J Police Crim Psych (2008) 23:61–70
DOI 10.1007/s11896-008-9026-7

A Failure to Find Empirical Support for the Homology Assumption in Criminal Profiling

Brandy Doan · Brent Snook

Published online: 26 August 2008

Abstract A fundamental assumption in criminal profiling is that criminals who exhibit similar crime scene actions have similar background characteristics. We tested this so-called homology assumption by first classifying, with pre-existing typologies, a sample of arsons (N = 87) and robberies (N = 177) into different crime types and then comparing the background characteristics of criminals who committed the various crime types. Results showed that using pre-existing typologies to classify the crimes into mutually exclusive types was not easily accomplished. Notwithstanding classification difficulties, the homology assumption was *violated* in 56% of the comparisons of background characteristics between the different arson types and in 67% of the comparisons of background characteristics between the different robbery types. Overall, 73% of the effect sizes for the associations between crime type and background characteristics were low to moderate (V < .3; d < .2). The implications of these findings for profiling practices are discussed.

Keywords Profiling · Homology · Arson · Robbery

The legitimacy of criminal profiling (CP) is predicated partially on there being strong empirical support for the assumption that criminals who exhibit similar crime scene actions have similar background characteristics (commonly, and henceforth, referred to as the *homology* assumption).[1] Demonstrating empirical support for the homology assumption is particularly vital for typology-based approaches to profiling because such approaches involve invoking a standard set of background characteristics for a particular type of criminal. For example, a profiler using Canter and Heritage's (1990) model of sex offenders might predict that two criminals who are classified as "criminality-type" rapists would each have previous convictions for burglary. Without support for the homology assumption, typology-based profiling practices are undermined.

Typology-based Profiling

Arguably, the most routinely used typology in the CP field is the FBI's organized-disorganized dichotomy (Ressler et al. 1986). The main assumptions underlying that typology are that: (a) crimes can be categorized as organized (e.g., well-planned) or disorganized (e.g., unplanned) based on crime scene behaviors, (b) criminals can be categorized as organized (e.g., high-functioning) or disorganized (e.g., low-functioning) based on the criminal's background characteristics, and (c) there is a correspondence between crimes and criminals (i.e., organized criminals commit organized crimes and disorganized criminals commit disorganized crimes).

Although the organized-disorganized typology has been central to profiling practices around the world for many years, it has only been subjected to empirical scrutiny in recent years. Canter et al. (2004) examined whether 100 US serial murders could be categorized as organized or

Support for the research reported in this article was provided to the first author by the Social Sciences and Humanities Research Council of Canada and to the second author by the Natural Sciences and Engineering Research Council of Canada.

B. Doan · B. Snook (✉)
Psychology Department, Science Building,
Memorial University of Newfoundland,
St. John's, NL A1B 3X5, Canada
e-mail: bsnook@play.psych.mun.ca

[1] Similarly, it is assumed that criminals who have different offending styles will have different types of background characteristics.

disorganized. Using a multidimensional scaling (MDS) procedure, they analyzed 39 crime scene behaviors that were categorized as organized or disorganized in the FBI's *Crime Classification Manual* (Douglas et al. 1992). In contrast to what would be predicted from the typology, the analysis did not reveal any distinct subsets of organized and disorganized behaviors, thus making it difficult to see how serial homicides may be categorized easily in this way. Similar findings have been reported for other popular classification systems (e.g., Canter and Wentink 2004; Melnyk et al. 2007). Ultimately, the inability to classify crimes into distinct types is directly relevant to the homology assumption because it prevents researchers from even being able to test the assumption. Indeed, the first step in testing the homology assumption requires the crimes committed by criminals to be assigned to a particular crime type.

Is There Any Empirical Support for the Homology Assumption?

Despite the proliferation of profiling classification systems and the use of typologies by profilers (e.g., see Kocsis 2006, for promotion of typology-based profiling), there have only been a handful of scientific evaluations of the homology assumption (Canter and Fritzon 1998; Häkkänen et al. 2004; House 1997; Mokros and Alison 2002; Woodhams and Toye 2007). Empirical tests of the homology assumption have generally involved subjecting crime scene behaviors to MDS analysis to derive thematically-related behavioral clusters, or *crime types*. Using their crime scene behaviors, the crimes for each criminal in a sample are then assigned to one of the resulting types and the background characteristics (e.g., age, previous convictions, history of psychiatric treatment) of offenders who commit the various crime types are compared. In other studies, MDS analyses are conducted on background characteristics as well — to produce *background types* — and comparisons are made between crime types and background types. Regardless of the type of analysis conducted, support for the homology assumption is assumed to exist when criminals who commit similar types of crimes (i.e., exhibit similar crime scene behaviors) have similar backgrounds. Similarly, criminals who commit different types of crimes (i.e., exhibit different crime scene behaviors) are assumed to have different backgrounds. Unfortunately, as is evident from the studies reviewed below, the empirical support for the homology assumption is weak.

House (1997) House (1997) tested the hypothesis that rapists who vary in terms of their criminal behavior might also vary in terms of their criminal antecedents. Specifically, based on an MDS analysis of rape behaviors, he tested the hypothesis that rapists who exhibit a high degree of criminality in their rapes (e.g., overt criminal acts indicative of attempts to conceal identity and avoid apprehension) would be more likely than other types of rapists (e.g., sadistic, aggressive, or pseudo-intimate) to exhibit background characteristics related to criminality (e.g., previously incarcerated). This was found not to be the case — the percentage of criminal, intimate, aggressive, and sadistic rapists who had been previously incarcerated was 94.4%, 93.1%, 92.3%, and 77.8%, respectively. Furthermore, the percentages of the other seven types of criminal antecedents that House examined were also similar across offenders who committed the four types of rapes.

Canter and Fritzon (1998) Based on a MDS analysis of 42 crime scene behaviors from 175 arsons, Canter and Fritzon identified four distinct types of arsons: instrumental-object, instrumental-person, expressive-object, and expressive-person. A second MDS analysis of 23 background characteristics (e.g., presence of a psychiatric history, economic status, previous convictions) revealed four background types: psychiatric history, young offender, failed relationship, and the repeat arsonist. Results from an analysis of the relationships between the crime and background types provided mixed support for the homology assumption, as those offenders committing different types of arsons were found to have similar backgrounds. Canter and Fritzon reported significant positive correlations between expressive-person arsons and psychiatric history (r_s = .38) and failed relationship (r_s = .21), and a significant negative correlation between expressive-person arsons and young offender (r_s = −.33). Significant negative correlations were found between instrumental-object arsons and psychiatric history (r_s = −.28) and failed relationship (r_s = −.31), whereas a significant positive correlation was found between instrumental-object arsons and young offender (r_s = .44). In addition, instrumental-person arsons were negatively correlated with young offender (r_s = −.56) and repeat arsonist (r_s = −.34), but associated positively with failed relationship (r_s = .49). Lastly, they found the expressive-object arsons were positively correlated with both psychiatric history (r_s = .42) and repeat arsonist (r_s = .56).

These aforementioned results show clearly that offenders committing different types of arsons often have similar backgrounds. For instance, both expressive-person and expressive-object arsons are associated positively with a psychiatric history background type. Similarly, both expressive-person and instrumental-person arsons are associated positively with a failed relationship background type. In actuality, the only clear support for the homology assumption in Canter and Fritzon's study is the finding that instrumental-object arsons are the only type to be

associated positively with a young offender background type and expressive-object arsons are the only type to be associated positively with repeat arsonist background type. Such mixed findings provide, at best, moderate support for the homology assumption.

Mokros and Alison (2002) In a study that first used the term *homology assumption* with respect to profiling, Mokros and Alison examined the extent to which 100 British stranger rapists who had similar offence styles were more similar in terms of their background characteristics than those rapists who had different offence styles. They created, for every possible pair of rapists, a similarity index for crime scene behaviors and a similarity index for age, socio-demographic features (e.g., employment situation, ethnicity, martial status), and previous convictions (e.g., burglary, drugs, assault). Discouragingly, correlations between the similarity index for crime scene behaviors and the three background indices showed that rapists with similar styles of offending were *less similar* with respect to age ($r_s = -.01$), socio-demographic features ($r_s = -.10$), and previous convictions ($r_s = -.06$) than those with different styles of offending. Needless to say, these results fail to provide empirical support for the homology assumption.

Häkkänen et al. (2004) Häkkänen and colleagues examined 189 arsons and identified, via MDS, four types: instrumental-object, instrumental-person, expressive-object, and expressive-person. A second MDS analysis of 30 background characteristics revealed four background types: adolescent, serial arsonist, self-destructive arsonist, and criminal. The resulting correlations between the background characteristics and types of arsons showed that expressive-person arsons were positively correlated with a self-destructive background ($r_s = .57$) and negatively correlated with an adolescent background ($r_s = -.34$). The expressive-object arsons were negatively correlated with a self-destructive background ($r_s = -.62$) and positively correlated with an adolescent background ($r_s = .34$). Instrumental-person arsons were reported to have modest positive correlations with both a self-destructive ($r_s = .27$) and a criminal ($r_s = .24$) background, but were negatively correlated with an adolescent background ($r_s = -.16$). Lastly, instrumental-objective arsons were positively correlated with the self-destructive ($r_s = .24$), criminal ($r_s = .29$), and serial arson ($r_s = .18$) background types. As with Canter and Fritzon's (1998) study, these results show that individuals committing different types of arsons often have similar backgrounds. For example, the fact that instrumental-object, instrumental-person, and expressive-person arsons are all positively correlated with the self-destructive background type suggests that the homology assumption is often violated.

Woodhams and Toye (2007) Most recently, Woodhams and Toye tested the homology assumption for a sample of 80 British commercial robberies. A hierarchical cluster analysis of 22 dichotomous crime scene behaviors revealed three types of robbers: violent opportunists, organized risk takers, and bladed nocturnal planners. In line with previous studies, there was no evidence of differences in background characteristics between the offenders committing the three types of robberies. Specifically, there were no statistically significant differences between the individuals committing the different types of robberies with respect to age, employment status, ethnicity, previous convictions, or how far their robbery was committed from their home location.

A tally of the five aforementioned studies shows that there is no support for the homology assumption in three of the studies, low to moderate support in two of the studies, and moderate to high support in none of the studies. Given this state of affairs, it appears that there is limited empirical support for the homology assumption. Nevertheless, because there have only been a few tests of this assumption, it is important to continue to give profilers the benefit of the doubt and test the extent to which CP is supported empirically.

In the current research, we were interested in two questions.

1. Can pre-existing typologies, developed using data from one location, be used to classify crimes from a different location?
2. If crimes can be classified with pre-existing typologies, is there any empirical support for the homology assumption in that novel environment?

We examined these questions by exploring two different typologies (using different types of crime) on two novel sets of data.

Study 1: Arson

Method

Sample Data were provided by the Royal Newfoundland Constabulary (RNC) located in St. John's, Newfoundland. All arsons that had occurred in the jurisdiction between 1991 and 1995 were reviewed. A database of arsons ($N = 87$) was collated by coding the arson files according to Canter and Fritzon's (1998) content dictionary (see Appendix). Our database contained 39 crime scene behaviors (e.g., used an accelerant, caught school on fire, material brought to the scene) and 9 background characteristics (e.g., prior offences, previous conviction for theft, criminal had a history of burglaries). All variables were dichotomously coded as

either present or not present. Due to logistical issues, it was not possible to conduct inter-rater reliability analysis.

Procedure We assigned the arsons to one of Canter and Fritzon's (1998) four types: (1) expressive-object (EO), (2) instrumental-object (IO), (3) instrumental-person (IP), and (4) expressive-person (EP).[2] The total number of crime scene behaviors exhibited by each criminal was first derived by determining the presence of each behavior in the database. For each criminal, the percentage of behaviors exhibited for each type of arson was then derived by dividing the total number of behaviors that were present for a particular type of arson by the total number of items comprising that type. For example, a criminal who committed an arson that had 10 of the 11 EO behaviors would produce a value of 91%. The resulting percentages were then used to classify each crime committed by each criminal according to a dominant type of arson. We used Canter et al.'s (2003) criterion for assigning crimes to types, where a crime is assigned to a dominant type if the percentage for one type is greater than the sum of the percentages for the other three types. For example, if a criminal exhibited 91% of the crime scene behaviors found in the EO type and 50% of the behaviors across the remaining three types, their crime would be classified as an EO type. In the event that a crime failed to meet the classification criterion, the crime would be classified as "mixed". Differences in background characteristics between criminals committing different types of arsons were then examined.

The following nine background characteristics were used to test for differences between those committing different types of arsons: (1) previous convictions, (2) age (juvenile or not), (3) previous psychiatric treatment, (4) a previous warning for criminal behavior but was not charged, (5) theft history, (6) history of criminal damage to property, (7) burglary history, (8) assault history, and (9) a history of failure to comply with court/probation orders or failed to appear in court (FTC/FTA).

[2] In brief, these themes refer to the extent to which the arson was the result of emotional processes (expressive) or an attempt to achieve an ulterior goal (instrumental), and to the extent that the arsonist was targeting the property to get back at a specific person (person) or to simply destroy the target (object). For our classification of the arsons, 11 variables comprised the EO type, 9 variables comprised the IO type, 12 comprised the IP type, and 7 made up the EP type. Because there was no information in the database concerning which day of the week the particular arson took place or the distance between the crime scene and the offender's home, these variables were eliminated from the typologies. The variable *set fire* was also excluded because it occurred in all the cases. This variable was found to be a central event in Canter and Fritzon's SSA analysis as well, and could not be classified into any particular arson type.

Results and Discussion

Using Canter et al.'s (2003) classification criterion, the results showed that 76% of the arsons were mixed. Approximately 6% (n = 5) of the cases were classified as IO arsons and 8% (n = 7) were classified as EP arsons. None of the arsons were classified as either EO or IP types. These results suggest that classifying a sample of arsons from Newfoundland, Canada based on a typology created using a sample of UK arsons is not easily accomplished.[3]

Although our research should have ceased at this point, we were interested in determining if the homology assumption would be supported if a more liberal, albeit unrealistic, classification criterion were used. To accomplish this goal, we simply used the largest percentage of crime scene behaviours to assign each criminal's crime to a dominant type of arson. For example, a crime with the percentages 36% EO, 33% IO, 33% IP, and 14% EP would be classified as an EO type. The results showed that 9.2% (n = 8) of the arsons were of the EO type, 28.7% (n = 25) were IO, 28.7% (n = 25) were IP, 32.2% (n = 28) were EP, and 1.1% (n = 1) were mixed. Because of the small sample sizes, the EO and mixed types were not included in subsequent statistical analyses.

The relationships, and associated effect sizes, between background characteristics and the three types of arsons are shown in Table 1. As can be seen, there were statistically significant associations between type of arson and the following six criminal antecedents: previous convictions, age, psychiatric treatment, previous warning, criminal damage, and FTC/FTA. There were no significant associations between arson type and the following criminal antecedents: theft, burglary, and assault. The average effect size was V = .38 (SD = .17), and the associated 95% CI was .25 to .52. Although these results look promising, closer inspection of the six statistically significant associations show that those committing IP and EP type arsons are equally likely to have had a previous conviction (64% versus 75%, respectively), previous warning (72% versus 79%), and a conviction for criminal damage (60% versus 61%) in their past. The only strong support for the homology assumption appears to be the findings that: (1) those committing EP type arsons are the only type that was most likely to have received past psychiatric treatment and

[3] For the 12 arson cases that were able to be classified, we found a difference in background characteristics for four of the nine background characteristics that were compared across the expressive-person (n=7) and instrumental-object type (n=5) arsons. We found that the expressive-person type arsons were more likely to be committed by juveniles and instrumental-object type arsons were more likely to have been committed by those with some sort of previous conviction, a previous conviction for criminal damage, and FTC/FTA.

Table 1 Relationships, and associated effect sizes, between criminal antecedents and arson type — instrumental-object/instrumental-person/expressive-person

Background Variables	Arson Type			χ^2	*p*	*V*
	IO	IP	EP			
Previous Convictions						
Yes	4	16	21	20.37	.00	.51
No	21	9	7			
Juvenile						
Yes	24	11	2	38.78	.00	.71
No	1	14	25			
Psychiatric Treatment						
Yes	2	4	14	14.01	.00	.42
No	23	21	14			
Previous Warning						
Yes	8	18	22	13.80	.00	.42
No	17	7	6			
Theft [a]						
Yes	2	5	4	1.48	.47	.14
No	23	20	24			
Criminal Damage						
Yes	4	15	17	13.46	.00	.42
No	21	10	11			
Burglary						
Yes	4	5	10	3.17	.20	.20
No	21	20	18			
Assault						
Yes	6	13	14	5.07	.07	.26
No	19	12	14			
FTC/FTA						
Yes	2	3	12	11.49	.00	.38
No	23	22	16			

Note. a = Fisher's Exact Test computed due to less than expected cell counts.

FTC/FTA and (2) those committing IO type arsons are the only type that were most likely to be juvenile, and much less likely to have convictions, warnings, and criminal damage arrests in their past.

We also tested the homology assumption by assigning crimes to one of two types. We did this by both collapsing across expressive/instrumental types and person/object types. Two-thirds (76%) of the arsons were able to be classified as an instrumental type and the remaining arsons were classified as an expressive type. As can be seen in Table 2, there were statistically significant associations between arson type and the following six criminal antecedents: previous convictions, age (juvenile or not), psychiatric treatment, previous warnings, history of burglary, and history of FTC/FTA. There was no association between type of arson and history of theft, history of criminal damage, or history of assault. The average effect size was $V = .25$ ($SD = .13$) and the associated 95% *CI* was .15 to .35.

Although such findings appear to provide strong support for the homology assumption, it must be noted that 52% of the arsons in this database were committed by juveniles and that 93% of the juveniles committed expressive type arsons. We suspected that the differences between the expressive and instrumental types were largely a function of age. In fact, six of the eight 2×2 χ^2 tests of association between the age of the criminal and type of criminal antecedents were statistically significant (χ^2 ranged from 5.06 to 21.82; Cramer's *V* ranged from .24 to .50). With the exception of FTC/FTA, there were no statistically significant associations between arson type and any criminal antecedent when only adult criminals were examined. Because younger criminals have had relatively less time to develop a criminal history, the difference between criminals who commit expressive and instrumental type arsons appears to be due

Table 2 Relationships, and associated effect sizes, between criminal antecedents and arson type — expressive versus instrumental

Background Variables	Arson Type		χ^2	*p*	*V*
	Expressive	Instrumental			
Previous Convictions					
Yes	17	31	7.44	.00	.29
No	4	35			
Juvenile					
Yes	3	42	15.38	.00	.42
No	18	24			
Psychiatric Treatment					
Yes	10	12	7.30	.00	.29
No	11	54			
Previous Warning					
Yes	17	38	3.74	.05	.21
No	4	28			
Theft [a]					
Yes	4	11	0.63	.80	.03
No	17	55			
Criminal Damage					
Yes	14	29	3.29	.07	.20
No	7	37			
Burglary					
Yes	9	13	4.52	.03	.23
No	12	53			
Assault					
Yes	12	27	1.69	.19	.14
No	9	39			
FTC/FTA [a]					
Yes	11	7	16.94	.00	.44
No	10	59			

Note. a = Fisher's Exact Test computed due to less than expected cell counts.

to differences in the time required to develop a criminal history rather than any real differences in backgrounds of criminals committing different types of arsons.

Sixteen of the arson cases had the same number of crime scene behaviors that were person and object-oriented. Forty-five arsons (51.7%) were predominantly directed towards a person and the remaining arsons (48.3%) were directed towards an object. As can be seen in Table 3, there were statistically significant associations between arson type and the following background characteristics: previous convictions, age (juvenile or not), and history of previous warnings. There were no statistically significant associations between arson type and the remaining six background characteristics. The average effect size was $V = .24$ ($SD = .14$) and the associated 95% *CI* was .13 to .35. Once again, a closer inspection of the statistically significant associations show that those committing object and mixed type arsons are equally likely to have any type of previous conviction (46% versus 31%, respectively), be a juvenile (85% versus 75%), and have had previous warnings (50% versus 44%) in their backgrounds.[4]

Table 3 Relationships, and associated effect sizes, between criminal antecedents and arson type — person/object/mixed

Background Variables	Arson Type			χ^2	*p*	*V*
	Person	Object	Mixed			
Previous Convictions						
Yes	31	12	5	7.98	.01	.30
No	14	14	11			
Juvenile						
Yes	11	22	12	28.14	.00	.57
No	34	4	4			
Psychiatric Treatment [a]						
Yes	14	5	3	1.67	.43	.14
No	31	21	13			
Previous Warning						
Yes	35	13	7	8.66	.01	.32
No	10	13	9			
Theft [a]						
Yes	7	7	1	3.15	.20	.19
No	38	19	15			
Criminal Damage						
Yes	26	10	7	2.71	.25	.18
No	19	16	9			
Burglary [a]						
Yes	9	9	4	1.86	.39	.15
No	36	17	12			
Assault						
Yes	24	10	5	2.93	.23	.18
No	21	16	11			
FTC/FTA [a]						
Yes	11	5	2	1.07	.58	.11
No	34	21	14			

Note. a = Fisher's Exact Test computed due to less than expected cell counts.

When interpreting the above results, it must not be forgotten that they are a direct consequence of using a very liberal classification criterion. In our opinion, the main message from this study is that classifying arsons in Newfoundland using a typology developed using data from UK arsons is rather difficult. It seems that a profiler wishing to use Canter and Fritzon's (1998) typology to assist an arson investigation in Canada would be ill-fated in such an endeavor.

If a profiler were to use our liberal classification criterion, their attempts would still, in all likelihood, fail. In fact, our findings tend to support previous conclusions that there is low to moderate support for the notion that different types of criminals (i.e., criminal committing crimes in different ways) have different types of backgrounds. We found that the homology assumption was violated in roughly 56% of all comparisons of background characteristics between the different types of arsons. Of course, it must also not be forgotten that inter-rater reliability analysis was not possible for the current data set, thus calling into question the reliability of the data used in this study and hence, the credibility of these findings.

It should be noted that no attempt was made to verify that the themes proposed by Canter and Fritzon (1998) actually existed in the data collected from the RNC. Thus, one possible explanation for why the homology assumption received little support in this study is that crime scene similarity was based on themes that do not actually exist. In future research, it would be important to replicate the MDS results found by Canter and Fritzon using the RNC data. Nevertheless, there is still clear value in testing the homology assumption in the way that we have here because police forces routinely apply thematic models of crimes that were developed somewhere else to crimes occurring in their jurisdiction for the purpose of constructing criminal profiles. For this practice to be valid, stronger results than those obtained in the current study are required.

Although tentative, it seems to us that an investigator wishing to have an empirically-based investigation would be best served by using base rates for demographic/background characteristics (e.g., average age, most common type of previous conviction) to guide a search for the perpetrator and ignoring attempts to identify crime type-specific antecedents that emerge from classifying criminals into types.

[4] Similar results were obtained when mixed arson types were removed from the analysis.

Study 2: Robbery

Method

Sample Data were provided by the RNC and were previously coded by an RNC officer. According to the RNC, all robberies that had occurred within the jurisdiction between 1978 and 2001 were reviewed to determine whether a commercial robbery, as opposed to a home invasion or street robbery, had occurred. This review resulted in 132 solved commercial robberies. Because some of the robberies were carried out by groups of individuals and some criminals were responsible for more than one robbery, each robber-robbery pair was treated as an independent case, resulting in a sample size of 177 cases.

Cases were content analyzed using a coding scheme that was developed by reading the initial reports and any follow-up investigative reports (e.g., victim statements) contained in the files. In particular, the coder attempted to identify background characteristics, target characteristics, behaviors at the crime scene, and/or victim experiences at the crime scene that could be used to distinguish between different robberies. Reliability of the coding was assessed by having an independent researcher code a random sample of 18 (~10%) of the police files according to the coding dictionary. A Kappa of .76 indicated high agreement between the coders (Cohen 1988).

Procedure With the exception of the typology used, the procedure employed in Study 1 was used here. Alison et al.'s (2000) robbery typology was used to classify the robberies in the database according to one of three types: Cowboys, Bandits, and Robin's Men.[5] Only some of Alison et al.'s variables were available in the database provided (and coded) by the RNC. Specifically, only five of 10 crime scene variables that comprised Alison et al.'s Cowboys, nine of the 11 variables for Bandits, and nine of the 13 variables for Robin's Men (see Appendix) were available in our database. As in Study 1, the total number of crime scene behaviors exhibited in each robber's crime was first derived by determining the presence of each behavior in the database. For each crime, the percentage of behaviors for each of the three types of robberies was then calculated by dividing the total number of behaviors that were present for a particular type of robbery by the total number of items comprising that type. Canter et al.'s (2003) criterion was then used to assign each robbery to a dominant type. Differences in background characteristics between criminals committing the different types of robberies were then examined.

The following fourteen characteristics were used to test for differences between those committing different types of robberies: (1) previous arrest, (2) property arrest history, (3) previous convictions, (4) presence of a tattoo, (5) prolific criminal, (6) previously incarcerated, (7) previous violent arrest history, (8) other criminal arrests, (9) previous arrest for burglary, (10) previous weapons arrest, (11) previous arrest for robbery, (12) previous deception arrest, (13) age, and (14) the number of days since their last arrest.

Table 4 Relationships, and associated effect sizes, between criminal antecedents and robbery type — cowboys versus bandits

Background Variables	Robbery Type		χ^2	p	V
	Cowboys	Bandits			
Tattoos [a, b]					
Yes	87	30	.256	.696	.05
No	6	3			
Previous Arrests					
Yes	121	37	.440	.735	.05
No	11	2			
Prolific Offender					
Yes	86	29	1.159	.282	.08
No	46	10			
Previous Convictions					
Yes	109	34	.466	.495	.05
No	23	5			
Previous Incarceration					
Yes	79	33	8.172	.004	.22
No	53	6			
Property Arrest [a]					
Yes	116	36	.598	.570	.06
No	16	3			
Violent Arrest					
Yes	74	31	6.971	.008	.20
No	58	8			
Deception Arrest					
Yes	31	9	.003	.958	.00
No	101	30			
Weapon Arrest					
Yes	28	19	11.428	.001	.26
No	104	20			
Robbery Arrest					
Yes	26	16	7.391	.007	.21
No	106	23			
Burglary Arrest					
Yes	67	25	2.157	.142	.11
No	65	14			
Other Criminal					
Yes	74	27	2.160	.142	.11
No	58	12			

Note. a = Fisher's Exact Test computed due to less than expected cell counts; b = sample size of 126.

[5] These themes refer to the extent to which the robbery was chaotic, spontaneous and involved opportunistic violence (Cowboys), haphazard (Bandits), or non-impulsive, well-planned, and tactical (Robin's Men).

Results and Discussion

Based on Canter et al.'s (2003) classification criterion, 75% of the robberies were classified as Cowboys, 22% were Bandit's, 2% were Robin's Men, and 1% were mixed. Due to the small number of robberies that were classified as Robin's Men and mixed, all subsequent comparisons of background characteristics were made between Cowboys and Bandits.

The relationships, and associated effect sizes, between the various criminal antecedents and robbery type are shown in Table 4. As can be seen, there are statistically significant associations between robbery type and the following four criminal antecedents: previous incarcerations, violence, weapons, and robbery. Bandits were more likely than Cowboys to have previous incarcerations, arrests for violent behavior, previous weapons arrests, and to have previous robbery arrests. Overall, the average effect size was V=.11 (SD=.08), and the 95% CI was .07 to .16. These findings suggest that there is little association between criminal antecedents and robbery type. Moreover, no significant difference in age was found between Cowboys (M=24.21, SD=8.4, n=132) and Bandits (M=23.84, SD=6.3, n=38), $t(168) = .252$, p=.80, d=.05. Similarly, no differences in the number of days since the last arrest were found between Cowboys (M=458.63, SD=467.3, n=100) and Bandits (M=507.89, SD=646.9, n=28), $t(126) = -.451$, p=.65, d=−.09

Similar to Study 1, these results support previous findings that there is little support for the homology assumption. In this study, we found that the homology assumption was violated in approximately 67% of the comparisons made between background characteristics and the two robbery types. Our findings show that Bandits were more likely than Cowboys to have previous incarcerations, arrests for violent behavior, previous weapons arrests, and to have previous robbery arrests.

We admit readily that there are at least three limitations that reduce the strength of the conclusions that can be drawn in this study. First, as in Study 1, no attempt was made to verify that the themes proposed by Alison et al. (2000) actually existed in the data collected from the RNC. Again, it is possible that the homology assumption received little support in this study because crime scene similarity was based on themes that do not actually exist. As with the arson sample, it would be important in the future to replicate the MDS results presented by Alison and his colleagues using the RNC data.

Second, in Study 2, Alison et al.'s (2000) content dictionary was not used to code the original police robbery files. Instead, we were restricted to relying upon portions of their content dictionary that were available in our database. Perhaps using Alison et al.'s original coding guide to code the police files (resulting in their entire content dictionary being used) would have resulted in more favorable support for the homology assumption. Having said that, our findings are ecologically valid because any crime scene information sent to profilers is likely to have been collected by a police officer who did not have access to a coding guide.

Third, and related to the second limitation, is the fact that there were few variables upon which to calculate the percentages in each type of robbery. With a reduced number of variables, the ability to accurately classify the robberies may have been compromised. It is certainly possible that different findings would have emerged if the total number of variables used by Alison and colleagues were used in this study.

Conclusion

Profilers, especially those who employ typology-based approaches, assume that it is possible to classify crimes into mutually exclusive types and that criminals who commit similar types of crimes will have similar backgrounds characteristics (and, by extension, criminals committing different types of crimes will have different backgrounds). The current studies failed to find strong empirical support for either of these assumptions. Given this, a warning is in order for anyone wishing to use either of the typologies explored in this research to guide profiling activities in Canada. Even after giving serious consideration to our methodological limitations, our confidence that support will be found for the homology assumption has weakened. Nevertheless, we look forward to future studies that test the generalizability and validity of criminal profiling typologies.

Acknowledgments We thank Sergeant John C. House for providing access to the data required to conduct this research and to Craig Bennell for providing wonderful guidance on the preparation of this manuscript. We also wish to thank an anonymous reviewer for providing insightful comments on how to improve the quality of the article.

Appendix: Coding Dictionaries for Arson and Robbery

Arson: Crime Scene Variables

Prior Arson: The offender had previous arrests or convictions for arson.
Institution: The offender was living in an institution at the time of the offense (e.g., hospital, group home, care facility).
Drugs: The offender was under the influence of drugs when the arson occurred.

Non-Specific Trigger: There was no specific trigger or reason for the arson that was evident to the investigators.
Business: The offender targeted a business?
Daytime: The arson occurred during daylight hours?
Remained: The offender returned to the scene of the arson, or remained at the scene.
Multiple Items Fired: Multiple items were set on fire.
Multiple Seats of the Fire: Multiple fires were set.
Spree: The offender set more than one fire in a 24-hour period.
Multiple Offenders: More than one offender participated in the arson.
Miscellaneous: The property that was set on fire was derelict or uninhabited.
Illegal: The offender used the fire to cover up another crime.
Theft: The offender stole items from the scene of the arson.
School: A school was the target of the arson.
Outside: The arson took place outside, not inside a building or structure.
Public View: The arson took place where it was observable by the public.
No Alert: The offender alerted someone of the fire.
Threats of Arson: The offender had threatened to commit arson.
Car: A vehicle was the target of the fire.
Accelerant Used: An accelerant (e.g., gasoline) was used to fuel the fire.
Material Brought: Material was used for the arson was brought to the scene (e.g., matches).
Alcohol: The offender was under the influence of alcohol when the arson occurred.
Planned: There was evidence that the offender had planned the arson.
Witness: There was a witness(s) present for the arson.
Argument: The arson followed an argument.
Trigger-Specific: There was a specific trigger evident for the arson (e.g., an argument).
Partner: The victim of the arson was the offender's partner.
Suicide Note: The offender left a suicide note.
Self: The offender set fire to him/herself.
Lives Deliberately Endangered by Location: The arson endangered lives by the location of the arson.
Lives Deliberately Endangered: The offender deliberately set the fire to harm others.
Residence: The targeted property was used for residential purposes.
Own Home: The offender set fire to his/her own home.
Targeted Property: There was evidence that a specific property was targeted.
Victim Known: The victim of the arson was known to the offender.
Public: The fire occurred at a building that the public had access to.
Prior Threats: Previous threats were made by the offender towards the victim.
Forced Entry: The offender made an effort to get inside the building (e.g., break window).

Arson: Background Variables

Previous Convictions: The offender had previous convictions of any kind.
Juvenile: The offender was in school and under the age of 16; even if they did not attend.
History of Theft: The offender had a history of theft offenses.
History of Burglary: The offender had a history of burglary offenses.
Caution: The offender had been previously come to attention to police, but not formally charged.
Assault: The offender had an arrest history for assault.
Criminal Damage: The offender had a history of vandalism or damaging property.
Fail to Appear/Fail to Comply: The offender had an arrest history for not appearing in court or abiding by probation/compliance orders.
Psychiatric Treatment: The offender was under psychiatric care when the offense occurred.

Robbery: Crime Scene Variables

Premises: Type of premises targeted (e.g., convenience store, bank).
Video: There was a closed-circuit TV security system on the premises.
Cash: Cash was taken.
Cigarettes: Cigarettes was taken.
Alcohol: Alcohol was taken.
Other: Other items were taken.
Style: The confrontation style of the robber during the robbery (e.g., surprise attack or delayed).
Behavioral Demeanor: The behavioral demeanor of the robber during the robbery (e.g., restrained or aggressive).
Type of Weapon: Type of weapon used to commit the robbery (e.g., gun, knife, tool).
Implied: The weapon used in the robbery was not seen, but implied.
Violence: The robber used violence towards the victim during the robbery.
Pushing: The robber pushed the victim during the robbery.
Punching: The robber punched the victim during the robbery.
Stabbing: The robber stabbed the victim during the robbery.
Shooting: The robber shot the victim during the robbery.

Aggressive: What style of aggression the robber(s) were during the robbery (e.g., controlling or used gratuitous violence) towards employees/customers during the robbery.
Threats: The robber threatened violence towards the victim during the robbery.
Nature of Threats: The threats made by the robber were spontaneous or in response to resistance by the victim.
Announced: The robbery was announced by the robber.
Demand: The robber demanded cash or an item.
Instruct: The robber directed the victim to comply with requests.
Reassure: The robber reassured the victim.
Apologize: The robber apologized to the victim.
Justifies: The robber justified the robbery to the victim.
Foul: The robber used foul language.
Delay: The robber told the victim to delay reporting the robbery.
Floor: The victim was required to lie on the floor during the robbery.
Bind: The robber bound the victim.
Blindfold: The robber blindfolded the victim.
Disguise: The robber used a subtle or overt disguise.
Lookout: The robber had an accomplice who kept a lookout while the robbery took place.
Tamper: The robber tampered with any security measures on the premises.
Disable: The robber disabled the telephone.

Robbery: Background Variables

Tattoo: The offender has tattoos.
Previous Arrests: The offender had a previous arrest.
Prolific: The offender has been arrested for more than three crimes.
Convictions: The offender had a previous conviction.
Incarcerated: The offender was previously incarcerated.
Property: The offender had an arrest history of property-related offences.
Violent: The offender had an arrest history for violent offences.
Deception: The offender had an arrest history for fraud-related offences.
Weapons: The offender had an arrest history for a weapon-related offence.
Robbery: The offender had an arrest history for robbery.
Burglary: The offender had a history for burglary.
Others: The offender had an arrest history of other offences.
Age: Age of the offender.
Last Arrest: The number of days since the offender was last arrested.

References

Alison LJ, Rockett W, Deprez S, Watts S (2000) Bandits, cowboys and robin's men: the facets of armed robbery. In: Canter DV, Alison LJ (eds) Profiling property crimes. Ashgate, Aldershot, UK, pp 75–106

Canter DV, Fritzon K (1998) Differentiating arsonists: a model of firesetting actions and characteristics. Legal Criminol Psychol 3:73–96

Canter DV, Heritage R (1990) A multivariate model of sexual offence behaviour: developments in 'offender profiling'. I. J Forensic Psychiatr 1:185–212

Canter DV, Wentink N (2004) An empirical test of Holmes and Holmes's serial murder typology. Crim Justice Behav 31:489–515

Canter DV, Bennell C, Alison LJ, Reddy S (2003) Differentiating sex offences: a behaviorally based thematic classification of stranger rapes. Behav Sci Law 21:157–174

Canter DV, Alison LJ, Alison E, Wentink N (2004) The organized/disorganized typology of serial murder: myth or model? Psychol Public Policy Law 10:293–320

Cohen J (1988) Statistical power analysis for the behavioral sciences, 2nd edn. Lawrence Earlbaum Associates, Hillsdale, NJ

Douglas JE, Burgess AW, Burgess AG, Ressler RK (1992) Crime classification manual: a standard system for investigating and classifying violent crime. Simon and Schuster, New York

Häkkänen H, Puolakka P, Santilla P (2004) Crime scene actions and offender characteristics in arsons. Legal Criminol Psychol 9:197–214

House JC (1997) Towards a practical application of offender profiling: the RNC's criminal suspect prioritization system. In: Jackson JL, Bekerian DA (eds) Offender profiling: theory, research and practice. Wiley, Chichester, England; pp 177–190

Kocsis RN (2006) Criminal profiling: principles and practice. Humana Press, Totowa, NJ

Melnyk T, Bloomfield S, Bennell C (2007) Classifying serial sexual homicide: validating Keppel and Walter's (1999) model. Poster presented at the annual meeting of the Society for Police and Criminal Psychology, Springfield, Massachusetts, USA, September

Mokros A, Alison LJ (2002) Is offender profiling possible? Testing the predicted homology of crime scene actions and background characteristics in a sample of rapists. Legal Criminol Psychol 7:25–37

Ressler RK, Burgess AW, Douglas JE, Hartman CR, D'Agostino RB (1986) Sexual killers and their victims: identifying patterns through crime scene analysis. J Interpers Violence 1:288–308

Woodhams J, Toye K (2007) An empirical test of the assumptions of case linkage and offender profiling with serial commercial robberies. Psychol Public Policy Law 13:59–85