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Abstract

This study explores modeling crime-scene characteristics of juvenile homicide in the French-speaking part of Belgium. Multidimensional scaling analysis was carried out on crime-scene characteristics derived from the court files of 67 individuals under 22 years old, who had been charged with murder or attempted murder (1995-2009). Three thematic regions (Expressive: multiple offenders; Instrumental: theft; Instrumental: sex/forensic awareness) distinguished types of aggression displayed during the offense. These themes reaffirm that the expressive-instrumental differentiation found in general homicide studies is valuable when attempting to discriminate juvenile homicides. The proposed framework was found useful to classify the offenses, as 84% of homicides were assigned to a dominant theme. Additionally, associations between crime-scene characteristics and offenders' characteristics were analyzed, but no associations were found, therefore failing to provide empirical support for the homology assumption. Cultural comparisons, as well as the influence of age on the thematic structure are discussed.

Keywords: homicide, crime scene analysis, juvenile homicide, profiling, classification

Exploration of Crime-Scene Characteristics in Juvenile Homicide in the French-Speaking Part of Belgium

Young offenders commit approximately 12% of homicides in Canada per year, 10% in the United States of America, 8% in Finland, and 6% in England and Wales (Rodway et al., 2011). Data on the rate of homicide committed by young offenders in Belgium are difficult to obtain. Where data are available, they cannot be compared because they are spread across diverse federal, regional, and local databases (Van Dijk, Dumortier, & Eliaerts, 2006). Recently, there has been a rise in international and multicultural research suggesting that different styles of homicides are reflected in the different types of crime-scene characteristics (Salfati & Dupont, 2006; Salfati & Park, 2007). Juvenile homicide, specifically, has been mainly studied from the perspective of offenders' characteristics, and little is known about the crime-scene characteristics associated with juvenile homicide (e.g., Busch, Zagar, Hughes, Arbit, & Bussell, 1990; Heide, 1999).

The hostile/expressive-instrumental aggression dichotomy (Feshbach, 1964) allows violent crimes to be differentiated by the aims or rewards obtained by the offender. Salfati and colleagues demonstrated the usefulness of differentiating homicide crime-scene characteristics and offenders' background characteristics as expressive or instrumental in nature (Salfati, 2000; Salfati & Dupont, 2006; Salfati & Haratsis, 2001). As such, it has been argued that using only crime-scene information as input data should allow the development of a homicide offense model that could be used as a decision-support tool in criminal investigations (Santtila, Häkkänen, Canter, & Elfgren, 2003). In a study of 247 British single-offender, single-victim solved homicides, Salfati (2000) showed that expressive homicide offenses involve extreme

physical attacks in which the offender demonstrates prior knowledge of the victim. Within instrumental homicide offenses, the victim is seen as an object with which the offender can achieve a criminal aim (e.g., sexual assault or theft). She found that 62% of cases could be classified in a dominant theme: 38% as expressive, 24% as instrumental, while 30% of cases could be classified as hybrid (where there are an equal number of expressive and instrumental characteristics), and 8% were nonclassifiable. The hybrid theme suggests that a substantial percentage of the crime-scenes shared a similar number of characteristics from the expressive and instrumental themes (Salfati, 2000).

Crime-scene characteristics do not occur randomly during the homicide, but instead have a theoretically interpretable structure (Santtila, Canter, Elfgren, & Häkkänen, 2001). For example, characteristics at the crime-scene such as binding the victim, suffocation, hiding the victims' body, and removing part of the body, are considered expressive; whereas sexual behaviors (e.g., injuries to genitals, vaginal or anal penetration), property offences (e.g., theft), and arson are considered instrumental (Santtila et al., 2001).

Thematic models of crime-scene characteristics have been developed with the aim of complementing findings from motivational studies that focus on the reasons behind the offense (Canter, Bennell, Alison, & Reddy, 2003). Salfati (2000) also emphasizes the importance of interpreting characteristics in a thematic way, rather than singularly and out of context. The analysis of crime-scene characteristics has been considered to be a more successful path in classifying different types of homicide, as the offender's interpersonal interaction style tends to be reflected by what happens at the crime-scene. As such, the interpretation of co-occurring crime-scene characteristics provides an indication of the context in which the offense

occurred, whether the characteristics indicate an offense that is expressive or instrumental in nature, and whether the characteristics reflect a dominant expressive or instrumental theme (Salfati, 2000). This theoretical thematic approach has been successfully used to unravel the meaning of the homicidal act by focusing on the meaning and the role of the victim to the offender (e.g., Salfati, 2000; Salfati & Canter, 1999; Salfati & Park, 2007).

Following Salfati's (2000) initial work, Salfati and Dupont (2006), Salfati and Haratsis (2001), Salfati and Park (2007), and Santtila et al. (2001) continued to test the expressive-instrumental model on general homicide cases, using national samples from other countries. The expressive-instrumental dichotomy has been a useful model that is applicable to different countries and cultures (i.e., Greece, Finland, Canada, and Korea). Furthermore, Thijssen and De Ruiter (2011) looked at the expressive-instrumental distinction between crime-scene and offender characteristics in homicide perpetrated by individuals aged between 18 and 57 years old in a Belgian sample. This first attempt, using Belgian data, obtained mixed support for the expressive-instrumental dichotomy in their sample, but was comparable to previous studies on homicide. It found that 50% of the crime-scene characteristics could be classified as dominant expressive, 8% as dominant instrumental, 12% as mixed, and 28% as nonclassifiable (Thijssen & De Ruiter, 2011). Their explanation for the low number of cases falling into a dominant theme is that violent crimes often contain both expressive and instrumental elements. A crime may initially occur due to an instrumental motive (e.g., theft) and then evolve into a crime that is expressive in nature due to the victim's resistance (Thijssen & De Ruiter, 2011). As such, the expressive-instrumental classification may be better seen as a continuum of characteristics, where some cases share aspects of both themes.

However, no attempt has been made to explore crime-scene characteristics in a sample of young offenders, and it is unknown whether young offenders exhibit the same themes as adult offenders. Salfati (2000) suggests that it is important for future research to investigate the crime-scene characteristics of juvenile homicide offenders. Indeed, she would have done so in her study, but had difficulty accessing relevant data. According to Carcach (1997), in terms of the way homicide is committed, there is a difference between offenders under the age of 25 and offenders over the age of 25. Younger offenders (those under the age of 25) tend to kill their victims as a result of conflict between strangers, friends, or acquaintances, usually in public places (e.g., bars, streets), or following the commission of other crimes (e.g., robbery, sexual assault). They were also less likely than older offenders to use a firearm during the offense, and more likely to use a sharp or blunt instrument and physical violence. In contrast, offenders over the age of 25 were more likely to kill a family member (e.g., parent, step-parent) or victims with whom they had an intimate relationship. Their victims tended to be older than them, and the offenses primarily took place at private locations. Despite these differences, it is hypothesized that Feshbach's (1964) expressive-instrumental dichotomy of aggression can be applied to juvenile homicide in a similar way to how it has been applied to adult homicide. This is because no matter what an individual's age is, if intentional aggression is considered in broad terms, it can be viewed as either an emotional response aimed at harming someone (i.e., expressive) or aggression in response to someone preventing the achievement of specific goals (i.e., instrumental; Feshbach, 1964). These broad responses are likely to be universal regardless of age.

However, it is important to note the developmental aspect of offending behavior. According to Moffitt (1993), there is an inclination for young people to

offend during adolescence, and young offenders can be categorized as either life-course persistent (i.e., continuous delinquency that carries on throughout the life-course) or adolescence-limited (i.e., temporary involvement in delinquency that may be due to social causes). Heide and Solomon (2006) state that adolescents' brains are not yet fully mature in terms of the higher cortical processes associated with thinking and judgment. As such, this may impair their decision-making. Peer pressure and a desire to fit in among friends, as well as testing boundaries imposed by adults, may also lead adolescents making poor decisions (Heide, Solomon, Sellers, & Chan, 2011).

Looking at adolescent homicide in Finland, Hagelstam and Häkkänen (2006) argue that the use of accomplices by adolescents was significantly related to the number of offenders and the motive behind the homicide, with a robbery motive being the most frequently reported (78% vs. 29% in other motives). Excessive violence was also related to multiple offenders, which could reflect the impact of peer pressure, where one offender may dominate the other offender and reinforce the use of violence. Additionally, Woodworth, Agar, and Coupland (2013) found an increase in the United States in accomplice-assisted youth perpetrated homicides since the early 1990s. They argue that the changing patterns in homicides committed for instrumental reasons and stranger homicides might be due to an overall increase in multiple-perpetrator offenses. In terms of the offender-victim relationship, when multiple offenders are involved, it has been found that juvenile homicide offenders tend to kill acquaintances and strangers rather than people with whom they have a closer bond (Cornell, Benedek, & Benedek, 1987).

Whilst the expressive-instrumental dichotomy has proven to be useful in classifying homicide crime-scene characteristics in mostly Western countries, only a

few studies have attempted to relate the offender's background characteristics and crime-scene characteristics to support police investigations in terms of suspect prioritization (Salfati & Park, 2007).

The process of inferring offender characteristics from crime-scene characteristics (i.e., profiling) relies upon two assumptions. First, the criminal style adopted by an offender will remain consistent throughout his or her different crimes (called the consistency assumption). Second, offenders behaving similarly when committing a crime will share similar characteristics (called the homology assumption; Goodwill & Alison, 2007; Mokros & Alison, 2002). However, several studies have failed to find evidence to support the homology assumption (Mokros & Alison, 2002; Woodhams & Toye, 2007), and it has been suggested that this assumption is too simple to provide a basis for offender profiling. However, Goodwill and Alison (2007) examined a sample of 85 stranger rape cases in the United Kingdom and argued that the homology assumption may hold in some cases and not in others. This may be dependent on the influence of the situation on the actions of the offenders, as well as psychological or interpersonal factors. Goodwill and Alison (2007) found that predicting an offender's age from the victim's age was only possible in cases where the offender planned his or her attacks *and* also acted in a gratuitous aggressive way toward the victim. The presence of these two elements significantly enhanced the ability to accurately predict the offender's age from the victim's age.

In addition, it seems that the consistency and homology assumptions might not be essential for deriving inferences (Canter & Youngs, 2009). There has been some success in associating crime-scene characteristics with an offender's background characteristics in, for example, arson (Canter & Fritzon, 1998) and sexual offending (Canter & Heritage, 1990; Goodwill & Alison, 2007).

The thematic structure of crime-scene characteristics has provided promising results when deducing offenders' characteristics (Santtila et al., 2003). Salfati and Canter (1999) differentiated homicide crime-scenes into three themes: Expressive (Impulsive)', 'Instrumental (Opportunistic)', and 'Instrumental (Cognitive)'. They found that these three themes were thematically linked to background characteristics of the offender (e.g., previous convictions). An offender characteristic associated with the expressive theme, for example, was a history of impulsive offenses (e.g., violent offenses, public disorder, damage to property, or sexual offenses), thus showing an offender's general attitude to interpersonal relationships (Salfati & Canter, 1999). In the homicide study by Santtila et al. (2003), they also found support to infer offender characteristics from the crime-scene themes, as broadly both expressive-instrumental crime-scene themes were associated with expressive-instrumental offender background characteristics. The significant, but low, association values found among their five themes can be explained by the relative heterogeneity of their sample, varying from infanticide through to the homicide of strangers. Based on these encouraging results, Santtila et al. (2003) recommend replicating their study with a sample of 'difficult-to-solve' homicide cases to increase the practical usefulness of this model for police investigations. There are several other implications regarding the distinction between expressive and instrumental offending characteristics. These range from developing prevention and intervention strategies through to offender rehabilitation programs (Youngs, Iannou, & Eagles, 2016).

Study Aims

The literature on crime-scene characteristics indicates that it is possible to differentiate homicide crime-scene characteristics and offenders' background characteristics in different cultures and contexts. However, there is a debate

concerning the possibility of inferring offender characteristics from the study of crime-scene characteristics (e.g., Goodwill & Alison, 2007). This study aims to explore the crime-scene characteristics of juvenile homicide committed in Wallonia and Brussels, and the thematic interpretation of these characteristics. Landau (2000, cited in Salfati & Park, 2007) describes the need to increase knowledge about homicide as a result of cross-cultural studies that permit the development of theories from different cultural contexts. This study aims to address this need. Therefore, the following research questions will be addressed:

1. Can a thematic structure be identified in juvenile homicide crime-scene characteristics?
2. Can this structure be related to the expressive-instrumental classification?
3. How useful and applicable is this structure when looking at the specificity of themes in juvenile homicide cases?
4. Can offender characteristics be inferred from crime-scene characteristics?

The study focuses on crime-scene characteristics involving Belgian juvenile homicide offenders. As offenders charged with murder share the same characteristics as those charged with attempted murder (Heide, 2003), the study will examine both homicide and attempted homicide cases perpetrated by juveniles.

Method

Sample

The sample consisted of 57 case files in which a total of 67 offenders, aged 21 years and below, had been charged with either murder or attempted murder that took place between 1995 and 2009 in Wallonia and Brussels. Access to the case files was authorized through the *procureurs du Roi* of the 13 French-speaking county courts. The case files are court files that include police investigation information, psychiatric

and psychological evaluations, forensic medical reports, interviews with neighbors and families, and reports from the trial.

The offenders' age ranged from 13 to 21, with a mean age of 18 ($SD = 1.956$). The study focused on offenders up to the age of 21 years old to incorporate the notion of development. The sample comprised of 41 murder offenses and 26 attempted murder offenses, in which a total of 64 victims were killed. Thirty offenders committed their crime alone, whilst 24 of them acted with an accomplice, nine acted as part of a group (minimum of three group members), and four acted as part of a gang (the offender was identified by the police as a gang member, the offender was usually involved in criminal activities and shared characteristics such as a name of the gang, tattoos, and symbols). It was decided to integrate cases in which multiple offenders were involved, as this is a representative characteristic of a sample of juvenile homicide offenders which would influence the dynamics of the crime-scene. None of the offenders in the sample were acquitted. Two thirds of the offenders received a murder or attempted murder sentence, while a third of the offenders received a manslaughter sentence.

Data Collection

In Belgium, there is no central database that registers homicide and attempted homicide. As such, to find juvenile homicide cases for the study, the names of offenders and/or victims needed to be first determined. Three sources were used to find the names of offenders and/or victims of juvenile homicide. These are (a) the Violent Crime Linkage Analysis System (VICLAS) and contacting police officers involved in homicide cases, (b) contacting justice staff who work for the court, and (c) open sources (e.g., documents found online or in the media). Once a list of names

were established, access to court files relating to available cases was authorized through the *procureurs du Roi* of the 13 French-speaking county courts.

A coding dictionary was created based on previous studies relating to homicide crime-scene characteristics (e.g., Salfati, 2000; Salfati & Canter, 1999; Salfati & Dupont, 2006) and an examination of the content of the court files. The interrater reliability of the coding dictionary was tested based on the double coding of 10% of the cases (i.e., six cases). Only variables that obtained a Cohen's Kappa value of more than 0.75 were used in the final coding dictionary. The coding dictionary was then used to code variables for their presence ('1') or absence ('0') across all 57 cases. This dichotomous coding approach has been applied in previous research (e.g., Canter & Fritzon, 1998; Salfati, 2000), and it has been argued that this approach ensures better clarity and reliability of data that were not initially recorded for research purposes (Canter & Fritzon, 1998; Salfati, 2000).

Data Analysis

Smallest Space Analysis (SSA; Guttman, 1954) was used to analyze the data. This is a nonmetric multidimensional scaling procedure. It provides a visual representation of the correlations between the crime-scene variables. The variables are viewed as points in a geometric space, and the rank order of the distance between each point inversely represents the ranks of the correlations between variables. This shows that the higher the correlation between two variables is, the smaller the distance between them in the related space. Guttman-Lingoes' coefficient of alienation represents how well the spatial representation fits the actual correlations. A small coefficient of alienation and fewer iterations suggest a better fit (Shye, Elizur, & Hoffman, 1994). SSA was performed using the Hebrew University Data Analysis Package (HUDAP, 8.0). Jaccard's coefficient was employed to calculate the

correlations, as it computes the correlations between dichotomous variables and lessens the impact of missing data.

SSA was conducted using 28 variables relating to crime-scene characteristics. The number of cases ($n = 57$) rather than the number of offenders (i.e., 67) were employed in order to avoid overrepresentation of crime-scene characteristics where multiple offenders were involved. Variables that occurred in 5% or less of the cases, or in more than 90% of the cases, were excluded as they could be considered too rare or too common to differentiate between the offenses (see Salfati & Canter, 1999).

The position of the variables in the SSA plot was examined and regions were delineated according to the different thematic emphases. Similar to Salfati and Canter (1999) and Salfati (2000), similar themed characteristics were located in the same region of the plot. Once the thematic regions were identified in the plot, due to the dichotomous nature of the data, the Kuder-Richardson Formula 20 (KR-20) was used to determine internal consistency and guide defining the different regions in the plot. This process has been used successfully in previous studies (e.g., Alison & Stein, 2001; Canter et al., 2003).

Once SSA had been conducted, cases were assigned to a dominant single thematic region by using a method of proportionality (see Häkkänen, Lindlöf, & Santtila, 2004; Salfati & Canter, 1999). The variables in each region were added together in each case. The resulting scores were then transformed to percentages, as there were a different number of variables in each region. Each case was then classified as belonging to a dominant region if the percentage of variables in that region was greater than the sum of the other regions. Cases were considered to be hybrids of two thematic regions if they contained approximately the same proportion of variables for each of the regions. Cases were not classified as dominant or hybrid if

they contained less than a third of the variables in any region, or if they contained roughly equal numbers of variables from more than two thematic regions. In these instances, the cases were classified as having 'no theme' (Fritzon & Brun, 2005).

Pearson's chi-square test and Fisher's exact test were conducted to identify the relationship between the dominant themes of crime-scene characteristics and the offenders' characteristics. Due to multiple tests being employed, the Bonferroni adjustment was used ($p = .004$).

Results

The two-dimensional representation of the SSA plot is shown in Figure 1. This representation was used as it had the lowest Guttman-Lingoes' coefficient of alienation, namely, .18 in 36 iterations. This indicates a good degree of fit (Shye et al., 1994). When using archival data, a generally accepted coefficient of alienation is .20 (Canter & Heritage, 1990). The frequency of each crime-scene characteristic occurring is presented in Table 1.

[Insert Figure 1 about here.]

The SSA plot shows three regions of crime-scene characteristics. As a result of the clusters of characteristics in each region, they can be labelled clockwise as follows: Expressive: multiple offenders, Instrumental: theft, and Instrumental: sex/forensic awareness. The regions reflect the different thematic emphases within the data. As such, the lines should not be considered rigid borders, but rather reflecting gradual distinctions that relate to offenses involving expressive characteristics and multiple offenders, offenses involving instrumental characteristics and criminal acts (theft), and offenses involving sexual assault or forensic awareness.

[Insert Table 1 about here.]

The region titled 'Expressive: multiple offenders' comprises 13 variables ($\alpha = .49$). These are as follows: the victim was male (77%), the offense occurred at night (58%), the offender was carrying the weapon with him/her at the time of the crime (54%), the offender used a sharp weapon (51%), there was an argument between the offender and victim (49%), multiple offenders were involved (49%), the offender attempted murder (39%), the victim had drunk alcohol (30%), the offense occurred during the weekend (28%), the offender had drunk alcohol (23%), the offender had taken drugs (23%), the offender used a firearm (17%), and the offense was gang-related (7%). Most variables in this thematic region, with the exception of carrying a weapon, using a sharp weapon, and using a firearm, had not been used in previous studies but were explored in the current study. The grouping of all the variables in this region suggests conflict occurring during some form of social encounter, where multiple offenders might have been involved.

The region titled 'Instrumental: theft' includes nine variables ($\alpha = .66$). These are as follows: the victim's head was injured (70%), the offense took place in a residential setting (53%), multiple wounds were distributed across the body (53%), physical violence was used (46%), the offender used a weapon found at the crime-scene (40%), the victim's body was left at the scene (33%), the offender stole from the victim (33%), a blunt weapon was used (23%), and the offender approached the crime-scene with the intention to commit another crime (23%). This thematic region highlights overtly criminal actions, where the offender may have had a more instrumental aim (e.g., theft) that lead to further violent aggression. In several cases, the aggression was directed at a person who tried to prevent them from achieving their primary goal (e.g., theft).

The region titled 'Instrumental: sex/forensic awareness' includes six variables ($\alpha = .65$). These are as follows: the victim's body was hidden after the crime (16%), the offender strangled the victim (12%), the offender carried out a sexual assault (10%), the victim was bound or gagged (9%), the offender cleaned up the crime-scene (9%), and the victim's genitals were injured (7%). The grouping of these variables suggests two subthemes: forensic awareness and a sexual element to the crime. The instrumental nature of this region can be observed where the offender used the victim as a vehicle to satisfy his or her needs.

The top and right parts of the SSA plot show the presence of conflict between the offender and victim when the offense occurred. The plot shows a more expressive emphasis at the top and right side of the plot (e.g., alcohol use, conflict), whereas the bottom and left side of the plot has a more instrumental emphasis (e.g., crime commission, theft, binding the victim). A modulating facet in terms of frequencies can also be observed with the higher frequencies agglomerated in the middle and lower frequencies located on the outskirts of the plot.

Classification of Cases according to Thematic Region

Table 2 indicates the number of cases that can be classified according to the thematic regions of the SSA plot. It shows that the three regions can explain 84% of the cases, while 14% of the cases did not fall within any of the thematic regions (or fell within all three regions, i.e., hybrid). Only one case could be characterized by two of the thematic regions (i.e., 'Expressive: multiple offenders' and 'Instrumental: theft'). There is a clear divide between cases that can be classified as 'Expressive: multiple offenders' (50%) and cases that can be classified as 'Instrumental: theft' (48%), while only one case can be classified as 'Instrumental: sex/forensic awareness'.

[Insert Table 2 about here.]

Relationship between Thematic Regions and Offenders' Characteristics

Following the work of Salfati (2000), Salfati and Park (2007), and Santtila et al. (2003), 12 variables that reflect the relationship between the offender and the victim, personal characteristics of the offender, and the offender's previous criminal history were included in this analysis. Table 3 shows the frequencies of these variables. Pearson's chi-square test and Fisher's exact test were conducted to identify significant relationships between the two dominant thematic regions of the SSA plot ('Expressive: multiple offenders' and 'Instrumental: theft') and the 12 variables relating to offenders' characteristics. The results of these analyses can be seen in Table 3, and as can be observed, there were no significant relationships.

[Insert Table 3 about here.]

Discussion

This is the first study to examine the thematic interpretation of crime-scene characteristics in juvenile homicide cases, using Belgian data. The results of the study indicate the presence of three themes relating to crime-scene characteristics. These themes reaffirm that the expressive-instrumental model found in general homicide studies (e.g., Salfati & Dupont, 2006; Salfati & Haratsis, 2001; Salfati & Park, 2007; Santtila et al., 2001) is useful when attempting to discriminate juvenile homicide in different countries.

However, it is evident that, when considering the variables in the SSA plot and the thematic split, the expressive-instrumental dichotomy is not as clear as previously found in homicide studies using adult samples (Salfati, 2000; Salfati & Canter, 1999;

Salfati & Dupont, 2006; Salfati & Haratsis, 2001; Santtila et al., 2001). Similarities can mainly be observed in terms of the nature of the themes, as similar to studies that consider adult offenders (Salfati & Dupont, 2006; Salfati & Haratsis, 2001; Salfati & Park, 2007), variables relating to, for example, sexual assault and theft were found in the instrumental region.

The main differences between the findings in the present study and those studies that have considered adult offenders were for crime-scene characteristics such as victim's head injury, hiding the victims' body, using a blunt weapon, and inflicting multiple wounds, which were all described as being expressive in studies relating to adult homicide offenders (Salfati, 2000; Salfati & Dupont, 2006; Salfati & Haratsis, 2001; Salfati & Park, 2007), while in the present study they were found to be instrumental.

Salfati (2000) states that certain expressive characteristics taken out of context can be interpreted as instrumental, while some instrumental characteristics can be interpreted as expressive. As such, the sexual elements found in the 'Instrumental: sex/forensic awareness' thematic region can potentially be seen as the offender wanting to physically harm someone, and by viewing the victim as a person, can be considered expressive. However, this thematic region can also be viewed as instrumental, as the offender can gain sexual gratification and view the victim as an object.

One of the unique aspects of the present study's sample is the high number of multiple offenders involved across the cases. Thirty-seven offenders acted with at least one accomplice. Hagelstam and Häkkänen (2006) suggest that the involvement

of multiple juvenile homicide offenders might reflect the offenders' development, as they need the approval and validation of their peers.

Cheatwood and Block (1990) also found that offenses involving multiple juvenile homicide offenders were more likely to include a concurrent felony, for example, killing inter-racial, old, or very young victims with a firearm. In the current study, the multiple offenders variable was found to be thematically related to the use of firearms, but not related to the variables of another crime commission and theft, which were found in a different thematic region ('Instrumental: theft'). Variables such as the victim's age, and offender and victim's race were not included in the present study. The findings of the current study might be explained by the context of the homicide in which the young offenders were involved. For instance, gang-related homicide, a variable that has not been included in studies of older offenders, was found in the expressive thematic region, which relates to the offenders' motives being directly related to emotional needs and confrontational disputes (i.e., these offenders were either involved in territory defense or retaliation). The context of the offense is therefore important, as Ewing (1990, cited in Shumaker & Prinz, 2000) found that most gang-related homicide in his U.S. sample was due to more instrumental reasons, such as drug trafficking or the commission of a crime.

The current study's results indicate a global structure, where the crime-scene characteristics can be roughly divided into either expressive or instrumental themes. There are similarities between the study's findings and those of Salfati and Park (2007), where Salfati and Park (2007) found in their instrumental theme that there was no indication of preparation or planning in the commission of the homicide, as the weapon used was found at the crime-scene. The authors argue that these actions suggest that the offender treated the victim as a vehicle to reach an ulterior motive,

such as material or sexual gain. Salfati (2000) suggests that instrumental violence should be considered an indication of a more pathological development, in which the offender is capable of using aggression for a specific purpose. In the current sample, this translates into the capacity of offenders to plan and commit a theft, robbery, or sexual assault. The homicide might not have been the primary goal.

The differences that were found between the current study's findings and the findings of those studies with older offenders (e.g., Salfati & Haratsis, 2001; Salfati & Park, 2007) might be explained by the culture of the offenders, as well as their age. It has been shown that different cultures may influence the expression of aggression and the way homicides are perpetrated might reflect the culture of the offender (Salfati & Park, 2007). Salfati and Haratsis (2001) suggest that the patterns of behavior displayed in homicide (e.g., weapon use, interaction between the offender and victim) may be guided by behavioral scripts that are specific to a country that displays different cultural trends from other countries. For example, the propensity for individuals to drink or keep a firearm at home to protect themselves may explain differences in homicide rates across regions in the United States (Corzine, Huff-Corzine, & Whitt, 1999). The introduction of substance consumption in the analyses of the present study, and the influence of substances on committing violent acts might reflect current trends in Belgium, and possibly Europe. This needs to be further investigated. It would be interesting to assess whether cultural or subcultural differences might predict the nature of homicide and its context in different countries across the world.

With regard to the thematic split of the SSA plot, Santtila et al. (2001) suggest that to be considered a useful classification device, the thematic divide needs to be relatively specific to allow associations to be found between crime-scene themes and

offender characteristics. The thematic split of the SSA plot in the current study showed that the themes explain 84% of the crimes-scene characteristics. In contrast, Salfati and Haratsis (2001) classified 63% of their cases as exhibiting a dominant theme, which gives a fairly good representation of the homicide themes, while Santtila et al. (2003) assigned 46% of all homicides to a single theme.

The thematic split of the SSA plot in the current study therefore gives a very good representation of crime-scene characteristic themes, and allows 23 cases (48%) to be classified as 'Instrumental: theft', and 24 cases (50%) to be classified as 'Expressive: multiple offenders'. This shows that the offenders who committed homicide in this sample clearly display a split between criminal characteristics and conflict-related characteristics (which can be related to instrumental and expressive themes). One case was classified as 'Instrumental: sex/forensic awareness'. Forensic awareness is defined as the use of additional measures taken by an offender to avoid apprehension by altering their criminal modus operandi to hide evidence (Davies, 1992). In the current study, example variables include hiding the victim's body and cleaning the crime-scene. Beauregard and Martineau (2014) found that sexual homicide offenders rarely take precautions to avoid detection, with the most commonly used precaution being the destruction or removal of evidence. In 16% of the cases in the current study, the offender hid the victim's body, and in 9% of the cases the offender cleaned the crime-scene. This indicates a small subset of offenders taking active precautions to prevent detection. This might also explain the low frequency of cases classified by this thematic region. In addition, the 'Instrumental: sex/forensic awareness' thematic region could be related to the 'Instrumental-Cognitive' theme found by Salfati and Canter (1999) in their study of 82 British stranger homicides, where the cognitive aspect of the offense surfaces, such as

planning the act or hiding evidence. The 'Instrumental: theft' thematic region is very similar to their 'Instrumental-Opportunistic' theme, where offenders opportunistically target victims to use them as an object through which another motive will be achieved, such as stealing money. It seems that the sexual elements are usually found in combination with variables reflecting some organized actions at the crime-scene.

Only 14% of the cases in the current study were classified as 'no theme' or 'hybrid', whereas only one case was classified as two themes (i.e., 'Instrumental: theft' and 'Expressive: multiple offenders'). In light of the results presented in Table 2, the thematic split of the SSA plot was specific enough to be considered as a good starting point to explore associations between the offenders' characteristics and the crime-scene characteristics. According to Salfati and Haratsis (2001), crime-scene characteristics are useful for analysis as they allow the nature of the offenses and offenders (i.e., expressive or instrumental) to be distinguished.

In terms of the implications of the research, the current findings support differentiating homicide according to the expressive-instrumental dichotomy, which is consistent with other homicide studies conducted in different countries (e.g., Salfati & Haratsis, 2001; Salfati & Park, 2007; Santtila et al., 2001). This dichotomy seems to transcend the offender's age, as by analyzing the crime-scene characteristics of juvenile homicide offenders, this dichotomy was apparent. Very few studies examine the influence of culture on homicide offenses, and there is a need for future studies to adopt a qualitative approach and interview offenders to assess the influence of culture on the offender's behavior. This could in turn not only support the investigation of juvenile homicide offenses, but also the rehabilitation of juvenile homicide offenders in the community when they are released.

The relationship between crime-scene characteristics and the offenders' characteristics have been established in other studies on homicide, and have been found useful in helping the police to focus their investigations (Salfati & Park, 2007). However, no significant relationships were found in the present study. Therefore, this study does not provide empirical support for the homology assumption.

Building on the work of Salfati and Canter (1999), it was expected that relating thematic regions of the SSA plot to the offenders' characteristics would assist in devising a decision-support system that would help in identifying offenders. As Salfati and Canter (1999) found, the identification of pertinent offender characteristics will help refine and prioritize suspect selection and lead to a faster process of identifying and convicting the offender. Little evidence was found in the current study for inferring offender characteristics, a process that may depend on the circumstances in which the crime takes place, and which may not always correspond with how the offender is usually behaving (Goodwill & Alison, 2007). In addition, the current findings add to the existing body of literature affirming that there might be some crimes that are more prone to offender profiling than others (see Doan & Snook, 2008). Goodwill and Alison (2007) show that thematic approaches that take into account broad and heterogeneous types of offenses have found limited examples in which offenders' characteristics are directly linked to crime-scene characteristics (Mokros & Alison, 2002), with the exception of some studies (e.g., Fritzon & Garbutt, 2001). As such, the lack of homology has been attributed in some cases to the approach and methods used, rather than the theoretical and conceptual background (Goodwill & Alison, 2007).

The lack of significant relationships between crime-scene characteristics and offenders' characteristics that was found in the current study might also be explained

by the heterogeneous nature of the sample. Similar to Santtila et al. (2003), who used all legally defined homicides in Finland, varying from stranger homicide to infanticide, the practical usefulness of their findings was limited. As such, they recommended for future studies to separately analyze homicides where the offender was not immediately arrested and homicide cases that were difficult to solve.

Further, previous studies that examined the relationship between homicide crime-scene characteristics and offender characteristics were carried out using adult samples (e.g., Salfati & Canter, 1999; Santtila et al., 2003). It might be that, when compared to adults, juvenile homicide offenders have a less extensive and varied history of offenses when they were arrested. On the other hand, Häkkänen et al. (2004) recommends caution when inferring offender characteristics from crime-scene characteristics and emphasizes the importance of context on actions displayed at the crime-scene. According to Goodwill and Alison (2007), situational and contextual factors have been found to have a significant impact on various offense behaviors and victim choice.

Due to the absence of a central database that classifies all homicides in Belgium, it is difficult to determine the representativeness of the current sample. With such a population, sample size was limited. Additionally, only cases that were solved, and in which the offender had been 'sentenced', were used in the current study, and the offenders' characteristics might not be generalizable to all juvenile homicide offenders.

As has been done in several studies on homicide (Salfati, 2000; Salfati & Canter, 1999; Salfati & Haratsis, 2001; Salfati & Park, 2007), it would be interesting to reproduce the analysis of juvenile homicide crime-scene characteristics in other countries to compare similarities across samples that are culturally different. In

addition, as found in the current sample, a more homogeneous sample might be more useful when trying to test the homology assumption. Additional studies examining juvenile homicide offenders may be required to establish whether it is feasible and useful to relate crime-scene characteristics to offender characteristics.

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TABLE 1.

Frequency of crime-scene characteristics per thematic region ($n = 57$)

Crime-scene characteristics	%
Expressive: multiple offenders ($\alpha = .49$)	
VMale: The victim was male	77
Night: The crime was committed in the evening or at night (dark outside)	58
WCarried: The offender was carrying the weapon used during the offense. He/she brought a weapon to the crime-scene	54
Sharp: Sharp weapons were used during the offense (e.g., knives, swords)	51
Confl: The offender was in an argument or dispute with the victim when the offense occurred	49
MultO: More than one offender was involved in the offense	49
Attempt: The crime was an attempted murder	39
VDrunk: The victim had been under the influence of alcohol when the offense occurred	30
CrWknd: The offense occurred during the weekend (Saturday and Sunday)	28
ODrunk: The offender was under the influence of alcohol when the offense occurred	23
ODrug: The offender was under the influence of drugs when the offense occurred	23
Firearm: A firearm was used to commit the offense	17
GangR: The offender was part of a gang who committed the offense	7
Instrumental: theft ($\alpha = .66$)	
HeadInj: The victim's head was injured	70
Resid: Location of crime-scene was in residential settings (e.g., house)	53

MultWndD: Multiple wounds were distributed across the body	53
PhysV: Physical violence was used to kill the victim (e.g., hitting, kicking)	46
WScene: The offender used a weapon found at the crime-scene	40
Bplaced: Victim's body left at the crime-scene	33
Theft: The offender stole goods or belongings of the victim	33
Blunt: Blunt instruments were used to commit the crime (e.g., hammer)	23
Crime: The offender approached the crime-scene with the intention to commit another felony (e.g., robbery)	23
<hr/>	
Instrumental: sex/forensic awareness ($\alpha = .65$)	
<hr/>	
VHidden: The victim's body was hidden	16
Strangul: The victim had been strangled	12
VSexAss: The victim had been sexually assaulted	10
Bound: The victim was bound or gagged	9
Cleaned: The offender cleaned up the crime-scene (e.g., used gloves)	9
GenInj: Victim's genitals were injured	7
<hr/>	

TABLE 2.

Cases that can be classified according to thematic region ($n = 57$)

Themes	<i>f</i>	%
One theme	48	84
Two themes	1	2
No theme/Hybrid	8	14
Expressive: multiple offenders	24	50
Instrumental: theft	23	48
Instrumental: sex/forensic awareness	1	2

TABLE 3.

Relationship between thematic regions and offenders' characteristics

Offenders' characteristics	%	<i>p</i> -value
The offender was male	96	1.00
The victim and offender knew each other through a previous association	77	.32
The offender had committed one or more offenses before the murder/attempted murder	72	.34
The offender had previously committed a property crime	55	1.00
The offender had previously committed a violent crime	49	.56
The offender was part of a large family (three or more children)	34	.13
The offender was under 18 years old	32	.53
The offender and victim were blood-related (e.g., parent)	15	.25
The offenders' first offense committed was a violent crime	15	.70
The offender had a mental disorder (e.g., psychosis)	6	.61
The offender had previously committed a sexual crime	6	1.00
The offender and victim had a previous sexual relationship	2	.49

** $p < .01$.

FIGURE 1.

SSA plot of 28 crime-scene characteristics in 57 cases.

