed of 211 participants whose sociodemographic data are presented in Table 1.

3.2 Procedure

A retrospective *ex post facto* design with accidental sampling was used for the study (Montero & León, 2007). High school educational institutions were recruited through an open call in social networks (Facebook and WhatsApp). Authorities from seven schools answered the call and requested information about the study. They received a copy of the research protocol. Finally, four schools agreed to participate. Two of the schools (one public and one private) were located in Córdoba, a city with nearly 1.4 million inhabitants. The other two (one public and one private) were located in cities of the same province with less than 30,000 inhabitants. The juvenile detention center is the only one in the province. The study sample represents 35% of the total population in the institution at the time of the assessment.

Given the legal concept of "progressive autonomy" established in the Argentinean Civil Code (Ley 26994, 2015) and the anonymity and confidentiality that had to be maintained on the data, the required parental consent was left to the responsibility of the schools. The methodological problems arising from dependence on parental consent, such as the alteration of the representativeness of the sample, have been described elsewhere (Baldwin Tigges, 2003; Esbensen, Huges Miller, Taylor, He, & Freng, 1999). One school required the consent of at least one parent. In this case, nearly 60% of the subjects were lost (parents did not return the request for consent or did not authorize their son or daughter to participate). In institutions where parental support was not requested and the school acted as the guarantor of ethical treatment of the data, every adolescent agreed to participate.

The questionnaires were administered collectively in the presence of one of the researchers and of a member of staff from each institution. All participants were asked for their informed consent to participate in the study, in line with the ethical norms of psychological research in Argentina (FePRA, 2013) and national legislation for the

protection of personal data (Ley 25326, 2000). The consent form explained the aims of the study, that participation in it was voluntary, and that the data collected was confidential.

For participants lacking the necessary reading skills (*n*=7 participants in the official offender group), the protocol was administered individually and verbally. In these cases, a researcher read the items aloud and each participant marked the answers in an anonymized protocol to guarantee the confidentiality of the data and reduce possible biases due to social desirability.

3.3 Variables and materials

Following the specialized bibliography, we defined several risk factors for the purposes of this study corresponding to the risk categories mentioned earlier (individual, social and environmental). The variables were chosen because many meta-analyses evidence (Hoeve et al., 2009; Lipsey, 1997; Vazsonyi, Mikuška, & Kelley, 2017) showed that they are consistent predictors of criminal and violent behavior in adolescents. We also defined the measurement procedures.

3.3.1 Individual risk factors

Low self-control. This variable was evaluated with the Spanish version (Bobbio & Arbach, 2017) of the Low Self-control Scale (Grasmick, Tittle, Bursik, & Arneklev, 1993), which describes the usual characteristics of people with low levels of self-control. The answers to each of the 24 items on the scale are on a 5-point Likert scale from *totally false* (0) to *totally true* (4), depending on the degree to which each subject identified with

each personal characteristic described. The scale showed a good reliability index in the sample evaluated here (α = .86).

Alcohol abuse. This was evaluated using the alcohol consumption subscale of the Normative Deviance Scale (NDS, Vazsonyi, Pickering, Junger, & Hessing, 2001) in its Spanish version (Garrido, Cupani, & Arbach, 2015). The subscale contains 7 items and the answers are presented in a 5-point Likert scale from *I never did it* (0) to *I did it 6 times or more* (4). The score in each item was added to obtain a total score that ranges from 0 to 28. The reliability index of the scale was acceptable (α = .79).

Drug Abuse. This was assessed using the 8-item drug use subscale of the NDS Spanish version mentioned above (Garrido et al., 2015). One item was excluded ("going to work drunk or high") due to 85% missing data. The answers and the total score were weighted as described for the alcohol consumption subscale. The total score in this scale ranges from 0 to 28. The reliability index of the subscale was very good (α = .91).

3.3.2 Social risk factors

Poor maternal parenthood*:* Parental practices in the family were evaluated through the Spanish version (Bobbio, Arbach, & Alderete, 2016) of the Adolescent Family Process Measure (Vazsonyi, Hibbert, & Blake Snider, 2003). This instrument measures the adolescents' perception about relationships with their mothers and fathers (or substitutes). It is answered on a 5-point Likert scale from *Totally false* (0) to *Totally true* (4). The items of *closeness* (e.g."I am closer to my mother than are a lot of kids my age."), *monitoring* (e.g. "In my free time away from home, my mother knows who I'm with and where I am"), *communication* (e.g. "I talk to my mother about major personal decisions") and *approval of peers* (e.g. "In general my mother approves of my friends"), were recoded in reverse to weigh them in their unfavorable or risky dimension. Given the high

percentage of data lost in relation to fathers' parenting practices (which would have led to an additional loss of 15% of the subjects), only the 25-item mothers' parental practices scale was included in the analysis, which is a strategy allowed by the tool (Vazsonyi et al., 2003). The score in each item was added to obtain a total score from 0 to 100, with the highest scores showing worst practices by mothers. The scale had a good reliability index (α = .82).

Antisocial peers. The possible link of participants with antisocial peers was evaluated by asking how many friends in their group performed any of eight offensive behaviors: smoking marijuana, drinking alcohol regularly, destroying things in public places, destroying other people's things, using drugs (cocaine, pills, paco[1], etc.), threatening or attacking others, violently arguing with parents or teachers, or stealing. The response options were on a 3-point Likert scale from *None of my friends do it* (0) to *Most of my friends do it* (2). The score in each item is added to obtain a total score from 0 to 16. This variable showed a good reliability index (α = .82).

3.3.3 Environmental risks or criminal opportunity

Criminogenic Neighborhood or Criminal opportunity (CO). The degree to which participants might be exposed to criminogenic environments or criminal opportunities was indirectly weighed through four questions about the subjects' perception of the degree of vandalism, abandoned houses, thefts, and aggression between neighbors in their neighborhood. The response options corresponded to a three category Likert scale from *This never happens in my neighborhood* (0) to *this happens frequently in my neighborhood* (2). The items were added to obtain a total score from 0 to 8. The scale showed a good reliability index (α = .81).

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[1] 'Paco'is the cocaine base paste, similar to crack.

Unlike other variables which we measured with standardized instruments (i.e. self-control), we found no theoretically guided standardized instruments to assess the variables antisocial peers and criminogenic neighborhood. Traditionally, these have been evaluated based on the needs of each particular study following empirical criteria. This work was no exception. We based the item design and response categories on previous work (Cretacci, 2008; Redondo Illescas, 2015, 2017; Vera & Moon, 2012) but adapted them to assess in peers and neighborhood the same antisocial behaviors evaluated in participants (i.e. substance use, theft, vandalism and aggression). In a previous work, these instruments showed a one-dimensional structure and good internal consistency (Bobbio, 2019).

3.3.4 Criminal motivation and criminal risk

Criminal motivation (CM). To assess possible interaction and potentiation between different risk factors, we defined the criminal motivation (CM) variable according the TRD Model, as the product of the confluence between individual and social risk factors. To operationally estimate this interaction, we selected the variable from each of these risk categories that was most correlated with criminal behavior (both official and self-reported, see Table 2): *drug abuse* (as an individual risk indicator) and *antisocial peers* (as an indicator of deficiencies in prosocial support). As an estimate of CM, the variables were multiplied, obtaining a CM score distribution from 0 to 448 points. Thus, for example, a subject who scored 5 in drug abuse and 7 in antisocial pairs, scored 35 points in the CM variable.

For methodological reasons, the CM (range 0-448) and CO (range 0-8) scores were dichotomized by the score corresponding to the 75th percentile, which resulted in a cut-off score of 90 and 5, respectively. The choice of the 75th percentile as the cut-off point

to dichotomize the risk factors is a method frequently used in studies to determine the presence or absence of a certain risk factor (see Laub & Sampson, 2006; Pérez Ramírez, 2012). Then, these cutoff points constituted the point of intersection of the axes of a Cartesian quadrant (see Figure 1) with CM (low/high) on the ordinates axis and CO (infrequent and minor/frequent and serious) on the abscissa.

Criminal risk. Previous operationalizations made it possible to classify the subjects in one of the following categories of criminal risk: (1) low risk, if both CM and CO scores were low; (2) moderate risk by CM, if motivation was high but criminal opportunity was low; (3) moderate risk by CO, if the criminal opportunity score was high but the criminal motivation was low; and (4) high risk if the scores on CM and CO were both high.

3.3.5 Criterion variables

As criterion variables, two indicators of antisocial behavior were evaluated:

Official records of antisocial behavior, defined dichotomously: young *offenders* (residents in a closed detention center) and young *non-offenders* (from school institutions). If a youth from the school institutions reported having been in a closed detention center at least once, he was included in the young offender group.

Self-reported antisocial behavior, initially defined as a continuous variable from the sum of the subscales of *Vandalism*, *Theft* and *Physical aggression* of the NDS (Garrido et al., 2015), composed respectively of 7, 5 and 6 items that were answered as previously described for the other NDS subscales. The total score ranged from 0 to 72. The subscales showed acceptable reliability indices (α = .78, .71 and .74 for *Vandalism*, *Theft* and *Physical aggression*, respectively).

In addition to assessing the frequency of antisocial behaviors, their severity was also weighted. For this, the three authors plus an external expert independently ranked the

severity of the antisocial behaviors described in each item (considering the strength or violence of each behavior as well as the seriousness attributed by juvenile criminal law). The following severity weightings were agreed: vandalistic behaviors (7 items) weighted by 1, minor theft indicators by 2 (2 items), serious theft indicators by 3 (3 items), minor physical aggressions by 4 (3 items), and serious physical aggressions by 5 (3 items). Thus, the frequency score of each subject in each item was multiplied by the severity attributed to each one, which resulted in a possible range between 0 and 188.

Finally, for data analysis purposes (similarly to how it was done with risk factors), this variable was dichotomized by the 75th percentile. Thus, two groups were formed: participants with *frequent and serious self-reported antisocial behaviors* (scores above 53, onwards: *high SAB*) and participants with *infrequent and minor self-reported antisocial behaviors* (scores equal to or less than 53, onwards: *low SAB*). The subjects were classified as low SAB or high SAB independently of their official records. Thus, some official offender youth were included in the low SAB group if they self-reported infrequent and minor antisocial behaviors.

3.4 Data analysis

For data analysis, the statistical package, SSPS version 22 (IBM Corp., 2013), was used. Descriptive statistics of sociodemographic and predictive variables were calculated and the significant differences between groups according to each criterion variable (official records of antisocial behavior: *offenders* vs*. non-offenders;* and self-reported antisocial behavior: *high SAB* vs. *low SAB*), were explored by means of the *t* test and the χ^2 test (Table 1). Odds ratios (OR) were calculated to evaluate the size of differences between groups when the χ^2 test was significant.

Bivariate correlations were then carried out using the Spearman correlation coefficient (r_S) (Table 2), to analyze the associations between risk factors and the two criterion variables and select the risk factors with the most robust associations to be used in subsequent analyses.

To evaluate the central thesis of the TRD Model, that the risk level estimated from the interaction between the antisocial motivation and criminal opportunities is useful to differentiate between adolescents with and without delinquent behavior, two contingency tables were made, one for each criterion variable, and the χ^2 statistic was calculated.

4. Results

4.1 Risk factors of juvenile delinquent behavior

Table 1 shows the descriptive statistics of sociodemographic variables and risk factors by each group of participants (*offenders* vs. *non-offenders*; and *high SAB* vs. *low SAB* participants). In general terms, the results showed a similar pattern of relationships between variables regardless of the crime criteria used (i.e., both official and self-reported antisocial behavior).

With regard to sociodemographic variables, a lower percentage of adolescents with official antisocial behaviors lived with both parents (*OR* = 0.29; 95% *CI* = 0.16 - 0.54; *p* < .001) and they were older than the adolescents without official records. Adolescents with high SAB were also older and with lower rates of living with both parents (*OR* = 0.46; 95% *CI* = 0.24 - 0.90; *p* = .023) than low SAB youths. The educational level of parents differed between groups only in the case of self-reported antisocial behavior (but not for official criminal behavior), with high SAB adolescents having mothers (*OR* = 0.27; 95% *CI* = 0.12 - 0.57; *p* < .001) and fathers (*OR* = 0.28; 95% *CI* = 0.13 - 0.61; *p* = .001) with lower educational levels than low SAB adolescents.

With regard to risk factors, adolescents who showed either official antisocial behavior or high SAB also showed less self-control and more problematic alcohol and substance abuse (individual risk factors), more deficient maternal practices and more antisocial peers (social risk factors), and lived in more criminogenic neighborhoods (environmental or opportunity risk factors), than participants without official records or with low SAB. One exception was in the case of parenting practices, which showed no differences in the self-reported criterion, where high SAB and low SAB adolescents showed similar figures.

*****Table 1 here*****

Table 2 shows the correlations between risk factors and both official and self-reported antisocial behavior (OAB and SAB, respectively). Risk factors and criteria were significantly associated (Table 2). The statistics in bold correspond to those factors of each source of risk that were most strongly associated with both criterion variables, and which were therefore selected for subsequent analysis.

*****Table 2 here*****

4.2 Interaction between criminal motivation and criminal opportunity

Two contingency analyses were carried out to assess the predictive validity of the *criminal risk* construct defined by the TRD theory as a result of the interaction between "criminal motivation" and "criminal opportunities". As can be seen in Table 3, the classification of the subjects by criminal risk level (low, moderate by CM, moderate by CO, high) was significantly associated with both official antisocial behavior (χ^2 (3, $N =$ 211) = 52.90, $p<.001$) and self-reported antisocial behavior (χ^2 (3, $N = 211$) = 84.60, $p<.001$).

Criminal risk discriminated the subjects of the sample (particularly, those classified as *low* and *high* criminal risk) with high specificity in both criteria of antisocial behavior (official and self-reported); even so, it was more effective at predicting self-reported than officially recorded antisocial behaviors.

Of the subjects classified as low risk, 79% lacked official records of criminal behavior and 93% lacked self-report of frequent and serious antisocial behaviors. In contrast, 84% of those who showed *high* criminal risk showed official criminal behavior and the same proportion self-reported frequent and serious antisocial behavior.

On the other hand, *criminal risk* showed less predictive power in the case of moderate risk levels. A majority subjects classified as at moderate criminal risk for high criminal motivation (CM) had both official antisocial behavior (73%) and severe/frequent self-reported behavior (61%). In contrast, fewer of the subjects classified as at moderate criminal risk due to exposure to criminal opportunity (CO) showed official antisocial behaviors (29%) or severe/frequent self-reported antisocial behaviors (25%).

***** Table 3 here*****

The graphic representation of the results helps to clarify the findings about the interaction between *criminal motivation* and *criminal opportunity*. As mentioned earlier, in the Cartesian quadrant of Figure 1, the *criminal motivation* variable (defined from the interaction between *personal risk* and *prosocial deprivation*) is located on the ordinate axis and the *criminal opportunity* variable (living in a "criminogenic neighborhood") on the abscissa. Its intersection from the cutoff point in each variable forms four quadrants of risk: Quadrant 1: low criminal risk; Quadrant 2: moderate criminal risk by CM; Quadrant 3: moderate criminal risk by CO; Quadrant 4: high criminal risk.

For each quadrant in Figure 1, the proportion of subjects predicted in this level of risk who actually committed official antisocial behaviors (OAB) and severe/frequent self-reported antisocial behavior (high SAB) is reported. As expected, only 22% of the subjects classified as low risk (quadrant 1: low criminal motivation and infrequent exposure to criminal opportunities) showed official criminal behavior and 6% showed serious self-reported antisocial behaviors. At the opposite extreme, 84% of juveniles classified as high risk (quadrant 4: high motivation and frequent exposure to criminal opportunities) showed serious antisocial behavior, both official and self-reported. Also in the case of moderate risk for CM (quadrant 2), it was possible to predict 73% and 61% of adolescents with official or self-reported antisocial behavior, respectively. However, the moderate risk for CO (quadrant 3) was the only one that was not useful in predicting the antisocial behavior of young people: only 29% actually showed official antisocial behaviors and 25% reported serious antisocial behaviors.

*****Figure 1 here*****

5. Conclusions

The first aim of this study was to analyze the relationship between individual, social and environmental risk factors and juvenile delinquency behavior in a sample of 211 adolescents from the province of Córdoba, Argentina. *Low self-control*, *alcohol abuse* and *drug abuse* were weighted as individual risk factors, *poor maternal parenting* and *antisocial peers* as social risk factors, and finally, *living in a criminogenic neighborhood* was assessed as an environmental or opportunity risk factor. Criminal behavior was measured using two complementary indicators: the official records of antisocial behavior (OAB) and self-reported antisocial behavior (SAB) (weighted by frequency and severity).

For some of the analyses, both the risk factors and the indicators of criminal behavior were dichotomized, as in the study by Pérez Ramírez (2012).

The descriptive statistics of the whole sample showed that, in general, adolescents who showed more antisocial behavior (both official and self-reported) had the following characteristics (compared with the non-antisocial group): older age; to a greater degree in the charge of only one parent; less self-control; more frequent consumption of alcohol and other drugs; mothers with poor parenting practices, more antisocial peers and friends, and more of them living in criminogenic neighborhoods. That is, all the risk factors analyzed here were significantly associated with both official and self-reported antisocial behavior criteria variables.

For the individual risk factors, the significant correlation between low self-control and antisocial behavior (official and self-reported) is fully consistent with the results of multiple previous studies (Bolger et al., 2018; Just et al., 2017; Portnoy et al., 2014). The results about the association between substance abuse and criminal behavior are also consistent with previous research (Brown & Shillington, 2017; Chassin et al., 2016; Hillege et al., 2017; Racz et al., 2016). Of the social risk factors, inappropriate parenting (especially by the mother) also proved to be a robust risk factor for crime, matching the previous literature (Clarke, 2017; Moitra et al., 2018; Ohara & Matsuura, 2016). And even clearer was the criminogenic influence of antisocial peers and friends, most prominently associated with antisocial behavior here, as usually reported (Marshall & Enzmann, 2012; Thomas, 2015; Wojciechowski, 2018). Finally, as previous studies have highlighted (Graif, 2015; Sciandra et al., 2013), the opportunity variable of living in neighborhoods with high crime rates was a robust correlate for criminal behavior.

These results are valuable as scientific information on the risk factors associated with juvenile delinquency in Argentina, within a line of empirical work in a context in which

evidence-based studies are scarce (Bobbio et al., 2018). They help to expand and consolidate knowledge in this region, as was achieved in European and Anglo-Saxon contexts (Case & Haines, 2009).

The main aim of this study was to assess whether, as proposed by the TRD Model, the criminal risk level estimated from the interaction between antisocial motivation and criminal opportunities is useful to differentiate between adolescents with and without delinquent behavior. To examine this, we selected from each risk source the risk factor with the greatest empirical association with the two antisocial behavior criteria. Thus, drug abuse, antisocial peers and living in a criminogenic neighborhood were selected as personal, social and environmental risk factors, respectively. The interaction (multiplication) between personal and social risk factors defined the *criminal motivation* construct. Finally, as suggested by the TRD Model, the *criminal risk* construct was based on the interaction between criminal motivation and criminal opportunity. We thus classified subjects in four quadrants (Figure 1), corresponding to four criminal risk levels.

The classification of the subjects in the "low risk" level predicted the absence of both official and self-reported criminal behavior with high specificity. The classification as "high risk" also discriminated with high sensitivity the presence of both criteria. However, the discriminative capacity of the "moderate risk" level was weaker: the interaction *high criminal motivation/low criminal opportunity* underestimated both the official (73%) and the self-reported (61%) antisocial behavior, and the interaction *low crime motivation/high crime opportunity* overestimated the prediction of both official (which was only 29%) and self-reported (only 25%) antisocial behavior.

These results match those obtained by Hay & Forrest (2008), who found that increases in opportunity increase the effect of low self-control on the probability of committing crimes and, as opportunities become more plentiful, differences in self-control become

more consequential for involvement in crime. The same was found by Wikström and Svenson who combined "criminal propensity" (individual risk factor) and "lifestyle" (criminal opportunity risk factor).

Our results on the interaction between risk factors also match previous findings. Seddig (2014) highlighted the association of violent behavior with the predictors "acceptance of proviolent norms" and "delinquent peer groups". Baskin-Sommers et al. (2016) showed the criminogenic combination of antisocial personality disorder (APD) and exposure to community violence. Janssen et al. (2016) documented the combined antisocial influence of low self-control, delinquent attitudes, deficient parenting, peer delinquents and time spent in criminogenic setting. Finally, Meinert & Reinecke (2018), in a sample of young people, showed close interaction between parental control and levels of self-control.

Thus, our results about the interaction between personal, social and environmental risk factors help to expand and generalize the data found in European and Anglo-Saxon studies. Together with those of Pérez Ramírez, (2012), they scientifically endorse the central proposal of the TRD Model (Redondo Illescas, 2008, 2015) about reciprocal interaction and empowerment between criminal motivation and criminal opportunities.

One strength of this research is that all the analyses were made in relation to two different indicators of criminal behavior, one official and one self-reported. The results thus acquire greater solidity from their systematic replication through double measurement of "antisocial behavior".

In applied terms, it is worth noting the good predictive capacity of the TRD Model for extreme cases in which high criminal motivation is combined with frequent exposure to criminal opportunities (high risk) or infrequent exposure (low risk). This means that, under the conceptual guidance of the TRD Model, good estimations of crime probability

can be achieved taking into account only a few critical risk factors (personal, social and environmental). This could be critical for violence risk assessment in countries with scarce empirical evidence or validated assessment instruments, as in the case of Argentina and other Latin American countries.

However, this study also has some limitations that must be considered in the interpretation of the results. Given that the sample integrated school students with individuals from the juvenile justice system, there may be methodological questions about the homogeneity of the sample. In principle, the sampling in the general population tried to resolve any possible differences, selecting subjects from neighborhoods that were socioeconomically similar to those of the offender population. Although some individual indicators could not be rigorously controlled, such as schooling of adolescents (a considerable proportion of the offenders had dropped out of school at the time of the study), this should not be viewed as a critical problem because this is not a variable directly related to the variables under study, and in addition most of the adolescents had a basic education that allowed them to respond autonomously to the instruments used (with a very few exceptions). There is also a certain homogeneity, since there were no differences between the data of each group on schooling of the parents.

Another important methodological limitation here is that, in this field (Farrington, 2013), it would have been ideal to have used a transversal and not a longitudinal design for the analysis of risk factors. Therefore, the association found between different risk factors and criminal behavior informs us about correlations of juvenile delinquent behavior, but in no case should they be literally interpreted (as the design itself prevents this) as a result of real influences or as causal factors of that behavior.

A third important limitation is that the results obtained here cannot be compared with data from other Latin American countries, due to the lack of other studies making similar

interactional analyses. All these limitations should, if possible, be resolved in future research.

Despite these difficulties, we consider that this to be a pioneer study in empirically exploring the predictive capacity of a series of juvenile delinquency risk factors in Latin America, and particularly in Argentina. It also contributes to the international bibliography evaluating the interaction and combined criminogenic influence of personal, social and environmental risk factors, as suggested in the TRD Model (Redondo Illescas, 2008, 2015).

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Table 1.

Descriptive statistics of sociodemographic characteristics and personal, social, and environmental risk factors: Score distribution and comparisons between criteria

	Non-offenders n= 136	Offenders n= 75	Differences test	Low SAB n= 160	High SAB n= 51	Differences test
Sociodemographic characteristics						
Age (M; SD)	15.70 (1.60)	16.16 (1.46)	*	15.64 (1.61)	16.44 (1.24)	*
Mother: Secondary or higher education (%)	63.3	50.9	*ns*	66.6	34.2	**
Father: Secondary or higher education (%)	62.3	50.0	*ns*	65.6	35.1	**
Living with both parents (%)	55.6	26.7	***	49.7	31.4	*
Risk factors						
Low self-control (*M*; *SD*)	45.33 (13.06)	52.48 (13.22)	*	44.58 (12.99)	53.90 (11.13)	*
Alcohol abuse (*M*; *SD*)	8.01 (6.13)	11.00 (7.42)	**	7.44 (5.77)	14.36 (6.76)	***
Drug abuse (*M*; *SD*)	4.76 (6.77)	14.76 (9.19)	***	4.12 (6.08)	12.09 (9.80)	***
Poor maternal parenting (*M*; *SD*)	33.82 (12.62)	38.84 (15.50)	*	33.75 (12.77)	34.55 (11.23)	*ns*
Antisocial peers (*M*; *SD*)	4.10 (2.71)	8.08 (3.74)	***	3.84 (2.58)	6.91 (2.70)	***
Criminogenic neighborhood (*M*; *SD*)	2.71 (2.38)	4.43 (2.24)	***	2.54 (2.31)	4.64 (2.54)	**

Note: *Non-offenders*: participants without official records of antisocial behavior; *Offenders*: participants with official records of antisocial behavior; *Low SAB*: participants with infrequent and minor self-reported antisocial behaviors; *High SAB*: participants with frequent and serious self-reported antisocial behavior.

* $p < .05$; *** $p < .001$; *ns*= no significant differences.

Table 2.

Spearman correlations between risk factors and both antisocial behavior criteria (AB)

Risks source		OAB	SAB
Individual risks	Low self-control	.25***	.33***
	Alcohol abuse	.20**	.40***
	Drug abuse	**.54***	**.54***
Social risks	Poor maternal parenting	.13	.23**
	Antisocial peers	**.50***	**.56***
Criminal opportunities	Criminogenic neighborhood	**.34***	**.40***

Note: OAB= Official Antisocial Behavior; SAB= Self-reported Antisocial Behavior.

* $p < .05$; ** $p < .01$; *** $p < .001$

Table 3.

Relationship between criminal risk level and (official and self-reported) antisocial behaviors

Criminal risk level	Non-offenders $n=136$ $f(\%)$	Offenders $n=75$ $f(\%)$	χ^2test	Low SAB $n=160$ $f(\%)$	High SAB $n=51$ $f(\%)$	χ^2 test
Low	104 (79.4)	27 (21.6)		123 (93.9)	8 (6.1)	
Moderate (CM)	9 (27.3)	24 (72.7)		13 (39.4)	20 (60.6)	
Moderate (CO)	20 (71.4)	8 (28.6)	***	21 (75.0)	7 (25.0)	***
High	3 (15.8)	16 (84.2)		3 (15.8)	16 (84.2)	

Note: *Non-offenders*: participants without official records of antisocial behavior; *Offenders*: participants with official records of antisocial behavior; *Low SAB*: participants with infrequent and minor self-reported antisocial behaviors; *High SAB*: participants with frequent and serious self-reported antisocial behavior.
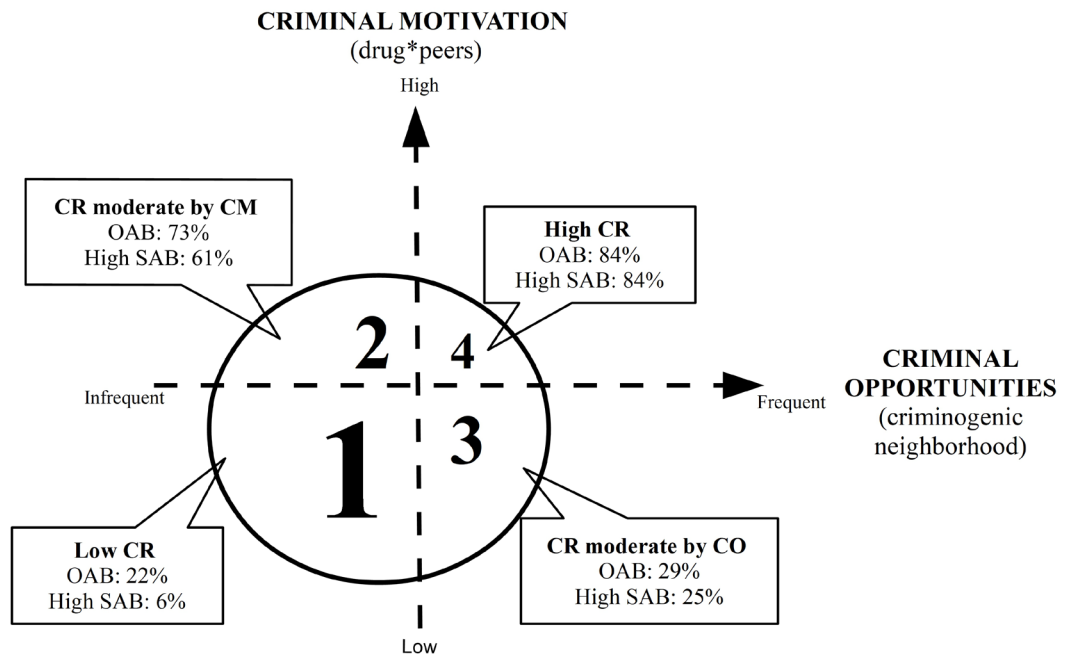
*** $p<.001$

Figure 1.
Percentage of subjects who effectively showed official or self-reported antisocial behavior according their risk classification.
Note. CR= criminal risk; CM= criminal motivation; CO= criminal opportunities; OAB= Participants with official antisocial behaviors; high SAB= Participants with frequent and serious self-reported antisocial behaviors.