Homicidal Child Sexual Abuse: Identifying the Combinations of Factors Predicting a Lethal Outcome

Julien Chopin (Ph.D), Eric Beauregard (PhD) & Matt Delisi (PhD)

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Introduction

Homicide is without question the most serious criminal offense in terms of the nature of the victimization, its legal seriousness and punishment consequences, and its societal and fiscal costs (Chan, 2019; DeLisi et al., 2010; Lee et al., 2017; Miller, et al., 1993). Sexual homicide, which involves a sexual crime contemporaneous to the homicide event, accounts for approximately 1% of homicides in Europe and North America, and given the joint occurrence of these two violent felonies is even more pathological (Beauregard & Martineau, 2017b). Although adult females account for the preponderance of sexual homicides (SHs) worldwide, a subset of these offenses involves child victims. Unfortunately given the relative rarity of homicidal child sexual abuse, the knowledge base about offenders who perpetrate SHs of children is limited.

An important question in sexual violence research is to understand the circumstances driving an offender to kill the victim during a sexual assault. Although previous studies have suggested that some offenders kill due to individual psychopathology or excessive rage (see Chan & Heide, 2016; Chopin & Beauregard, 2019d; Stefanska et al., 2016 for detailed reviews), there is also mounting evidence that SH may be one of many outcomes of a rape (Beauregard & Mieczkowski, 2012; Beech, Fisher, et al., 2005; Beech, Oliver, et al., 2005; Chopin & Beauregard, 2019a; Mieczkowski & Beauregard, 2010). Previous studies have focused on the identification of specific characteristics of sexual homicide offenders (SHOs) and the SHs.

A first set of studies determined that when compared with nonhomicidal sex offenders (NSHOs), SHOs presented with several specific characteristics. SHOs were more likely to present with personality disorders (antisocial, borderline personality, schizoid), maladaptive personality traits, and various paraphilic disorders, including sexual sadism (see Beauregard & DeLisi, 2018b; Chopin & Beauregard, 2019e; Grubin, 1994; Oliver et al., 2007; Proulx & Sauvêtre, 2007). For instance, Beauregard and DeLisi (2018a) focused on developmental
factors and determined that SHOs were more likely to present a background characterized by abuse and a variety of problematic behaviors (chronic lying, angry temperament, running away, reckless behaviors), and to have reported cruelty against animals. As to their lifestyle, SHOs were more likely to report loneliness problems, fewer intimate relationship experiences, an angry temperament, and previous criminal convictions (Beauregard et al., 2018; Chene & Cusson, 2007; Chopin & Beauregard, 2019e; Grubin, 1994; Higgs et al., 2015; Marshall, 1989; Milsom et al., 2003; Nicole & Proulx, 2007; Oliver et al., 2007; Palermo, 2008). Finally, several studies explored criminal behaviors of SHOs and determined that they were more likely to use non-coercive strategies to approach the victim, to commit the crime in a residence, to vaginally penetrate the victim, to beat and torture the victim, to use asphyxiation, as well as use a weapon intentionally (see Chopin & Beauregard, 2019e; Healey et al., 2016; Healey et al., 2013; Higgs et al., 2015; Salfati & Taylor, 2006; Vettor & Beech, 2014).

A second set of studies tested the crime escalation hypothesis suggesting that the lethal outcome can be partly explained by an escalation of violence during the crime. To illustrate, Mieczkowski and Beauregard (2010) found that the likelihood of a sexual assault escalating to a SH was influenced by a complex combination of victim, situational, and crime scene characteristics. The most lethal combination of event characteristics identified were when the offender used a weapon during the crime, did not commit intrusive sexual acts on the victim, but spent more than 30 minutes with the victim. Using a similar approach, Chopin and Beauregard (2019a) determined that the violence used by offenders during a sexual assault was fundamental to predict the lethal outcome. They also found that despite some offenders’ characteristics being associated with a lethal outcome, their contribution is limited as these characteristics only have an impact in certain situations (Chopin & Beauregard, 2019a).

Sexual Homicide of Children: A Distinct Offender with a Specific Crime-Commission Process
Only a handful of studies have specifically examined the SH of children. However, recent studies have shown that it constitutes a different type of SH compared to those involving adult victims. Some of the existing studies compared SHs of children with cases involving adult victims and found that SHOs of children were more likely to present deviant sexual fantasies, paraphilias, feelings of rejection from other individuals, antisocial personality disorders, and low self-esteem (Beauregard et al., 2008; Firestone et al., 1998; Gratzer & Bradford, 1995; Proulx et al., 2007; Schmidt & Madea, 1999). For example, Spehr et al. (2010) found that SHOs of children were less likely to report alcohol or drugs use, sexual dysfunctions, and narcissistic personality disorders. The comparison of the crime-commission process of SH involving child and adult victims indicates that in crimes involving young victims, SHOs were more likely to establish contact with the victim prior to the crime, to use physical violence to control the victim, to commit the crime outdoor, to use strangulation to kill the victim, and to dismember and hide the victim’s body (Beauregard et al., 2008; Proulx et al., 2018). Moreover, in SHs of children, offenders were less likely to premeditate their crime, to pre-select the crime site, to use restraints, to use violence to humiliate the victim, and to use torture (Beauregard et al., 2008; Proulx et al., 2018). Moreover, Proulx et al. (2018) noted that in SHs of children, victims were more likely to be killed to avoid police detection compared to SHOs of adult victims.

**Aim of Study**

Previous studies focusing on the lethal outcome in sexual crimes suggest that offenders who end up killing their victims present both specific individual characteristics as well as a crime-commission process (i.e., the set of decisions and actions used by the offender to successfully complete his crime) that contribute to a lethal outcome. Considering the uniqueness of child victims, findings with adult victims may not adequately explain the lethal outcome in sexual crimes of children. Although previous studies have raised the question as to
whether the lethal outcome was due to an escalation of violence or to a deviant intent, with rare exceptions (Chopin & Beauregard, 2020; Mieczkowski & Beauregard, 2010), most have failed to consider the complex interactions involved in the crime-commission process of these crimes. Thus, previous studies have identified factors associated with a lethal outcome, neglecting to examine how the combination of these factors may interact with each other to produce a lethal outcome. Here, the current study aims to identify specific combinations of factors most associated with a lethal outcome in sexual crimes involving children. Specifically, we compare the offender, victim, and crime characteristics of a large sample of child sexual abuse (CSA) cases with or without a lethal outcome. In order to better understand the complex dynamics involved in the lethal outcome associated to sexual crimes, combinations of these various factors are examined to predict the likelihood of lethality in sexual crimes of children.

**Methodology**

**Sample**
The sample consists of 646 offenders convicted of CSA (78.94%, n = 510) or SH of children (21.06%, n = 136).¹ Sexual homicide cases are oversampled in the current study to allow for the exploration of the differential factors associated with sexual violence and SH. All sexual assault cases come from a French database, while SH cases come from Canada and France. The data were collected in Canada and France with exactly the same tool created to reference information on victims, offenders, and the crime-commission process with a total of 126 variables. The data included in the database come from various sources of information and were compiled by crime analysts’ experts in violent crimes and using the exact same standardized grid of data collection in both Canada and France. In each case, the information comes from investigative reports, offender interview reports, autopsy reports provided by pathologists, psychological reports provided by a team of forensic psychologists, and reports provided by

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¹ Randomized selection from a sample including 1345 extrafamilial CSA cases.
forensic experts (for an exhaustive description of the database methodology see Chopin & Beauregard, 2019b).

Cases included in the current study occurred in an extrafamilial context (i.e., stranger or acquaintance relationship between offenders and victims) between 1979 and 2018 and have been solved by the police. Information included in this database comes from criminal investigation files and expert reports provided by a team of forensic psychologists, coroners, and forensic scientists.

There is no consistent method to operationalize what constitutes a child. In this study, we chose to follow guidelines provided by previous studies and therefore the current sample includes all cases involving victims under the age of 16 (see for example Beauregard et al., 2012; Chopin, 2017; Chopin & Beauregard, 2019c, 2020a, 2020b; Chopin & Caneppele, 2019; Leclerc et al., 2007; Leclerc et al., 2006; Leclerc et al., 2009; Leclerc et al., 2013; Leclerc et al., 2010, 2011; Proulx et al., 2018). To be considered in this sample, there needed to be the presence of at least one of the following sexual behaviors: sexual penetration with a penis (i.e., vaginal and/or anal), fellatio, cunnilingus, penetration with fingers, masturbation, and inanimate object insertion.

Sexual homicide cases were identified using the FBI definition provided by Ressler et al. (1988) stating that for a homicide to be considered as sexual, it has to present at least one of the following characteristics at the crime scene: victim’s attire or lack of attire; exposure of the sexual parts of the victim’s body; sexual positioning of the victim’s body; insertion of foreign objects into the victim’s body cavities; evidence of sexual intercourse; evidence of substitute sexual activity, interest, or sadistic fantasy. As the FBI definition has been criticized for its ability to potentially present false positive (see Beauregard & Martineau, 2017b; Kerr et al.,

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2 Sexual homicide cases were drawn from the SHIELD database Chopin, J., & Beauregard, E. (2019b). Sexual Homicide in France and Canada: An International Comparison. *Journal of interpersonal violence, Advance online publication*. https://doi.org/10.1177/0886260519875547 which includes cases from both Canada and France.
2013; Stefanska et al., 2016), all cases included in the study present at least two criteria of the SH definition. This definition was used in most studies focusing on SH of children (see e.g., Beauregard et al., 2008; Chopin & Beauregard, 2019c; Chopin & Beauregard, 2020b; Skott, 2019).

Participants

Victims included in the sample are all women, who were on average 10.83 years old ($SD = 3.89$). Victims were assaulted while walking (35.91%; $n = 232$), while playing (22.76%; $n = 147$), while involved in sports or recreational activities (11.46%; $n = 74$), while involved in domestic activities (7.43%; $n = 48$) or while sleeping (4.80%; $n = 31$).

Offenders were all men, aged on average of 33.57 years old ($SD = 14.88$). They were mostly in a relationship at the time of the crime (57.43%; $n = 371$) and approximately one quarter (24.15%; $n = 156$) of offenders had used alcohol and/or drugs prior to the offenses. A small proportion of offenders had a previous criminal history ($n = 88$) while 12.07% ($n = 78$) of them were characterized by some paraphilic behaviors (i.e., type of behavior associated to any paraphilias but without having to meet the diagnostic criteria, see Chopin et al., 2020).

Measures

Dependent variable. In this study we used one dichotomous (0-1) dependent variable. This variable describes the crime outcome with 0 used for CSA and 1 for SH.

Independent variable. In this study, we used a total of 31 dichotomous independent variables. These variables were divided into three blocks: Offender, victim, and crime characteristics.

Offender characteristics. Previous studies have shown that SHOs present specific characteristics, such as alcohol and drug use, paraphilias, loneliness problem, and previous criminal convictions when compared with non-homicidal sex offenders (NSHOs; (see e.g.,

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3 Specific details on previous crime committed are not available
We used a total of six dichotomous variables describing offender characteristics: 1) Offender is single, 2) offender has a sexual collection (i.e., sexual and/or violent pictures and/or movies), 3) offender is a loner (i.e., avoid social contact with others), 4) offender has previous criminal convictions, 5) offender used alcohol/drug prior to crime, 6) paraphilic behaviors (e.g., sadism, masochism, urophilia, bondage, fetishism, zoophilia, see Beauregard & Martineau, 2017a; Chopin et al., 2020).

Victim characteristics. Previous studies found that SH of children is a heterogeneous crime with different categories of victims (i.e., age, sex) assaulted in various context (i.e., everyday activities, lifestyle) (Chopin & Beauregard, 2019c, 2020b; Lanning, 1994). We used a total of 12 dichotomous variables to describe the victim characteristics. Specifically, these variables provide details on victim sociodemographics, lifestyle, and everyday activities: 1) Victim was targeted, 2) victim and offender were strangers (i.e., totally unknown at the time of the offence; as opposed to acquaintance), 3) victim was a female, 4) victim was less than 10 years old (i.e., several studies introduced a distinction between childhood and adolescence based on lifestyle and routine activities characteristics. These studies used an age breakdown of 10 years old, see e.g., Chopin & Beauregard, 2020a; Chopin & Caneppele, 2019; Finkelhor et al., 2009), 5) victim consumed alcohol/drugs prior to crime, 6) victim was frequently engaged in social activities, 7) victim was involved in domestic activities prior to crime (e.g., watching TV), 8) victim was sleeping, 9) victim was playing, 10) victim was travelling (i.e., walking to or from somewhere at the time of offense), 11) victim was involved in sport /recreational activities, 12) victim was hitchhiking.

Crime characteristics. Previous studies have shown that SHOs present a specific crime-commission process when compared with NSHOs. For instance, they were more likely to vaginally penetrate the victim, to beat and torture the victim, to bring a weapon, and to use
specific methods (e.g., strangulation) to cause death (see Chopin & Beauregard, 2019a, 2019e; Healey et al., 2016; Healey et al., 2013; Higgs et al., 2015; Mieczkowski & Beauregard, 2010; Salfati & Taylor, 2006; Vettor & Beech, 2014). We used a total of 12 dichotomous variables to describe the crime characteristics. Specifically, a total of five dichotomous variables were used to describe the sexual acts perpetrated by offenders during the crime-commission process: 1) Vaginal/anal penetration with a penis, 2) digital penetration, 3) foreplay (i.e., masturbation, cunnilingus, fellatio), 4) fondling, 5) foreign object insertion. To describe the non-sexual behaviors during the crime, we used seven dichotomous variables: 1) use of a con to approach the victim (e.g., befriended the victim, posed as an authority figure, offered assistance, etc.), 2) use of a weapon, 3) beating the victim, 4) acts of physical torture, 5) use of forensic awareness strategies (i.e., strategies to destroy/remove forensic evidence, protect identity, stage the crime scene, act on victim), 6) contact location was a deserted place, and 7) offence location was a deserted place.

Analytical Strategy.

The analysis of the data followed a three-step process. First, we examined at the bivariate level (i.e., chi-square) the differences between CSA and SH for the entire set of independent variables (Fisher’s exact test was used when the cell count requirement was violated, i.e., cells with expected values less than five). Second, using only the significant variables \((p \leq 0.05)\) from the bivariate analyses, we looked at which factors were associated with SH at the multivariate level. Specifically, we used a sequential binomial regression to identify the specific characteristics associated with SH of children and determine the weight of each block (i.e., offender, victim, and crime characteristics). Each block of variables was tested individually. Then, a nested binomial regression analysis was conducted using only the significant variables from all the previous models. This analysis represents the final and best model. Third, using only significant variables \((p \leq 0.05)\) predicting SH \((OR<1)\) from the nested
binomial regression analysis, we computed a series of conjunctive analysis of case configurations. This technique allows to analyze all possible interaction terms and determine odds or probabilities associated with each particular interaction complex (Miethe et al., 2008). Conjunctive analysis of case configurations has been previously used for the analysis of crime escalation (see e.g., Beauregard & Mieczkowski, 2012; Chopin & Beauregard, 2019a; Mieczkowski & Beauregard, 2010) as it permits an exploration of interactions among categorical variables – that is, that the same outcome can be created by more than one multivariate configuration of the antecedent conditions that the analysis is exploring. By using this approach and considering all possible combinations of variables – a saturated model – one can target three different aspects of the cause-effect relationship: (1) the determination of the smallest number of all factors which appear to be related to the outcome state; (2) the potential identification of some set of necessary conditions (i.e., elements which appear in every case of the outcome state); or (3) the potential identification of some set of sufficient conditions (i.e., elements, which if present, result in the outcome state).

The limitation of conjunctive analysis is that the matrix of interaction terms can quickly grow very large since, for a binary variable, for example, the number of theoretical combinations is $2^n$, where $n$ is the number of variables included in the matrix. Thus, a matrix with more than four or five binary variables quickly becomes unwieldy.

Ethical approval was obtained to conduct this research from the Institutional Review Board of the two first authors’ institution.

Results

Bivariate Analysis

Table 1 presents the bivariate analyses between the offender, victim, and crime characteristics with the outcome of the crime (CSA vs SH of children). Findings show that compared to cases of CSA, SH offenders of children were more frequently loners ($\chi^2 = 24.51$,}
$p = .000$) and had more previous criminal convictions ($\chi^2 = 88.69, p = .000$). Similarly, offenders involved in SH of children more frequently used alcohol/drugs prior to the crime ($\chi^2 = 70.21, p = .001$) and presented more paraphilic behavior ($\chi^2 = 130.57, p = .000$).

Similarly, offenders involved in SH of children more frequently used alcohol/drugs prior to the crime ($\chi^2 = 70.21, p = .001$) and presented more paraphilic behavior ($\chi^2 = 130.57, p = .000$).

As to the victim selection characteristics, in SH of children offenders were more likely to specifically target a victim ($\chi^2 = 1.22, p = .027$) and to select a female victim ($\chi^2 = 3.13, p = .007$). SHOs more often targeted victims that used alcohol/drugs prior to the crime ($\chi^2 = 46.09, p = .000$) or that were frequently engaged in social activities ($\chi^2 = 22.59, p = .000$). In SH of children, victims were more frequently sleeping at the time of the crime ($\chi^2 = 4.08, p = .050$) or hitchhiking ($\chi^2 = 21.85, p = .000$), while they were less frequently travelling ($\chi^2 = 36.04, p = .000$).

Vaginal/anal penetration of victims ($\chi^2 = 131.96, p = .000$) and foreign object insertion ($\chi^2 = 8.27, p = .004$) were more frequent in SHs of children, whereas foreplay ($\chi^2 = 5.48, p = .019$) and fondling ($\chi^2 = 136.04, p = .000$) were less frequent. SHOs more often brought a weapon with them ($\chi^2 = 198.58, p = .000$), beat their victims ($\chi^2 = 215.26, p = .000$), and were more likely to sexually torture the victim ($\chi^2 = 58.45, p = .000$). Finally, in SH involving child victims, offenders were less likely to use detection avoidance strategies ($\chi^2 = 14.55, p = .000$) and to select deserted locations for contact ($\chi^2 = 5.23, p = .022$) and crime scenes ($\chi^2 = 36.04, p = .000$).

Sequential Binomial Regression

Table 2 presents findings of the binomial sequential regression. Model 1 includes only the variables related to the offender characteristics and presents a Nagelkerke $R^2$ of 0.41. Results show that loner offenders (OR = 2.70, $p = .000$), offenders with previous criminal convictions (OR = 5.43, $p = .000$), offenders who used alcohol/drugs prior to crime (OR = 4.49, $p = .000$), and offenders with paraphilic behaviors (OR = 9.89, $p = .000$) were respectively 2.70,
5.43, 4.49 and 9.89 times more likely to be involved in SH of children. Model 2 includes only the variables related to the victim selection characteristics and presents a Nagelkerke $R^2$ of 0.21. Findings indicate that victims who used alcohol/drugs (OR = 5.76, p = .000) and were hitchhiking (OR = 9.81, p = .000) prior to the crime were respectively 5.76 and 9.81 times more likely to be involved in SH of children. On the contrary, victims younger than 10 years old (OR = 1/0.55, p = .009) and who were travelling (OR = 1/0.20, p = .000) prior to the crime were respectively 1.81 and 5 times less likely to be victim of a SH. Model 3 includes only the variables related to the crime characteristics and presents a Nagelkerke $R^2$ of 0.70. Cases where vaginal/anal penetration was present (OR = 8.36, p = .000), where offenders brought a weapon (OR = 10.47, p = .000), and where offenders beat their victims (OR = 18.22, p = .000) were respectively 8.36, 10.47 and 18.22 times more likely to end as a SH. On the other hand, cases where offenders committed foreplay (OR = 1/0.21, p = .000) and fondling (OR = 1/0.22, p = .000) were respectively 4.76 and 4.54 times less likely to end with a lethal outcome. The best model includes only the significant variables of the three previous models and presents a Nagelkerke $R^2$ of 0.82. Results show that loner offenders (OR = 3.60, p = .006), offenders with previous criminal convictions (OR = 5.56, p = .002), offenders who used alcohol/drugs prior to the crime (OR = 2.77, p = .015), and offenders with paraphilic behaviors (OR = 10.50, p = .000) were respectively 3.60, 5.56, 2.77 and 10.50 times more likely to be involved in a SH of children. However, victims that were travelling at the time of the crime (OR = 1/0.07, p = .000) were 14.29 times less likely to be involved in a SH. Cases where vaginal/anal penetration was present (OR = 5.91, p = .000), where offenders brought a weapon (OR = 12.40, p = .000), and where offenders beat their victims (OR = 14.22, p = .000) were respectively 5.91, 12.40, and 14.22 times more likely to end as SHs. On the contrary, cases where offenders committed foreplay (OR = 1/0.22, p = .000) and fondling (OR = 1/0.16, p = .000) were respectively 4.54 and 6.25 times less likely to end with a lethal outcome.
Conjunctive Analysis

We calculated odds ratios as an index of the relative dangerousness of each particular combination. For instance, an odds ratio greater than 1 indicates this particular combination increases the risk of an escalation from CSA to SH, while an odds ratio of less than 1 means it reduces the risk that the offender kills his victim during a sexual assault. In order to assess the impact of the crime characteristics, we have first calculated a baseline model including only the offender characteristics. Then, four other matrices were calculated adding one offender characteristic to the baseline model.

Table 3 presents the matrix produced by the conjunctive analysis of the offender characteristics and the crime outcome. Findings suggest that the most lethal combination is #3 (OR = 76.07). This combination shows that when offenders were loners, had previous criminal convictions, did not use alcohol/drug, and presented paraphilic behaviors, the crime was approximately 76 times more likely to end with a lethal outcome. The second most dangerous combinations are both #2 and #11 (OR = 26.76). Combination #2 shows that when offenders were loners, had previous criminal convictions, used alcohol/drugs, and did not present paraphilic behaviors, the lethal outcome was 26.76 times more likely to occur. Combination #11 shows that when offenders were not loners, when they had previous criminal convictions, used alcohol/drugs, and presented paraphilic behaviors, the lethal outcome was 26.76 times more likely to occur. It is noteworthy that of the eleven combinations presenting an odds ratio higher than 1 (#2,3,4,6,7,9,10,11,13,14,15), eight involve offenders with previous criminal convictions, six involve offenders with alcohol/drugs consumption, six involve offenders with paraphilic behaviors, and five involve offenders with a loner lifestyle.
Table 4 presents the matrix produced by the conjunctive analysis of the modus operandi characteristics - including the offender characteristic of presenting paraphilic behaviors - on the crime outcome. Findings suggest that the most lethal combination is #2 (OR=111.60). This combination shows that when offenders presented paraphilic behaviors, penetrated vaginally/anally the victim, brought a weapon, and did not beat the victim, the crime was approximately 111 times more likely to present a lethal outcome. Interestingly, the second most dangerous combination is #3 (OR = 67.53), showing that when offenders presented paraphilic behaviors, penetrated vaginally/anally the victim, did not bring a weapon, and did not beat the victim, the crime was approximately 67 times more likely to end with a lethal outcome. Moreover, of the ten combinations presenting an odds ratio higher than 1 (#1,2,3,4,5,7,9,10,11,13), seven involve vaginal/anal penetration and the beating of the victim, whereas six involve bringing a weapon and the presence of paraphilic behaviors.

Table 5 presents the matrix produced by the conjunctive analysis of the modus operandi characteristics — including the offender characteristic of having previous criminal convictions — on the crime outcome. Findings show that the most lethal combination is #1 (OR=67.86). This combination shows that when offenders had previous criminal convictions, penetrated vaginally/anally the victim, brought a weapon, and beat the victim, the crime was approximately 67 times more likely to end with a lethal outcome. Interestingly, the second most dangerous combination is #13 (OR = 50.85), which shows that when offenders did not have previous criminal convictions, did not penetrate vaginally/anally the victim, brought a weapon, and beat the victim, the crime was approximately 50 times more likely to end with a lethal outcome. Moreover, of the ten combinations presenting an odds ratio higher than 1 (#1,2,3,4,5,9,10,11,12,13), eight involve crimes with vaginal/anal penetration, six involve crimes with the beating of the victim, and bringing a weapon.
[INSERT TABLE 5 HERE PLEASE]

Table 6 presents the matrix produced by the conjunctive analysis of the modus operandi characteristics - including the offender characteristic of having used alcohol/drugs prior to the crime - on the crime outcome. Findings show that the most lethal combination is #1 (OR=103.60). This combination shows that when offenders used alcohol/drugs prior to the crime, penetrated the victim vaginally/anally, brought a weapon, and beat the victim, the crime was approximately 103 times more likely to end with a lethal outcome. It is noteworthy that the second most dangerous combination is #4 (OR = 102.51), which shows that when offenders used alcohol/drugs prior to the crime, penetrated vaginally/anally the victim, did not bring a weapon, and did not beat the victim, the crime was approximately 102 times more likely to end with a lethal outcome. Moreover, of the eight combinations presenting an odds ratio higher than 1 (#1,2,4,5,9,10,11,13), six involve crimes with vaginal/anal penetration and bringing a weapon.

[INSERT TABLE 6 HERE PLEASE]

Table 7 presents the matrix produced by the conjunctive analysis of the modus operandi characteristics - including the offender characteristic of having a loner lifestyle - on the crime outcome. Findings suggest that the most lethal combination is #13 (OR=76.07). This combination shows that when offenders did not present a loner lifestyle, did not penetrate vaginally/anally the victim, brought a weapon and beat the victim, the crime was approximately 76 times more likely to present a lethal outcome. The second most dangerous combination is #2 (OR = 63.09), which shows that when offenders presented a loner lifestyle, penetrate vaginally/anally the victim, brought a weapon, and did not beat the victim, the crime was approximately 63 times more likely to end with a lethal outcome. Moreover, of the nine combinations presenting an odds ratio higher than 1 (#1,2,6,9,10,11,13,15), six involve crimes with vaginal/anal penetration, bringing a weapon, and beating of the victims.
Discussion

Homicide is the most costly criminal offense in terms of lethality, assorted fiscal costs, and the devastation that it imposes on convictism of homicide (Lee et al., 2017; McCollister et al., 2010; Spilsbury et al., 2017). In the current study, we examined the SH of children using conjunctive analysis to quantify the precise pathways that culminate in this rare, but extraordinarily aggravated offense. Several findings warrant discussion and serve as guide for future research.

First, offenders who sexually murder children are extremely instrumental (i.e., the killing of the victim occurred in order to avoid police detection and is not part of the sexual process) in their conduct and this is clearly evident across offender, victim, and crime characteristics. Relative to offenders who perpetrate CSA, sexual murderers of children are more likely to specifically target the victim, particularly those who were hitchhiking, and to engage in sexual behaviors that are indicative of sheer forcefulness, such as vaginal rape, anal rape, and foreign object insertion. Sexual behaviors that are antecedent to rape, such as foreplay acts or fondling, are much less common in SH of children. The disinterest in these sexual acts in favor of violent rape is also consistent with the non-sexual behaviors that are displayed including the use of a weapon, physical torture of the victims, and beating of the victim. Given that the prevalence of paraphilic disorders is tenfold higher and the prevalence of previous criminal convictions is fivefold higher among sexual murderers of children, these offenders should be considered at the right-tail of the violent career criminal distribution (see DeLisi, 2001, 2005; Koeppel et al., 2019; Meloy, 1997; Vaughn et al., 2009), especially when also considering their greater use of forensic awareness strategies. These are sadistic offenders whose offense histories are punctuated by sexual violence and who view their child victims as objects to be raped, brutalized, and destroyed.
Second, amidst these instrumental features, sexual murderers of children are also opportunistic and attuned to emerging opportunities to procure victims, such as those who are sleeping, who are hitchhiking, or who are contacted in a deserted area. For instance, offenders with paraphilic behaviors who vaginally and/or anally penetrated the victims, brought a weapon to the offense, but did not beat the victim, were 111 times more likely to perpetrate a SH. For an armed, antisocial, paraphilic offender, a random contact is all that is needed to complete a sexual assault and kill the victim.

Third, sexual murderers of children have a life history that has an externalizing valence one that manifests in diverse antisocial conduct. It is revealing that previous criminal convictions, alcohol and drug consumption, and paraphilic behaviors figured so consistently in combinations that resulted in homicidal outcomes. Similarly revealing from the modus operandi results from Table 4 is the salience of rape, weapons use, and paraphilic disorders. Taken together, these offenders are consistent with other extreme offender prototypes most prominently represented among the life-course-persistent (Moffitt, 1993, 2018) and severe 5% (Vaughn et al., 2011; Vaughn et al., 2014) offenders, albeit those in the current study engaged in even arguably more extreme forms of violence.

Fourth, the assorted combinations from the conjunctive analysis indicate an intriguing tradeoff of sorts between substance use and paraphilic behaviors. For example, offenders that were loners, had prior convictions, used drugs/alcohol, but did not exhibit paraphilic behaviors were nearly 27 times more likely to perpetrate a homicide, despite paraphilic behaviors overall having a large association with homicide. It appears that offenders differentially use substance use to desensitize themselves to their sexual violence, to neutralize potential inhibitions to the use of sexual violence, or to simply facilitate the crime’s commission. There is evidence of highly sadistic and psychopathic SH offenders, such as Jeffrey Dahmer, for instance, who would use alcohol to overcome a sense of revulsion during
his use of torture and sexual predation (Jentzen et al., 1994). Paraphilic disorders, especially sexual sadism, have robust associations with diverse forms of serious crime (Chopin & Beauregard, 2020b; DeLisi et al., 2017; Healey et al., 2013; Hill et al., 2006) and as such can be understood as a primary driver of antisocial behavior. Thus, it is curious that offenders nevertheless rely on substance use to facilitate their homicidal offending.

**Conclusion**

This study which is the first to specifically investigate the lethal outcome of sexual crimes involving child victims present several implications. As to the theoretical implications, our results show that offender characteristics play a prominent role in the lethal outcome of sexual crimes involving children, which are more likely to be characterized by extreme forms of sexual victimization and gratuitous violence. These specificities suggest that SH of children are more often the outcome of extreme deviant sexual fantasies rather than an escalation of violence to overcome the victim’s resistance. As to the practical implications, offender characteristics identified in our findings can help criminal investigators for suspect prioritization (e.g., identification of previous criminal convictions, possession of sexual collection associated with paraphilic behaviors, etc.). Moreover, analysis of target selection characteristics suggests that SHOs of children select isolated and vulnerable victims. Situational crime prevention measures should be designed and tailored to avoid unsupervised activities at isolated places (e.g., parks, streets). Finally, the management of these offenders should be adapted to the various characteristics they present. Interventions should focus on the combination of risk factors (e.g., paraphilic behaviors; alcohol/drug use) to reduce the risk of recidivism for offenders who will be released back into the community. Strict supervision conditions should be imposed on those offenders more likely to be reintegrated back into the community after being sentenced.
While the current study offered several strengths including the richness of the data and the multiple analytical framework, there are also limitations to consider. First this study is based on official data which are known to present limitations in terms of validity and reliability (Aebi, 2006; Chopin & Aebi, 2018, 2019). We cannot exclude that some cases were never reported to police. This assumption is more likely to be true for extrafamilial CSA than for SH of children. Second, cases used in this study are all solved (i.e., police investigators identified and charged a suspect) and perpetrated in an extrafamilial context. Consequently, findings of this research cannot be generalized to crimes occurring in a familial context and to unsolved cases. Third, the use of police data allowed us to have a large and representative sample for a crime of rare occurrence. The downside is that psychological information is less detailed than what we would expect from judicial or clinical data. Finally, an important unavailable variable is homicidal ideation, which prior research with diverse study groups has shown to be importantly related not only to homicide offending, but also other violent conduct (Carbone et al., 2020; DeLisi et al., 2017; Vaughn et al., 2020). Among sexual offenders who experience homicidal ideation, those lethal thoughts could serve as an activation mechanism that motivates victim selection and crime characteristics. On the other hand, sexual offenders who do not experience homicidal ideation might limit their violence to rape and other forms of sexual assault but stop short of killing the victim. This should be tested in future studies. Similarly, future studies need to examine other psychological variables (e.g., personality, deviant sexual fantasies) and how they may influence the lethal outcome in CSA. Although this study provides some initial insights about SHOs’ characteristics, more research is needed to improve our understanding of these offenders, the risk of lethal outcome in CSA, as well as how we should design our methods of intervention.
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Tables

Table 1. Bivariate analyses of offender, victim, and crime characteristics on the crime outcome (N = 646)

| Offender characteristics | Child Sexual Abuse n = 510 | Sexual homicide of children n = 136 | \( \chi^2 \) Fischer’s exact test |
|-------------------------|---------------------------|---------------------------------|-------------------------------|
| Offender is single      | 210 (41.18%)              | 65 (47.79%)                     | 1.92                          |
| Offender has a sexual collection | 76 (14.90%)              | 23 (16.91%)                     | 0.33                          |
| Offender is a loner     | 69 (13.53%)               | 43 (31.62%)                     | 24.51***                      |
| Offender has previous criminal convictions | 36 (7.06%)                | 52 (38.24%)                     | 88.69***                      |
| Offender used alcohol/drug prior to crime commission | 86 (16.86%)               | 70 (51.47%)                     | 70.21***                      |

| Evidence of paraphilic behaviors | 23 (4.51%) | 55 (40.44%) | 130.57*** |

| Victim selection | Child Sexual Abuse n = 510 | Sexual homicide of children n = 136 | \( \chi^2 \) Fischer’s exact test |
|------------------|---------------------------|---------------------------------|-------------------------------|
| Victim specifically targeted | 162 (31.76%)              | 50 (36.76%)                     | 1.22***                       |
| Victim and offender were strangers | 271 (53.14%)              | 77 (56.62%)                     | 0.52                          |
| Victim was a female | 379 (74.31%)              | 111 (81.62%)                    | 3.13                          |
| Victim was less than 10 years old | 224 (43.92%)              | 47 (34.56%)                     | 3.87*                         |
| Victim consumed alcohol/drugs prior to crime | 10 (1.96%)                | 22 (16.18%)                     | 46.09***                      |
| Victim was frequently engaged in social activities | 29 (5.69%)                | 25 (18.38%)                     | 22.59***                      |
| Victim was involved in domestic activities prior to crime | 35 (6.86%)                | 13 (9.56%)                      | 1.14                          |
| Victim was sleeping | 20 (3.92%)                | 11 (8.09%)                      | 4.08*                         |
| Victim was playing | 115 (22.55%)              | 32 (23.53%)                     | 0.06                          |
| Victim was walking to or from somewhere at the time of offense | 213 (41.76%)              | 19 (35.76%)                     | 36.04***                      |
| Victim was involved in sport/recreational activities | 62 (12.16%)               | 12 (8.82%)                      | 1.18                          |
| Victim was hitchhiking | 4 (0.78%)                 | 10 (7.35%)                      | 21.85***                      |

| Crime characteristics | Child Sexual Abuse n = 510 | Sexual homicide of children n = 136 | \( \chi^2 \) Fischer’s exact test |
|----------------------|---------------------------|---------------------------------|-------------------------------|
| Sexual behaviors     |                           |                                 |                                |
| Vaginal/Anal penetration with a penis | 129 (25.29%)              | 107 (78.68%)                    | 131.96***                     |
| Digital penetration  | 101 (19.80%)              | 26 (19.12%)                     | 0.03                          |
| Foreplay acts        | 198 (38.82%)              | 38 (27.94%)                     | 5.48*                         |
| Fondling             | 367 (71.96%)              | 23 (16.91%)                     | 136***                        |
| Foreign object insertion | 8 (1.57%)               | 8 (5.88%)                      | 8.27**                        |

| Non-sexual behaviors | Child Sexual Abuse n = 510 | Sexual homicide of children n = 136 | \( \chi^2 \) Fischer’s exact test |
|---------------------|---------------------------|---------------------------------|-------------------------------|
| Con approach        | 361 (70.78%)              | 95 (69.85%)                     | 0.05                          |
| Weapon involvement  | 51 (10.00%)               | 90 (66.18%)                     | 198.58***                     |
| Victim was beaten   | 9 (1.76%)                 | 63 (46.32%)                     | 215.26***                     |
| Physical torture    | 3 (0.59%)                 | 19 (13.97%)                     | 58.45***                      |
| Offender used forensic awareness strategies | 196 (38.43%)              | 77 (56.62%)                     | 14.55***                      |
| Contact scene: Deserted place | 100 (19.61%)              | 39 (28.68%)                     | 5.23*                         |
| Offense scene: deserted | 171 (33.53%)              | 75 (55.15%)                     | 21.28***                      |

Notes. *p \( \leq .05 \), **p \( \leq .01 \), ***p \( \leq .001 \).
Table 2. Sequential binomial regression for offender, victim, and crime characteristics on the crime outcome (N = 646)

| Offender characteristics | Model 1 |  |  | Model 2 |  |  | Model 3 |  |  | Best Model |  |  |  |
|--------------------------|---------|---|---|---------|---|---|---------|---|---|------------|---|---|---|
|                          | B       | S.E. | Exp(B) | B       | S.E. | Exp(B) | B       | S.E. | Exp(B) | B       | S.E. | Exp(B) |
| Offender is a loner      | 0.99    | 0.27 | 2.70*** | 1.28    | 0.48 | 3.60**  | 1.72    | 0.55 | 5.56**  | 1.02    | 0.43 | 2.77*   |
| Offender has previous criminal convictions | 1.69    | 0.29 | 5.43*** | 1.28    | 0.48 | 5.56**  | 1.02    | 0.43 | 2.77*   |
| Offender used alcohol/drug prior to crime commission | 1.50    | 0.25 | 4.49*** | 1.02    | 0.43 | 2.77*   | 1.02    | 0.43 | 2.77*   |
| Paraphilic behaviors     | 2.29    | 0.31 | 9.89*** | 2.35    | 0.53 | 10.50*** | 2.35    | 0.53 | 10.50*** |

| Victimological characteristics | Model 1 |  |  | Model 2 |  |  | Model 3 |  |  | Best Model |  |  |  |
|-------------------------------|---------|---|---|---------|---|---|---------|---|---|------------|---|---|---|
| Victim was less than 10 years old | -0.59  | 0.23 | 0.55** | -0.26  | 0.45 | 0.77   | -0.26  | 0.45 | 0.77   |
| Victim consumed alcohol/drugs prior to crime | 1.75    | 0.44 | 5.76*** | 0.89   | 0.90 | 2.45   | 0.89   | 0.90 | 2.45   |
| Victim was sleeping           | 0.65    | 0.41 | 1.92   | 0.65   | 0.41 | 1.92   | 0.65   | 0.41 | 1.92   |
| Victim was walking to or from somewhere at the time of offense | -1.61   | 0.29 | 0.20*** | -2.72  | 0.61 | 0.07*** | -2.72  | 0.61 | 0.07*** |
| Victim was hitchhiking        | 2.28    | 0.69 | 9.81*** | 1.43   | 0.97 | 4.19   | 1.43   | 0.97 | 4.19   |

| Crime characteristics | Model 1 |  |  | Model 2 |  |  | Model 3 |  |  | Best Model |  |  |  |
|-----------------------|---------|---|---|---------|---|---|---------|---|---|------------|---|---|---|
| Vaginal/Anal penetration with a penis | 2.12    | 0.35 | 8.36*** | 1.78    | 0.45 | 5.91*** | 1.78    | 0.45 | 5.91*** |
| Foreplay acts          | -1.53   | 0.36 | 0.22*** | -1.52   | 0.43 | 0.22*** | -1.52   | 0.43 | 0.22*** |
| Fondling               | -1.59   | 0.35 | 0.21*** | -1.86   | 0.43 | 0.16*** | -1.86   | 0.43 | 0.16*** |
| Foreign object insertion | 0.01   | 1.08 | 1.01   | 0.01   | 1.08 | 1.01   | 0.01   | 1.08 | 1.01   |
| Weapon involvement     | 2.35    | 0.35 | 10.47*** | 2.52    | 0.44 | 12.40*** | 2.52    | 0.44 | 12.40*** |
| Victim was beaten      | 2.90    | 0.48 | 18.22*** | 2.66    | 0.61 | 14.22*** | 2.66    | 0.61 | 14.22*** |
| Physical torture       | 1.01    | 0.86 | 2.75   | 1.01    | 0.86 | 2.75   | 1.01    | 0.86 | 2.75   |
| Contact scene: Deserted place | 0.53   | 0.42 | 1.70   | 0.53   | 0.42 | 1.70   | 0.53   | 0.42 | 1.70   |
| Offense scene: deserted | 0.06    | 0.38 | 0.94   | 0.06    | 0.38 | 0.94   | 0.06    | 0.38 | 0.94   |
| Offender used forensic awareness strategies | 0.18    | 0.34 | 1.19   | 0.18    | 0.34 | 1.19   | 0.18    | 0.34 | 1.19   |

| Constant               | -2.75   | 0.19 | 0.06*** | -0.90   | 0.17 | 0.41*** | -2.67   | 0.36 | 0.07*** | -2.97   | 0.56 | 0.05*** |

| χ²                     | 197.74*** | 92.67*** | 385.59*** | 479.23*** |
| -2 Log Likelihood      | 467.20    | 572.26    | 279.34    | 185.70    |
| Cox & Snell R²         | 0.26      | 0.13      | 0.45      | 0.52      |
| Nagelkerke R²          | 0.41      | 0.21      | 0.70      | 0.82      |
| Overall classification % | 85.40    | 81.30    | 91.00    | 94.60    |

Notes. *p ≤ .05. **p ≤ .01. ***p ≤ .001
| Offender is a loner | Offender has previous criminal convictions | Offender used alcohol/drug prior to crime commission | Offender has paraphilic behavior | Odds Ratio | Combo # |
|-------------------|---------------------------------|---------------------------------------------------|-------------------------------|------------|--------|
| Yes               | Yes                             | Yes                                               | 0                             | 11.30      | 1      |
|                   | No                              | Yes                                               | 0                             | 26.76*     | 2      |
|                   | No                              | No                                                | 0                             | 76.07**    | 3      |
|                   | Yes                             | Yes                                               | 3                             | 5.12*      | 4      |
|                   | No                              | Yes                                               | 12                            | 3.29**     | 6      |
|                   | No                              | No                                                | 48                            | 0.52       | 8      |
|                   | Yes                             | Yes                                               | 3                             | 17.86***   | 9      |
|                   | No                              | Yes                                               | 5                             | 12.52***   | 10     |
|                   | Yes                             | No                                                | 0                             | 26.76*     | 11     |
|                   | No                              | Yes                                               | 25                            | 0.59       | 12     |
|                   | No                              | Yes                                               | 59                            | 6.31**     | 13     |
|                   | No                              | Yes                                               | 8                             | 8.54***    | 14     |
|                   | No                              | No                                                | 336                           | 0.08***    | 16     |

Notes. *p \leq .05. **p \leq .01. ***p \leq .001
Table 4. Conjunctive analysis of the offender (paraphilic behavior) and modus operandi characteristics and the crime outcome (CSA versus SH) (N = 646)

| Offender has paraphilic behaviors | Vaginal/anal penetration with a penis | Weapon involvement | Victim was beaten | Child sexual abuse (n=510) | Sexual Homicide (n=136) | Odds Ratio | Combo # |
|----------------------------------|--------------------------------------|--------------------|------------------|---------------------------|------------------------|------------|--------|
| Yes                              | Yes                                  |                    | Yes              | 1                         | 11                     | 44.79**    | 1      |
|                                  |                                      |                    | No               | 0                         | 13                     | 111.60**   | 2      |
|                                  |                                      |                    | Yes              | 0                         | 8                      | 67.53**    | 3      |
|                                  |                                      |                    | No               | 9                         | 13                     | 5.88***    | 4      |
|                                  |                                      |                    | Yes              | 0                         | 3                      | 2.21%      | 5      |
|                                  |                                      |                    | No               | 3                         | 3                      | 2.21%      | 6      |
|                                  |                                      |                    | Yes              | 0                         | 3                      | 2.21%      | 7      |
|                                  |                                      |                    | No               | 10                        | 1                      | 0.74%      | 8      |
|                                  |                                      |                    | Yes              | 2                         | 20                     | 14.71%     | 9      |
|                                  |                                      |                    | No               | 19                        | 28                     | 20.59%     | 10     |
|                                  |                                      |                    | Yes              | 4                         | 9                      | 6.62%      | 11     |
|                                  |                                      |                    | No               | 96                        | 4                      | 2.94%      | 12     |
|                                  |                                      |                    | Yes              | 0                         | 8                      | 5.88%      | 13     |
|                                  |                                      |                    | No               | 28                        | 7                      | 5.15%      | 14     |
|                                  |                                      |                    | Yes              | 0                         | 2                      | 1.47%      | 15     |
|                                  |                                      |                    | No               | 338                       | 3                      | 2.21%      | 16     |

Notes. *p ≤ .05. **p ≤ .01. ***p ≤ .001
Table 5. Conjunctive analysis of the offender (offender has previous criminal conviction) and modus operandi characteristics and the crime outcome (CSA versus SH) (N = 646)

| Offender has previous criminal conviction | Vaginal/anal penetration with a penis | Weapon involvement | Victim was beaten | Child sexual abuse (n=510) | Sexual Homicide (n=136) | Odds Ratio
|------------------------------------------|-------------------------------------|--------------------|------------------|---------------------------|------------------------|---------------|
|                                          | Yes                                 | Yes                | Yes              | Yes 1 0.20% 16 11.76% | 67.86*** 1 | Sexual Homicide / Child sexual abuse | Combo # |
|                                          | Yes                                 | Yes                | No               | Yes 0 0.00% 5 3.68% | 42.70** 3 | | |
|                                          | Yes                                 | No                 | Yes              | Yes 0 0.00% 5 3.68% | 42.70** 5 | | |
|                                          | Yes                                 | No                 | No               | Yes 0 0.00% 2 1.47% | 18.97 7 | | |
|                                          | Yes                                 | No                 | No               | Yes 0 0.00% 0 0.00% | 0.1 8 | | |
|                                          | Yes                                 | Yes                | Yes              | Yes 2 0.39% 15 11.03% | 31.48*** 9 | | |
|                                          | No                                  | Yes                | Yes              | Yes 4 0.78% 12 8.82% | 12.24*** 11 | | |
|                                          | No                                  | Yes                | No               | Yes 0 0.00% 6 4.41% | 50.85* 13 | | |
|                                          | No                                  | Yes                | No               | Yes 23 4.51% 7 5.15% | 1.14 14 | | |
|                                          | No                                  | Yes                | No               | Yes 2 0.39% 2 1.47% | 3.79 15 | | |
|                                          | No                                  | Yes                | No               | Yes 329 64.51% 4 2.94% | 0.02*** 16 | | |

Notes. *p \(\leq .05\), **p \(\leq .01\), ***p \(\leq .001\)
Table 6. Conjunctive analysis of the offender (psychoactive substances) and modus operandi characteristics and the crime outcome (CSA versus SH) \((N = 646)\)

| Offender used alcohol/drug prior to crime commission | Vaginal/anal penetration with a penis | Weapon involvement | Victim was beaten | Child sexual abuse \((n = 510)\) | Sexual Homicide \((n = 136)\) | Odds Ratio | Combo # |
|---|---|---|---|---|---|---|---|
| Yes | Yes | Yes | Yes | 1 | 0.20% | 23 | 16.91% | 103.60*** | 1 |
| | Yes | Yes | No | 5 | 0.98% | 16 | 11.76% | 13.46*** | 2 |
| | Yes | No | Yes | 29 | 5.69% | 9 | 6.62% | 1.17 | 3 |
| | No | Yes | Yes | 0 | 0.00% | 12 | 8.82% | 102.51** | 4 |
| No | Yes | No | Yes | 0 | 0.00% | 4 | 2.94% | 34.67* | 5 |
| | No | Yes | No | 5 | 0.98% | 3 | 2.21% | 2.27 | 6 |
| | No | No | Yes | 0 | 0.00% | 2 | 1.47% | 18.98 | 7 |
| | No | No | No | 46 | 9.02% | 1 | 0.74% | 0.07* | 8 |

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| Yes | Yes | Yes | No | 2 | 0.39% | 8 | 5.88% | 15.87** | 9 |
|---|---|---|---|---|---|---|---|---|---|
| Yes | Yes | No | No | 8 | 1.57% | 22 | 16.18% | 12.11*** | 10 |
| Yes | No | Yes | Yes | 4 | 0.78% | 5 | 3.68% | 4.82** | 11 |
| Yes | No | Yes | No | 76 | 14.90% | 12 | 8.82% | 0.55 | 12 |
| Yes | No | No | Yes | 0 | 0.00% | 7 | 5.15% | 58.23** | 13 |
| Yes | No | No | No | 30 | 5.88% | 7 | 5.15% | 0.85 | 14 |
| No | Yes | Yes | Yes | 2 | 0.39% | 2 | 1.47% | 3.79 | 15 |
| No | Yes | Yes | No | 302 | 59.22% | 3 | 2.21% | 0.02*** | 16 |
| No | Yes | No | Yes | 2 | 0.39% | 2 | 1.47% | 3.79 | 15 |
| No | Yes | No | No | 302 | 59.22% | 3 | 2.21% | 0.02*** | 16 |

Notes. *\(p \leq 0.05\). **\(p \leq 0.01\). ***\(p \leq 0.001\)
Table 7. Conjunctive analysis of the offender (loner) and modus operandi characteristics and the crime outcome (CSA versus SH) (N = 646)

| Offender is socially isolated | Vaginal/anal penetration with a penis | Weapon involvement | Victim was beaten | Child sexual abuse (n = 510) | Sexual Homicide (n = 136) | Odds Ratio | Combo # |
|-----------------------------|-------------------------------------|--------------------|-----------------|-----------------------------|--------------------------|------------|---------|
| Yes                         | Yes                                 | Yes                | Yes             | 1                           | 0.20%                     | 6          | 4.41%   | 23.49** | 1       |
|                            |                                    | No                 | Yes             | 0                           | 0.00%                     | 15         | 11.03%  | 63.09***| 2       |
|                            |                                    | No                 | Yes             | 0                           | 0.00%                     | 5          | 3.68%   | 42.28*  | 3       |
|                            |                                    | No                 | Yes             | 11                          | 2.16%                     | 7          | 5.15%   | 2.46    | 4       |
|                            |                                    | No                 | Yes             | 3                           | 0.59%                     | 5          | 3.68%   | 6.45*   | 6       |
|                            |                                    | No                 | Yes             | 0                           | 0.00%                     | 0          | 0.00%   | -       | 7       |
|                            |                                    | No                 | Yes             | 53                          | 10.39%                    | 3          | 2.21%   | 0.19**  | 8       |
|                            |                                    | Yes                | Yes             | 2                           | 0.39%                     | 25         | 18.38%  | 57.20***| 9       |
|                            |                                    | Yes                | No              | 16                          | 3.14%                     | 23         | 16.91%  | 6.28*** | 10      |
|                            |                                    | No                 | Yes             | 4                           | 0.78%                     | 12         | 8.82%   | 12.24***| 11      |
|                            |                                    | No                 | Yes             | 94                          | 18.43%                    | 14         | 10.29%  | 0.51*   | 12      |
|                            |                                    | No                 | Yes             | 0                           | 0.00%                     | 9          | 6.62%   | 76.07** | 13      |
|                            |                                    | No                 | Yes             | 34                          | 6.67%                     | 0          | 0.00%   | 0.05*   | 14      |
|                            |                                    | No                 | Yes             | 2                           | 0.39%                     | 4          | 2.94%   | 7.69*   | 15      |
|                            |                                    | No                 | Yes             | 289                         | 56.67%                    | 6          | 4.41%   | 0.04*** | 16      |

Notes. *p ≤ .05, **p ≤ .01, ***p ≤ .001