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Rapists' behaviors to avoid police detection

Julien Chopin[a,*], Eric Beauregard[a], Sonja Bitzer[b], Kylie Reale[a]

[a] School of Criminology, Simon Fraser University, 8888 University Drive, Burnaby, British Columbia V5A 1S6, Canada
[b] Faculty of Law and Criminology, Catholic University of Leuven, Belgium

1. Introduction

Although sexual assault is one of the more common violent offenses, it is also one of the most underreported crimes. For instance, in the US, analyses using the National Violence Against Women Survey found that only 19.1% of rape victims under the age of 18 reported the crime to police (Tjaden & Thoennes, 2006), while in Canada it was less than 6% (Du Mont, Miller, & Myhr, 2003). Even when sexual assault cases are reported, not all will lead to the conviction of the offender as prosecution rates for sexual assaults are among the lowest compared to other types of violent crime (Sommers & Baskin, 2011). Studies have shown that a suspect is likely to be arrested, charged, prosecuted, and convicted in only the minority of cases (e.g., Spohn, Tellis, & O'Neal, 2014). Furthermore, some rapists will also simply go undetected and their crimes never investigated.

Despite these difficulties, there remains only a dearth of research on factors related to solving rape cases. Most of the research on crime solvability has focused on homicide (see Braga & Dusseault, 2018; Hawk & Dabney, 2018; Regoeczi, Jarvis, & Mancik, 2018). The various factors which influence homicide solvability have been traditionally organized around two main conflicting perspectives in the literature which can be applied to rape cases as well. According to the discretionary perspective (Riedel, 2008), victimology (e.g., age, gender) influences how vigorously and diligently the police work to solve a crime (Black, 1976). Such a perspective has been often used to explain why, for example, the murder of a white female from an upper socio-economic background would be more likely to be solved than the murder of a sex trade worker (for a review see Beauregard & Martineau, 2014).

The nondiscretionary perspective (Riedel, 2008) on the other hand, suggests that it is the characteristics of the offense itself (e.g., weapon use, presence of forensic traces) that are most important in determining the solvability of the crime. According to this perspective, the police are fully engaged and committed to clear every homicide, although they may not be able to do so due to external situational factors. For instance, studies have shown that homicides where witnesses are available are more likely to be solved (Klinger, 1997). In their study, James and Beauregard (2018b) found that investigators' skills have an important impact on the likelihood of a sexual homicide being solved. For instance, cases involving unskilled sexual murderers and skilled investigators were more likely to lead the solving of the crime, whereas situations with unskilled investigators led to improbable crime solving.

In line with the nondiscretionary perspective, Beauregard and Martineau (2014) have suggested that some criminals avoid police detection because they make specific choices that will allow them to go unnoticed. Central to the definition of modus operandi – i.e., 'the actions taken by an offender to perpetrate the offense successfully' (Douglas, Burgess, Burgess, & Ressler, 2006, p. 353) – is the idea of avoiding police detection. This perspective focuses on the actions of the criminal as opposed to the failure of the criminal justice system to solve the crime. Thus, criminals may target a specific type of victim (e.g., sex trade worker) and adopt certain behaviors with the specific aim of hindering any subsequent police investigation and increasing the likelihood of avoiding detection. Criminals make conscious decisions and choose to act a certain way to evade police detection.

It is possible to link the nondiscretionary perspective to the rational choice approach (Cornish & Clarke, 1986). According to this approach, crime is the result of choices made by individuals to meet a specific need. These choices follow a cost-benefit analysis where the advantages or benefits of committing the crime are counterbalanced by the risks involved. Usually, when risks are perceived to outweigh the gains, the offender will refrain from committing the crime. However, this perception of risks and benefits is highly subjective and is usually based on partial or incomplete information.

One of the most important risks for the offender is to be detected and caught by the police. As stated by Cornish and Clarke (1986), after making the decision to get involved or not in a crime, offenders need to make a series of decisions during the various steps of the crime-commission process to successfully commit the crime and avoid detection. For instance, some offenders will target victims who present specific characteristics (e.g., age, vulnerable lifestyle) as they are associated with a greater chance to avoid police detection. Also, some offenders will use certain strategies to commit the crime (e.g., blitz approach, beating the victim) to increase their chances of remaining undetected. Finally, some offenders will adopt specific strategies to reduce the risks that forensic evidence would lead to their apprehension – a phenomenon also known as forensic awareness (Beauregard & Martineau, 2012).

* Corresponding author.
E-mail addresses: julienc@sfu.ca (J. Chopin), ebeaureg@sfu.ca (E. Beauregard), sonja.bitzer@uclouvain.be (S. Bitzer), kylie_reale@sfu.ca (K. Reale).

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1.1. Modus operandi used in unsolved rape cases

Rapists often target victims who present specific characteristics associated with their likelihood of avoiding detection. Studies comparing solved and unsolved rapes have shown that cases involving young victims presented a higher probability of getting solved compared to cases with older victims (Du Mont & Myhr, 2000; Du Mont & Parnis, 2000). It has been suggested that when victims are younger, they are more vulnerable, which increases the pressure on the police to solve the crime. Consequently, more resources are devoted to solve these crimes quickly (Du Mont & Parnis, 2000; Riedel, 2008). Moreover, crimes against children are generally perpetrated by acquaintance or in the presence of witnesses, which leads to more information being available to solve the crime (Regoeczi, Jarvis, & Riedel, 2008; Riedel, 2008). Another victim characteristic associated with the solvability of rape cases is the victim's vulnerable lifestyle. Du Mont and Parnis (2000) have found that women who consumed alcohol prior to being raped as well as younger victims are not penalized by that. These findings suggested that police officers are more sensitive to the vulnerability of the victim (Du Mont & Parnis, 2000). In sexual homicide however, Beauregard and Martineau (2014) have found that cases involving sex trade workers were more likely to remain unsolved, mainly due to the circumstances surrounding this activity (e.g., sexual activities at risky places, absence of potential witnesses, difficulties in establishing the victim's whereabouts, time elapsed between the crime and the report of the victim missing).

Studies have also shown that certain crime characteristics may help offenders to avoid detection. For instance, Johnson, Peterson, Sommers, and Baskin (2012) found that arrest in rape cases were more likely when the victim and the offender were acquainted. Also, in a study focusing on solved and unsolved cases of sexual homicide, (Beauregard & Martineau, 2014) showed that the best strategy to avoid detection was to conceal the body after the murder. Sexual murderers who choose to conceal the victim's body post murder are likely to see the number of days until body recovery increased, which in turn is likely to increase the chances of forensic traces being lost and then decreases the likelihood of the offender being connected to the crime. Similarly, Reale and Beauregard (2018) observed that sexual murderers who delay victim body recovery past the first 48 h of a homicide or missing persons investigation are more likely to be married, use detection avoidance strategies like disposing of the victims' body or cleaning up the crime scene, and typically target victims that are hitch-hiking, jogging or walking. These studies highlight the impact that detection avoidance strategies can have on the ability for investigators to effectively collect forensic evidence, establish leads, and ultimately determine the perpetrator.

Forensic awareness strategies (Beauregard & Martineau, 2012) represent a specific component of the modus operandi and include the measures taken by the offenders during the crime-commission process to thwart police investigative efforts (Beauregard & Bouchard, 2010). Due in part to the scientific advances in forensic science, especially in DNA profiling and computing technology (Cole, 2010), some offenders increase their efforts to prevent traces (e.g., semen) to be left at the crime scene or for the victim to be able to identify them (e.g., wearing a mask, preventing their face from being seen). Based on a sample of serial rapists, Beauregard and Bouchard (2010) have shown that more than half of offenders used at least one of the forensic awareness strategies, protecting their identity being the most common, whereas DNA removal behavior was less frequent. Interestingly, LaFree (1981) found that the best predictor of sexual offender arrest was when the victim was able to identify and describe the suspect. Despite all the potential factors associated with forensic evidence, it is important to highlight the fact that for rapes occurring in the US, forensic traces are collected from sexual assault kits (SAKs) in 63.8% of the cases. However, only 32.2% will be submitted to the laboratory and only 18.6% will actually be analyzed (Johnson et al. (2012). Yet, it was estimated that 50 to 60% of SAKs contain evidence connected to the perpetrator (Ritter, 2013).

2. Aim of study

Despite the importance of understanding factors related to solving sexual crimes, only a few studies have been conducted on this topic. Most published studies have focused on homicide and they have mainly examined victim characteristics and/or some aspect of the police work, neglecting the fact that offenders may adopt certain behavior that increases their chances of evading detection. Therefore, the current study takes a different approach by testing whether offenders committing sexual crimes adopt certain behaviors that increase their chance of avoiding detection. The current study examines what are the most important factors to predict the status (i.e., solved versus unsolved) of rape cases. Specifically, this research aims to: 1) compare offender's behavior (i.e., selection of certain victim characteristics, crime characteristics, and forensic awareness strategies) of solved and unsolved rapes, and 2) identify which of these factors are the most important for the offender to remain undetected.

3. Method

3.1. Sample

This study is based on a sample of 4354 cases of rapes committed in France between 1979 and 2018.[1] Of these cases, 1111 were still unsolved at the time of data collection. Unsolved cases include rapes where an offender has not been identified by investigators, whereas solved cases are those in which police investigators identified and charged a suspect. Several reasons can explain why rape cases remain unsolved: Offender behavior, investigators' skills, and luck (see for example Beauregard & Bouchard, 2010; Beauregard & Martineau, 2014; James & Beauregard, 2018a, 2018b; Rossmo, 2009). These cases have been collected from an operational national police database compiled by crime analysts, experts in extrafamilial sexual crime, and based on criminal investigation files. Crime data and cases status are constantly updated with new investigative information shared by criminal investigators and compiled by crime analysts. Data used for the current study were extracted from the database on August 1st 2018. All cases included in the current study involved extrafamilial and stranger relationship. There are situations where the offenders and the victims were totally unknown at the time of the offense. It is in opposition to situations where victims and offenders were strangers but had a contact (visual and/or social) just before the assault. For instance, a victim may have seen the offender several times at the same bus stop without never talking to him. Although she can recognize the offender, she does not know him. The same could be said of an offender and a victim living in the same apartment building, cross path sometimes, and say hello once in a while.

For the purpose of the study, rapes are operationalized as the occurrence of vaginal and/or anal penetration with a penis and/or foreign objects (i.e., unanimated objects used to perform vaginal and/or anal penetration).

3.2. Measures

The dependent variable examined in this study is a dichotomous variable identifying the status of the case (0 = unsolved, 1 = solved). As to the independent variables, they have been grouped under three categories: selection of victim characteristics, crime characteristics, and forensic awareness strategies.

[1] 0.67% of cases were committed before 1980, 13.90% were committed between 1990 and 1999, 57.68% were committed between 2000 and 2009 and 27.75% of cases were committed between 2010 and 2018.

3.2.1. Selection of victim characteristics

A total of 16 dichotomous (0 = no, 1 = yes) variables have been used to describe the selection of victim characteristics: 1) Victim is a female; 2) victim is less than 15 years old at the time of offense; 3) victim is white; 4) victim was single at the time of the offense; 5) victim abuses alcohol and/or drugs; 6) victim likes to socialize; 7) victim was a sex trade worker at the time of offense (i.e., victim is a sex trade worker but was not necessary working at the time of the offense); 8) victim has a physical handicap; 9) victim was involved in domestic activities at the time of offense; 10) victim was sleeping at the time of offense (e.g., watching TV, etc.); 11) victim was playing at the time of offense; 12) victim was traveling to or from somewhere at the time of offense (i.e., this variable describes cases where victims move from one place to another independently of the travelled distance that could be very short); 13) victim was jogging/walking at the time offense; 14) victim was socializing at a bar at the time of offense; 15) victim was visiting friends or relatives at the time of offense; and 16) victim was involved in sex trade work at the time of offense (i.e., victim was involved in sex trade work at the time of assault).

3.2.2. Crime characteristics

The crime characteristics have been organized following the crime script perspective (Cornish, 1994) with 16 precrime, crime, and postcrime dichotomous (0 = no, 1 = yes) variables. Precrime variables include: 1) Victim was targeted by the offender; 2) offender and victim were stranger (i.e., describes situations where offenders and victims were totally unknown at the time of the rape in opposition with situations where offenders and victims were strangers but had a visual and/or social contact visual and/or social just before the assault); 3) offender used a con approach (e.g., befriended the victim, posed as an authority figure, offered assistance, etc.); 4) offender used a surprise approach (e.g., lay in wait inside a building, grabbed the victim, etc.); 5) offender used a blitz approach (e.g., offender grabbed and immediately chocked the victim, offender immediately overpowered the victim, offender immediately hit the victim, offender immediately stabbed or shot the victim, etc.); 6) encounter, assault, and victim release occurred at the same location; 7) crime scene was deserted (i.e., nobody can see and/or interrupt the crime); 8) assault occurred in residence (e.g., victim's residence, offender's residence, single-family dwelling, multi-family dwelling, third party residence); 9) assault occurred in a public area (e.g., school, library, hospital, public washroom, theatre, religious facility, public swimming pool, etc.); 10) assault occurred in an outdoor location (i.e., residence front/back yard, play space, green space, jogging/bike path, public park, wooded area, alley, etc.); 11) assault occurred in a parking; Crime variables include: 12) offender performed acts of sexual sadism (i.e., beating sexual areas, biting, using sexual bondage, inflicting physical torture, mutilating body cavities/genitals, whipping); 13) victim was beaten; 14) no physical violence was used. Finally, postcrime characteristics include: 15) victim was intentionally released and 16) semen was left at the crime scene.

3.2.3. Investigative awareness strategies

A total of 11 variables – ten of which are dichotomous (0 = no, 1 = yes) – measure the forensic awareness strategies used by the offenders: 1) offender removed or destroyed forensic traces; 2) offender has forced the victim to shower after the assault; 3) offender wore gloves; 4) offender wore mask; 5) offender used a condom; 6) offender gave false name; 7) offender covered victim's eyes or face; 8) offender covered victim's mouth; 8) offender disabled telephone and/or security system; 9) offender bound victim; and 10) offender threatened the victim. Finally, one continuous variable (0 to 6 or more) measures the number of forensic awareness strategies used by the offender during the crime.

3.3. Analytical strategy

Our analytical strategy followed a two-step process. First, bivariate analyses (i.e., Chi-square analyses) were performed to examine the differences between the dependent and independent variables. The second step involved looking at the differences between solved and unsolved cases at the multivariate level. Using only the significant variables at the bivariate level, a sequential logistic regression was performed. This was done not only to better understand the impact of each variable while taking into account the other significant variables in the model, but also to identify which of the three groups of variables (i.e., selection of victim characteristics, crime characteristics, and forensic awareness strategies) was more important to explain why some rape cases remain unsolved. The sequential logistic regression includes three models. Model 1 includes only the selection of victim characteristic variables. Model 2 includes the selection of victim characteristics as well as the crime characteristic variables. Finally, Model 3 includes all three groups of variables, namely the selection of victim characteristics, the crime characteristics, and the forensic awareness strategies.

4. Results

Table 1 presents results on the comparisons between solved and unsolved cases on the selection of victim characteristics. Findings show that rapes of female victims are more often unsolved (*Cramer's* $V = 0.09$, $p = .000$), whereas when victims are younger than 15 years old they are more often solved (*Cramer's* $V = 0.10$, $p \leq .001$). Also, cases involving white victims (*Cramer's* $V = 0.06$, $p = .001$) and victims who are not single have better chances of being solved by the police. Cases involving sex trade workers (*Cramer's* $V = 0.03$, $p = .025$) and physically handicapped victims (*Cramer's* $V = 0.03$, $= 0.028$) are more likely to be solved by the police. Moreover, results show that cases are more likely to be solved when victims were involved in domestic activities (*Cramer's* $V = 0.05$, $p = .001$), sleeping (*Cramer's* $V = 0.04$, $p = .020$), playing (*Cramer's* $V = 0.10$, $p = .000$), visiting friends (*Cramer's* $V = 0.09$, $p = .000$), or were involved in prostitution related activities (*Cramer's* $V = 0.04$, $p = .012$) at the time of the offense. On the other hand, cases are more likely to remain unsolved when victims were jogging or walking (*Cramer's* $V = 0.18$, $p = .000$) at the time of the offense.

Table 2 presents the comparisons between solved and unsolved rape cases on crime characteristics. As to the precrime factors, cases are more likely to be solved by the police when the victims were targeted by offenders (*Cramer's* $V = 0.16$, $p = .000$), the offender used a con to approach the victim (*Cramer's* $V = 0.16$, $p = .000$), and when the crime scene is a residence (*Cramer's* $V = 0.15$, $p = .000$). However, cases are more likely to remain unsolved when the relationship between the offender and the victim is stranger at the time of the assault (*Cramer's* $V = 0.23$, $p = .000$), the use of a surprise (*Cramer's* $V = 0.09$, $p = .000$) or blitz (*Cramer's* $V = 0.12$, $p = .000$) approaches by the offender, as well as the fact that the encounter, crime, and release locations are the same (*Cramer's* $V = 0.08$, $p = .000$). Moreover, rape cases are more likely to remain unsolved when the crime scene was deserted (*Cramer's* $V = 0.05$, $p = .002$), when the assault took place outdoors (*Cramer's* $V = 0.15$, $p = .000$) or in a parking lot (*Cramer's* $V = 0.04$, $p = 003$).

As to the crime phase, acts of sexual sadism (*Cramer's* $V = 0.04$, $p = .011$) and the lack of expressive physical violence (*Cramer's* $V = 0.04$, $p = .017$) by the offenders were associated with the case being solved by the police. Finally, the only significant difference on the postcrime phase showed that cases where the offenders left semen at the crime scene were more likely be solved (*Cramer's* $V = 0.06$, $p = .000$).

Table 3 presents the comparisons between solved and unsolved cases on the forensic awareness strategies used by the offenders. It is noteworthy that only the type of forensic awareness strategy presents significant differences with regards to the status of the case, whereas

Table 1
Bivariate analysis of victimological characteristics (N = 4354).

	Solved cases (n = 3243)		Unsolved cases (n = 1111)		Cramer's V/φ
	n	%	n	%	
Victim is a female	2973	91.67%	1075	96.76%	0.09***
Victim has less than 15 years old	530	16.34%	97	8.73%	0.10***
Victim is white	2128	65.62%	685	61.66%	0.04*
Victim is single	1478	45.58%	431	38.79%	0.06***
Lifestyle					
Victim abuses alcohol/drugs	432	13.32%	125	11.25%	0.03†
Victim likes to socialize/party	478	14.74%	159	14.31%	0.01
Victim is a sex trade worker	164	5.06%	38	3.42%	0.03*
Victim have a physical handicap	204	6.29%	36	3.24%	0.06***
Routine activities					
Victim was doing domestic activities	412	12.70%	98	8.82%	0.05***
Victim was sleeping	319	9.84%	83	7.47%	0.04*
Victim was playing	164	5.06%	5	0.45%	0.10***
Victim was traveling to or from somewhere	172	5.30%	75	6.75%	0.03†
Victim was jogging/walking	1332	41.07%	682	61.39%	0.18***
Victim was socializing in a bar	235	7.25%	71	6.39%	0.02
Victim was visiting friends or relatives	183	5.64%	14	1.26%	0.09***
Victim was sex trade working	154	4.75%	33	2.97%	0.04*

*** $p \leq .001$.
* $p \leq .05$.
† $p \leq .1$.

the actual number of forensic awareness strategies used by the offenders is approximately the same between solved and unsolved cases. Offenders who wore gloves (*Cramer's V* = 0.07, p = .000), a mask (*Cramer's V* = 0.11, p = .000), or a condom (*Cramer's V* = 0.06, p = .000) are more likely to avoid police detection and see their case remain unsolved. However, offenders providing a false identity (*Cramer's V* = 0.06, p = .000), who disabled the victims' phone (*Cramer's V* = 0.04, p = .021), and who threatened the victim (*Cramer's V* = 0.11, p = .000) were more likely to be identified and see the case being solved by the police.

Table 4 presents the results of the sequential binomial regression examining the case status (i.e., solved/unsolved). Model 1 includes the victimological characteristics. Findings indicate that offenders assaulting women (OR = 1/0.60, p = .007) who were walking or jogging at the time of the assault (OR = 1/0.51, p = .000) are respectively 1.66 and 1.96 times more likely to avoid police detection. Conversely, cases where the victims are younger than 15 years old (OR = 1.32, p = .032), playing (OR = 5.82, p = .000) or visiting friends (OR = 3.07, p = .000) at the time of offense are respectively, 1.32, 5.82 and 3.07 times more likely to be solved by the police.

Model 2 adds the crime characteristics to the victim selection characteristics. Three victim selection characteristics from Model 1 remained significant. More specifically, when victims were playing at the time of offense (OR = 5.16, p = .001), rapes are 5.16 times more likely to be solved, whereas when victims walking or jogging at the time of the crime (OR = 1/0.68, p = .001) rapes are 1.47 times less likely to be solved. Also, when victims were targeted by the offenders (OR = 1.52, p = .000) cases are 1.52 times more likely to be solved.

Table 2
Bivariate analysis of crime characteristics (N = 4354).

	Solved cases (n = 3243)		Unsolved cases (n = 1111)		Cramer's V/φ
	n	%	n	%	
Precrime phase					
Victim was targeted by the offender	1051	32.41%	177	15.93%	0.16***
Offender and victim were strangers	2146	66.17%	998	89.83%	0.23***
Offender used a con strategy	2040	62.90%	500	45.00%	0.16***
Offender used a surprise strategy	796	24.55%	375	33.75%	0.09***
Offender used a blitz strategy	567	17.48%	318	28.62%	0.12***
Contact, assault and release locations are at the same place	1431	44.13%	594	53.47%	0.08***
Crime scene was deserted	1811	55.84%	680	61.21%	0.05**
Assault occurred in a residence	1769	54.55%	421	37.89%	0.15***
Assault occurred in a public area	236	7.28%	75	6.75%	0.01
Assault occurred in an outdoor place	1248	38.48%	619	55.72%	0.15***
Assault occurred in a parking lot	173	5.33%	86	7.74%	0.04**
Crime phase					
Offender performed sexually sadistic acts	225	6.94%	53	4.77%	0.04*
Victim was beaten	618	19.06%	194	17.46%	0.02
No physical violence was used	892	27.51%	266	23.94%	0.04*
Postcrime phase				0.00%	
Victim was intentionally released	2325	71.69%	825	74.26%	0.03†
Offender have left semen at the crime scene	2398	73.94%	755	67.96%	0.06***

*** $p \leq .001$.
** $p \leq .01$.
* $p \leq .05$.
† $p \leq .1$.

Table 3
Bivariate analysis of forensic awareness strategies (N = 4354).

	Solved cases (n = 3243)		Unsolved cases (n = 1111)		Cramer's V/φ
	n	%	n	%	
Type of Investigative Awareness					
Offender removed or destroyed forensic evidence	163	5.03%	44	3.96%	0.20
Offender forces victim to bathe or douche	68	2.10%	25	2.25%	0.01
Offender wore gloves	120	3.70%	76	6.84%	0.07***
Offender wore mask	205	6.32%	149	13.41%	0.11***
Offender used a condom	341	10.51%	165	14.85%	0.06***
Offender gave false name	170	5.24%	9	0.81%	0.10***
Offender covered victim's eyes or face	169	5.21%	74	6.66%	0.03†
Offender covered mouth	594	18.32%	221	19.89%	0.02
Offender disabled telephone/security system	180	5.55%	42	3.78%	0.04*
Offender bound victim	150	4.63%	58	5.22%	0.01
Offender threatened the victim	926	28.55%	199	17.91%	0.11***
Number of Investigative Awareness Strategies					
0	1311	40.43%	451	40.59%	0.00
1	1058	32.62%	369	33.21%	0.01
2	463	14.28%	162	14.58%	0.00
3	218	6.72%	62	5.58%	0.02
4	108	3.33%	34	3.06%	0.01
5	49	1.51%	19	1.71%	0.01
6 and more	36	1.11%	14	1.26%	0.01

*** $p \leq .001$.
* $p \leq .05$.
† $p \leq .1$.

Rapes that occur in a residence (OR = 1.36, p = .004) are respectively 1.36 times more likely to be solved by the police. Finally, when semen is found at the crime scene (OR = 1.33, p = .008), rapes are 1.33 times more likely to be solved, whereas when offenders and victims were strangers at the time of the assault (OR = 1/0.36, p = .000), rapes are 2.78 times less likely to be solved. When the assault occurred at the same location of encounter and release (OR = 1/0.72, p = .000) or at an outdoor location (OR = 1/0.77, p = .015), the cases are respectively 1.38 and 1.29 times less likely to be solved.

Model 3 considers simultaneously victim selection, crime characteristics, and forensic awareness strategies. Similar to Model 1, four victim selection characteristics were significant. Cases where victims were sex trade workers (OR = 1.57, p = .028) or were playing (OR = 5.04, p = .001) at the time of the crime are respectively 1.57 and 5.04 times more likely to be solved by police. On the opposite, when rape cases involved victims who were walking/jogging at the time of the crime (OR = 1/0.69, p = .000), they are 1.44 times less likely to be solved. As to the crime characteristics, the same that were significant in Model 2 remained significant in Model 3. Specifically, when victims were targeted by offenders (OR = 1.52, p = .000), when the assaults occurred in a residence (OR = 1.35, p = .006) and semen was present at the crime scene (OR = 1.32, p = .002), rape cases were more likely to be solved. On the other hand, when offenders and victims were strangers at the time of the offense (OR = 1/0.36, p = .000), the encounter, assault, and release were at the same location (OR = 1/0.77, p = .002), or the assault occurred at an outdoor location (OR = 1/0.78, p = .022), rape cases were less likely to be solved. Finally, as to the forensic awareness strategies, results show that when offenders gave a false identity (OR = 5.89, p = .000), disabled the telephone/security system (OR = 1.84, p = .001), or threatened the victim (OR = 1.58, p = .000) rapes were respectively 5.89, 1.84 and 1.58 times more likely to be solved by the police. However, when offenders wore a mask (OR = 1/0.59, p = .000) or used a condom (OR = 1/0.59, p = .000) rapes were less likely to be solved by police.

5. Discussion

5.1. Victims' characteristics as a rational decision by the offender

Past research on factors related to detection avoidance in cases of rape is limited, despite these crimes being some of the hardest for police to solve and convict (e.g., Spohn et al., 2014). Moreover, only homicide studies (e.g., Beauregard & Field, 2008; Reale & Beauregard, 2018) have considered the role that the offender may have on detection avoidance, such as adopting specific behaviors during the offense to avoid detection. Accordingly, the current study explored the role of the offender's behavior (e.g., victim/crime characteristics and forensic awareness) on cases of solved and unsolved rapes involving a large national sample. At the bivariate level, we have found that age presented a significant difference according to the case status. More specifically, as victims increased in age the likelihood of solving the case decreased. This result is congruent with previous rape studies (Du Mont & Myhr, 2000; Du Mont & Parnis, 2000), showing that cases involving young victims are more often solved than cases involving older victims. As suggested previously, with cases involving younger victims such as children, police face greater administrative and public pressure to solve the crime and therefore are provided with greater resources (Du Mont & Parnis, 2000; Riedel, 2008). Moreover, the context surrounding the rape of a child usually makes this crime easier to solve due to the presence of witnesses, the relationship (i.e., acquaintance) between the offender and the victim, as well as sometimes an offender known by the authorities (Regoeczi, Jarvis, & Riedel, 2008; Riedel, 2008).

However, what is more interesting in our findings – and which adds weight to our interpretation of the victim characteristics as a purposeful behavior on the offender's part – is that sociodemographic variables such as age become non-significant when lifestyle variables are introduced. For instance, our findings indicate the rape of a single victim is more likely to remain unsolved, coherent with the lifestyle and routine activities theories (Cohen & Felson, 1979; Hindelang, Gottfredson, & Garofalo, 1978). Thus, single victims, especially if they are young, present a different lifestyle and routine activities than victims who are in a relationship. Due in part to their social activities that take them out of their residence, they face more opportunities to encounter motivated offenders. As these motivated offenders are also

Table 4
Sequential binomial regression of factors predicting crimes solving (N = 4354).

	Model 1			Model 2			Model 3		
Variables	B	SE	Exp(B)	B	SE	Exp(B)	B	SE	Exp(B)
Victimological Characteristics									
Victim is a female	−0.515	0.192	0.598**	−0.244	0.201	0.784	−0.241	0.203	0.786
Victim is less than 15 years old	0.276	0.129	1.318*	0.100	0.136	1.105	0.038	0.139	1.039
Victim is single	0.049	0.077	1.05	−0.118	0.084	0.889	−0.166	0.086	0.847
Victim is white	0.051	0.076	1.052	0.067	0.08	1.069	0.044	0.082	1.045
Victim is a sex trade worker	0.309	0.193	1.361	0.239	0.199	1.27	0.45	0.205	1.569*
Victim has a physical handicap	0.305	0.201	1.357	0.133	0.209	1.142	0.053	0.212	1.054
Victim was doing domestic activities	0.087	0.131	1.091	−0.193	0.149	0.824	−0.131	0.154	0.877
Victim was sleeping	−0.030	0.141	0.97	−0.182	0.163	0.834	−0.161	0.167	0.851
Victim was playing	1.761	0.471	5.818***	1.641	0.479	5.161***	1.617	0.48	5.040***
Victim was jogging/walking	−0.671	0.086	0.511***	−0.379	0.092	0.684***	−0.371	0.093	0.690***
Victim was visiting friends or relatives	1.123	0.286	3.074***	0.567	0.297	1.763	0.612	0.302	1.845*
Crime Characteristics									
Victim was targeted by the offender				0.420	0.101	1.523***	0.417	0.104	1.518***
Offender and victim were stranger				−1.026	0.115	0.358***	−1.028	0.116	0.358***
Offender used con strategy				0.231	0.173	1.26	0.195	0.175	1.215
Offender used surprise strategy				0.003	0.153	1.003	0.074	0.155	1.077
Offender used blitz strategy				−0.158	0.152	0.854	−0.151	0.154	0.86
Contact, assault and release are on the same place				−0.331	0.082	0.718***	−0.264	0.084	0.768**
Crime scene was deserted				−0.117	0.077	0.89	−0.137	0.078	0.872
Assault occurred in a residence				0.307	0.108	1.359**	0.299	0.11	1.348***
Assault occurred outdoors				−0.263	0.106	0.769*	−0.246	0.108	0.782*
Assault occurred in a parking lot				−0.245	0.149	0.783	−0.208	0.151	0.812
Offender performed sexually sadistic acts				0.126	0.167	1.135	0.087	0.169	1.091
No physical violence was used				−0.058	0.092	0.944	−0.037	0.093	0.963
Offender left semen at the crime scene				0.286	0.085	1.331***	0.274	0.087	1.316**
Forensic Awareness Strategies									
Offender wore gloves							−0.237	0.174	0.789
Offender wore a mask							−0.524	0.131	0.592***
Offender used a condom							−0.532	0.115	0.587***
Offender gave a false name							1.774	0.349	5.892***
Offender disabled telephone/security system							0.611	0.185	1.842***
Offender threatened the victim							0.286	0.085	1.331***
Constant	1.372	0.240	3.944***	1.404	0.322	4.069***	0.46	0.096	1.584***
χ^2	233.376***			509.130***			628.535***		
Cox & Snell R^2	0.052			0.110			0.134		
Nagelkerke R^2	0.077			0.163			0.198		
Overall % predicted	74.5			74.8			75.6		

*** $p \leq .001$.
** $p \leq .01$.
* $p \leq .05$.

more often stranger to the victims, it decreases the chance of identification for the police. Similarly, rape cases are more likely to remain unsolved when victims were assaulted while walking or jogging. In such context, victims are often alone, outdoors, usually without witnesses. First, the absence of witnesses constitutes an additional obstacle for the police investigators to identify the suspect (Alderden, 2008). Second, when crimes occurred outdoors, traces are more likely to be degrading faster making their detection and collection difficult and lower the chances of obtaining a useable result after their analysis (Martin, Delémont, Esseiva, & Jacquat, 2019). Third, these rapes are more likely to be committed by strangers, increasing the difficulties in identifying them (Beauregard & Martineau, 2017).

These interpretations are coherent with our finding showing that rape cases that occurred when the victims were playing are more likely to be solved while age of victim variable does not remain significant at the multivariate level. The fact that the age of victim was no longer significant when lifestyle variables were introduced reinforces the idea that it is the context of the crime that matters the most here to explain why a victim will be selected by the offender. As an alternative to suggestions that rape cases involving child victims are easier to solve due to public pressure on police (Du Mont & Parnis, 2000; Riedel, 2008), these findings situate well within the routine activities perspective, wherein the activities of the victim will influence the context of the crime (Cohen & Felson, 1979) as discussed by Regoeczi et al. (2008) as well as Riedel (2008). More specifically, when young victims are assaulted while playing, they are rarely alone, and witnesses may have seen the offender. Moreover, strangers' access to children is usually more difficult as supervision by a capable guardian is often present, which increases the chances of being able to identify the offender quickly.

Contrary to prior studies (Du Mont & Myhr, 2000; Du Mont & Parnis, 2000) – and to the discretionary perspective (Riedel, 2008) – our findings showed that rape cases involving sex trade workers are more likely to be solved by the police. Our findings were also in the opposite direction from those of Beauregard and Martineau (2014) on sexual homicide. Such discrepancy may be explained by the fact that contrary to sexual homicide, rape victims are still alive after the crime and can testify. Moreover, in most cases the sex trade worker may know the offender (e.g., client) and is able to provide a good description to the police to facilitate his apprehension. This is suggesting that despite the vulnerable lifestyle of the victim, the offender may also consider whether the victim may identify him.

5.2. Crime characteristics to avoid detection

As suggested by the rational choice perspective, offenders who have made the decision to get involved in a specific crime need to make a series of other decisions in order to commit the crime successfully. Part

of this "success" is the notion of avoiding police detection. Our findings have shown that offenders adopt specific criminal behavior during the crime that increase their chance of avoiding police detection. Moreover, our findings revealed that most of the crime characteristics related to the case status (i.e., solved/unsolved) were found in the precrime phase.

Our findings showed that rapists targeting their victims prior to the crime are more likely to be arrested by the police and to see their case being solved. The decision to select a particular victim is a "double-edge sword" and illustrates perfectly the cost-benefit analysis of rational choice perspective. On one hand, by selecting the victim the offender may choose a victim that matches his preferences according to some subjective criteria, which increases his benefits. On the other hand, often the selection of a victim implies that the offender knows the victim – and vice versa – which may increase the risk to be arrested following the crime. Targeting the victim might also have led to prior "surveillance" activities by the offender, which are also prone to leaving traces, whether forensic or other, increasing the risk of being arrested following the crime. Our findings are in line with previous studies (Johnson et al., 2012; LaFree, 1981) showing that rape cases where offenders and victims are strangers are less likely to be solved, as the connection between the offender and the victim is difficult to make for the police.

Our findings also showed that when the encounter, crime, and release locations are the same, rape cases are less likely to be solved by the police. One explanation is that by doing everything all at the same location, the offender decreases the chances of being seen with the victim at the various locations and during their movement. This is especially true if the offender selects a deserted location. Moreover, based on the Locard's exchange principle (Locard, 1920), by multiplying the crime scenes, offenders also multiply the probability of leaving forensic traces that could lead to their identification by the police. This is similar to our result showing that rapes occurring in residences are more likely to get solved whereas rapes occurring outdoor are more likely to remain unsolved. Partly due to the weather and the elements, forensic traces are less prone of being degraded when left indoors (i.e., residence) than at an outdoor location (Martin et al., 2019).

5.3. Investigative awareness to avoid detection…not always

Our results have shown that the most efficient strategies to avoid police detection focus on the same goal, that is to protect the offender's identity. As could be expected, rapists using condoms were more likely to avoid police detection. However, surprisingly, wearing a mask during the rape was associated with a higher likelihood of avoiding police detection, suggesting that protecting one's identity may be more important than to worry about forensic traces that could be left behind. We can also suggest that rapists wearing a mask exhibited the most expertise at not leaving any traces. As mentioned previously, the victim's testimony plays a crucial role in solving rape cases (e.g., Sommers & Baskin, 2011). If the offender is a complete stranger, the police will need to rely mainly on the victim's description of her assailant (e.g., physical description, voice tone). In the case where the offender is wearing a mask, the useful information that may be provided by the victim will be limited, which will not increase the chance of identifying the offender. It must be noted that the data of the events used in this study go back to 1979, a time when DNA analysis had not been developed yet, and was far from being used routinely in police case work (Wong, Wilson, Patel, Povey, & Jeffreys, 1987). In addition, it is not surprising that leaving a "rich" biological trace is not sufficient to solve a case. Indeed, the offender needs to be either targeted by the police and his reference DNA sample taken, analyzed and compared or already be registered in the national DNA database to get useful information from the trace, which also needs to be collected and analyzed. The simple fact of it being present does necessarily contribute to the resolution of a case.

Furthermore, the forensic awareness strategies used by rapists are not always useful to avoid detection. Actually, some may be counterproductive. For instance, our results have shown that when rapists lie about their name or threaten the victim to avoid police detection, they increase the risk of being identified and arrested. These findings could be explained by the fact that due to the verbal exchange between the victim and offender, the victim is able to collect some information about the offender that could later lead to his arrest (e.g., voice tone, some information accidently provided by the offender). Moreover, it is possible that the decision to threaten the victim during the rape is directly linked to the fear that the victim could report the crime, hence suggesting that she would have some information about the offender that could lead to his identification and his arrest (e.g., victim knows his name, offender and victims are acquainted). Finally, even when offenders take time to disable the victims' phone or security system, the use of this strategy increases the odds of solving the crime for the police. Although counterintuitive at first, it is possible that spending time at the crime scene to disable the victim's phone or security system increases the time the offender is at risk and also, it represents additional opportunities for the police to recover forensic traces at the crime scene (e.g., fingermarks or contact DNA traces). These types of strategies could also be related to offenders who have more criminal experience and thus may have been previously detected for other types of offenses (e.g., in property crimes) making it possible for police to link forensic traces to existing DNA profiles in their databases.

5.4. Crime characteristics versus forensic identification

Solving crimes can be accomplished in one of three ways: by witness statements, by physical evidence, or by confession (Klockars & Mastrofski, 1991). When the police are conducting their rape investigation, they will largely rely on witness statements and physical evidence to identify the offender (Johnson et al., 2012). Interestingly, our study indicated that crime characteristics (as provided by the victims and/or witnesses) appear more important than forensic traces in order to solve rapes. As suggested previously, such finding could be due to the strategies used by the offender to commit the crime and the interactions between him and the victim. Thus, our results suggested that the more interactions (i.e., visual, verbal and physical) between the offender and the victim during the crime, the better the chances of the rape to be solved by the police. We can hypothesize that this greater level of interactions between the offender and the victim allows the victim or witnesses to collect crucial information leading to the offender's identification and arrest.

On the other hand, our results suggested that forensic information has a limited contribution in solving rapes. Similarly, evidence from rape conviction studies have demonstrated the minor role of forensic evidence in case convictions compared to witness testimony (e.g., Ingemann-Hansen, Brink, Sabroe, Sørensen, & Charles, 2008; Sommers & Baskin, 2011). Although both identification from semen analysis and fingermark comparison were significant, they held quite a bit less weight than other variables. The limited contribution of forensic evidence to solving rapes may be especially apparent for cases where the victim and potential suspect are known to one another as there is typically no longer a need to prove the identity of the alleged offender (e.g., DNA or bodily fluid testing), but rather to determine whether the alleged victim consented or not (Hazelwood & Burgess, 2016). As such, appropriate interviewing techniques for sexual assault investigations can better aid investigators in determining the situational factors that lead up to the crime (e.g., time of the event, conservations between the victim and offender, the use of force or physical resistance; Westera & Kebbell, 2014) especially in cases where the role of forensic evidence may be less important to the case outcome as the information provided by the victim.

However, we also believe this could also be partly due to some of

the difficulties and challenges associated with forensic evidence analysis. It is a mistake to assume that forensic traces are identified at every crime scene Cole (2010), they are far from being collected and even less analyzed in every case (Bitzer, Ribaux, Albertini, & Delémont, 2016; Ritter, 2013). Despite the fact that in our findings we showed that only a few offenders used a condom (less than 15%) and/or wore gloves (less than 10%) during the rapes, it is possible that still today, collection and analysis of forensic traces is not systematically performed, something observed a while ago by Horvath and Meesig (1996) as well as more recently by Johnson et al. (2012) and Valentine et al. (2016). This inconsistent processing decision could be due to financial and technical reasons. The number of rapes occurring each year is important to consider when compared to homicide and budget constraints for forensic analyses are increasing (Maguire, Houck, Williams, & Speaker, 2012). Choices need to be made by investigators and police administrators to prioritize some cases at the expense of others. Moreover, sometimes forensic traces are not collected or analyzed because they could prove difficult or even impossible to analyze due to factors such as degradation due to weather exposure, which highly impacts on the quality of the analysis result and thus its utility in the case, or even the delay between the rape and the moment of collection of forensic traces. As mentioned earlier, the dataset includes cases committed prior to the development of DNA analysis, and its routine use in police case work. Thus, the full potential of DNA analysis, and thus of semen traces left at the crime scene, had thus not been developed yet. In addition, the initial use of traces was to “build a case against the suspect” (Baskin & Sommers, 2010), as either the national DNA database had not been put in place or its utility not recognized (Bitzer, Albertini, Lock, Ribaux, & Delémont, 2015). This leads to the use of traces, and their analysis, once a suspect has been identified through traditional police work. Thus, the significance of forensic traces for the resolution of cases is lowered when they are used in only a restricted manner.

6. Conclusion

The current study aimed to investigate different types of factors identified by previous research to explain the solving of rape cases (victim characteristics, crime characteristics, and forensic awareness strategies). We compared offenders' behavior of solved and unsolved rapes, and identified which of these factors are the most prevalent to avoid police detection. Our results indicated that crime characteristics are the most important to predict crime status compared to victims' characteristics and forensic awareness used by rapists. In terms of theoretical implication, this study provides an empirical answer to the debate between various perspectives explaining crime solving. Contrary to the discretionary perspective, our findings suggest that the sociodemographic characteristics of the victims are not related to solving rape itself but instead represent proxies of the potential exposition of the victim to the crime opportunity (i.e., vulnerable lifestyle). As suggested by the non-discretionary perspective, our results confirm that the characteristics of the offense itself are most important to predict crime solving.

This study presents also several practical implications. By identifying crime characteristics at the beginning of the investigation, it is possible to predict which cases should be harder to solve. Consequently, depending on the how difficult a rape case is to solve, human and material resources can be deployed efficiently. Thus, a case that present several characteristics of the unsolved status could be allocated more resources right from the start to increase the chances to ultimately solve the case. This may be even more important in cases involving stranger victims were the lack of a potential suspect may result in forensic traces having a lower priority for laboratory testing (Strom & Hickman, 2010). Especially considering that the mere presence of an assailant's DNA taken from rape kit, even in the absence of a suspect, has been found to contribute to case clearance as well as its presentation to the prosecutor (Alderden, 2008). We also identified that victim's involvement in the criminal investigation (testimony, suspect identification) is a very important parameter in crime solving. Therefore, investigators should take particular care to collect victims' testimonies using the most appropriate techniques, such as the Cognitive Interview (Fisher & Geiselman, 2010).

Although this study offers several new insights into the role of the offender's behavior in rape case outcomes, this research is not without limitations. Our results largely depend on the techniques use by investigators, which may have varied across space and time. First, our findings are based on a French sample and we cannot conclude that they are generalizable to rapes occurring in other countries. Secondly, our study is based on cases that occurred between 1979 and 2018. During these 39 years, investigative techniques have changed and evolved, which could have affected our results. However, this possibility is limited by the fact that a large portion of the cases included in this study (i.e., 43%) occurred since 2000. Thirdly, we did not have the possibility to include variables tapping into the police work that could have impacted the case status, as suggested by James and Beauregard (2018b). Finally, it is impossible to exclude the fact that sometimes crimes remain unsolved not because of the offender or the police, but simply due to circumstances and bad luck (Rossmo, 2009).

Further studies could replicate this study with data from other countries to confirm the generalization of our findings or identify a new model and confirm the idea that crime status is dependent on specific investigative techniques. Moreover, qualitative studies should be undertaken to increase our knowledge of forensic awareness strategies used by sex offenders. Interviews with rapists would allow for a better understanding of why some of offenders used strategies associated with avoiding detection and why others did not.

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References

Alderden, M. A. (2008). *Processing of sexual assault cases through the criminal justice system.* University of Illinois at Chicago.

Baskin, D., & Sommers, I. (2010). The influence of forensic evidence on the case outcomes of homicide incidents. *Journal of Criminal Justice, 38*(6), 1141–1149.

Beauregard, E., & Bouchard, M. (2010). Cleaning up your act: Forensic awareness as a detection avoidance strategy. *Journal of Criminal Justice, 38*(6), 1160–1166.

Beauregard, E., & Field, J. (2008). Body disposal patterns of sexual murderers: Implications for offender profiling. *Journal of Police and Criminal Psychology, 23*(2), 81.

Beauregard, E., & Martineau, M. M. (2012). A descriptive study of sexual homicide in Canada: Implications for police investigation. *International Journal of Offender Therapy and Comparative Criminology, 57*(12), 1454–1476. https://doi.org/10.1177/0306624X12456682.

Beauregard, E., & Martineau, M. M. (2014). No body, no crime? The role of forensic awareness in avoiding police detection in cases of sexual homicide. *Journal of Criminal Justice, 42*(2), 213–220.

Beauregard, E., & Martineau, M. M. (2017). *The sexual murderer: Offender behaviour and implications for practice.* UK: Routledge.

Bitzer, S., Albertini, N., Lock, E., Ribaux, O., & Delémont, O. (2015). Utility of the clue—From assessing the investigative contribution of forensic science to supporting the decision to use traces. *Science & Justice, 55*(6), 509–513.

Bitzer, S., Ribaux, O., Albertini, N., & Delémont, O. (2016). To analyse a trace or not? Evaluating the decision-making process in the criminal investigation. *Forensic Science International, 262*, 1–10.

Black, D. (1976). *The behavior of law*. New York, NY: Academic Press.
Braga, A. A., & Dusseault, D. (2018). Can homicide detectives improve homicide clearance rates? *Crime & Delinquency, 64*(3), 283–315.
Cohen, L. E., & Felson, M. (1979). Social-change and crime rate trends - routine activity approach. *American Sociological Review, 44*(4), 588–608. https://doi.org/10.2307/2094589.
Cole, S. A. (2010). Forensic identification evidence: Utility without infallibility. *Criminology & Public Policy, 9*(2), 375–379.
Cornish, D. B. (1994). The procedural analysis of offending and its relevance for situational prevention. In R. V. Clarke (Ed.). *Crime prevention studies*. New York: Transaction Press.
Cornish, D. B., & Clarke, R. V. (1986). Introduction. In D. B. Cornish, & R. V. Clarke (Eds.). *The reasoning criminal: Rational choice perspectives on offending*. New York: Springer-Verlag.
Douglas, J., Burgess, A. W., Burgess, A. G., & Ressler, R. K. (2006). *Crime Classification Manual : A standard system for investigating and classifying violent crimes* (John Wiley & Sons ed.). Jossey-Bass.
Du Mont, J., Miller, K. L., & Myhr, T. L. (2003). The role of "real rape" and "real victim" stereotypes in the police reporting practices of sexually assaulted women. *Violence Against Women, 9*(4), 466–486.
Du Mont, J., & Myhr, T. L. (2000). So few convictions: The role of client-related characteristics in the legal processing of sexual assaults. *Violence Against Women, 6*(10), 1109–1136.
Du Mont, J., & Parnis, D. (2000). Sexual assault and legal resolution: Querying the medical collection of forensic evidence. *Medecine & Law, 19*, 779–792.
Fisher, R. P., & Geiselman, R. E. (2010). The cognitive interview method of conducting police interviews: Eliciting extensive information and promoting therapeutic jurisprudence. *International Journal of Law and Psychiatry, 33*(5–6), 321–328.
Hawk, S. R., & Dabney, D. A. (2018). Shifting the focus from variables to substantive domains when modeling homicide case outcomes. *Homicide studies*.
Hazelwood, R. R., & Burgess, A. W. (2016). *Practical aspects of rape investigation: A multidisciplinary approach.* CRC Press.
Hindelang, M. J., Gottfredson, M. R., & Garofalo, J. (1978). *Victims of personal crime: An empirical foundation for a theory of personal victimization.* Cambridge: Mass. Ballinger.
Horvath, F., & Meesig, R. (1996). The criminal investigation process and the role of forensic evidence: A review of empirical findings. *Journal of Forensic Science, 41*(6), 963–969.
Ingemann-Hansen, O., Brink, O., Sabroe, S., Sørensen, V., & Charles, A.-V. (2008). Legal aspects of sexual violence—Does forensic evidence make a difference? *Forensic Science International, 180*(2–3), 98–104.
James, J., & Beauregard, E. (2018a). How sexual murderers thwart investigations. In J. Proulx, E. Beauregard, A. J. Carter, A. Mokros, R. Darjee, & J. James (Eds.). *Routledge international handbook of sexual homicide studies* (pp. 574–595). New York: USA: Routledge.
James, J., & Beauregard, E. (2018b). Murderer vs investigator: Factors influencing the resolution of sexual homicide cases. *Police Practice and Research,* 1–15. https://doi.org/10.1080/15614263.2018.1526683.
Johnson, D., Peterson, J., Sommers, I., & Baskin, D. (2012). Use of forensic science in investigating crimes of sexual violence: Contrasting its theoretical potential with empirical realities. *Violence Against Women, 18*(2), 193–222.
Klinger, D. A. (1997). Negotiating order in patrol work: An ecological theory of police response to deviance. *Criminology, 35*(2), 277–306.
Klockars, C. B., & Mastrofski, S. D. (1991). *Thinking about police: Contemporary readings.* New York, NY: McGraw-Hill.
LaFree, G. D. (1981). Official reactions to social problems: Police decisions in sexual assault cases. *Social Problems, 28*(5), 582–594.
Locard, E. (1920). *L'enquête criminelle et les méthodes scientifiques [Criminal investigation and scientific methods]*. Paris: Flammarion.
Maguire, C., Houck, M. M., Williams, R., & Speaker, P. J. (2012). Efficiency and the cost-effective delivery of forensic science services: Insourcing, outsourcing, and privatization. *Forensic Science Policy & Management: An International Journal, 3*(2), 62–69.
Martin, J. C., Delémont, O., Esseiva, P., & Jacquat, A. (2019). *Investigation de scène de crime [Crime scene investigation]. 3rd éd. PPUR, 2019* (3rd ed.). Lausanne: Presses Polytechniques et Universitaires Romandes.
Reale, K., & Beauregard, E. (2018). Body recovery after the "first 48": Implications for sexual homicide investigations. *Homicide studies*.
Regoeczi, W. C., Jarvis, J. P., & Mancik, A. (2018). Homicide investigations in context: Exploring explanations for the divergent impacts of victim race, gender, elderly victims, and firearms on homicide clearances. *Homicide Studies*1088767918802885.
Regoeczi, W. C., Jarvis, J. P., & Riedel, M. (2008). Clearing murders: Is it about time? *Journal of Research in Crime and Delinquency, 45*(2), 142–162.
Riedel, M. (2008). Homicide arrest clearances: A review of the literature. *Sociology Compass, 2*(4), 1145–1164.
Ritter, N. (2013). Untested evidence in sexual assault cases: Using research to guide policy and practice. *Sexual assault report. 16. Sexual assault report* (pp. 3–). .
Rossmo, K. (2009). *Criminal investigative failures.* Boca Raton, FL: CRC Press.
Sommers, I., & Baskin, D. (2011). The influence of forensic evidence on the case outcomes of rape incidents. *Justice System Journal, 32*(3), 314–334.
Spohn, C., Tellis, K., & O'Neal, E. N. (2014). Policing and prosecuting sexual assault. *Critical issues on violence against women: international perspectives and promising strategies. 3. Critical issues on violence against women: international perspectives and promising strategies* (pp. 93–103).
Strom, K. J., & Hickman, M. J. (2010). Unanalyzed evidence in law-enforcement agencies: A national examination of forensic processing in police departments. *Criminology & Public Policy, 9*(2), 381–404.
Tjaden, P. G., & Thoennes, N. (2006). *Extent, nature, and consequences of rape victimization: Findings from the National Violence Against Women Survey*.
Valentine, J. L., Sekula, L. K., Cook, L. J., Campbell, R., Colbert, A., & Weedn, V. W. (2016). Justice denied: Low submission rates of sexual assault kits and the predicting variables. *Journal of Interpersonal Violence*0886260516681881.
Westera, N. J., & Kebbell, M. (2014). Investigative interviewing in suspected sex offences. *Investigative interviewing* (pp. 1–18). Springer.
Wong, Z., Wilson, V., Patel, I., Povey, S., & Jeffreys, A. J. (1987). Characterization of a panel of highly variable minisatellites cloned from human DNA. *Annals of Human Genetics, 51*(4), 269–288.