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Preface

The Last Editors:
Passing the Torch to the Next Editors of WSC's New Journal

Volume 15, no. 1 (April, 2014) is the last issue of the *Western Criminology Review,* which in future will be published as the *Journal of Criminology, Criminal Justice, Law and Society.* The journal will continue to be published online by the Western Society of Criminology and will start with Volume 15 no. 2 (August, 2014).

The first issue of the *Western Criminology Review* was published in June 1998. The then president of WSC, Barbara Bloom, stated in her Inaugural letter: "This landmark issue of the WCR includes an impressive collection of articles that reflect the 1998 WSC conference theme of restorative justice as well as an overview of the conference proceedings. Patrick Jackson, WCR Editor, has devoted the past year to the development and production of the journal." Indeed, Patrick introduced the first issue of the WCR, which included articles by some of the major researchers in the field of restorative justice, including Mark Umbreit, Allison Morris, John Gehm, Gordon Bazemore and Mara Schiff, with the following statement: "The restorative justice movement deserves our undivided attention as a potential alternative to present responses to crime. Today there is much discussion about restorative justice, numerous calls for its implementation, and some critical response. It is clear that the public, our political leadership, numerous organizations involved in crime control, mainstream criminology, and many others need to learn what restorative justice means and how victims, society, and offenders can benefit from it." While much has changed in the 16 years that WCR has been in production, Patrick's words about the role and value of restorative justice are still true today.

Patrick has been our hidden support person for unfathomable technical issues that we occasionally encounter, that he seems uniquely able to solve, and Sonoma State University, where he works, has hosted the WCR journal on its website from the outset. We thank him and the Sonoma State University Librarian, Paula

Hammett, for their support over the years. As Patrick framed that inaugural issue he stated: "This is a proud moment for the WSC. After a quarter century of work toward creating a more equitable and just society, we have finally seized the moment to charter a new course by publishing a free, peer reviewed electronic journal. It is sure to enliven and broaden our perspectives in profound ways over the years to come." This it has done, but it has also done something more important, which is to embrace new technology, and provide criminological research and analysis at no charge to the contributing authors or the readers of their articles.

We are also indebted to the other editors and universities who have kept the WCR torch alive over the years. Universities that have provided editors and funding support for publishing the journal include California State University San Bernardino, University of Alaska Anchorage and Sam Houston State University, as well as our own San Diego State University.

The journal receives articles from all regions of the United States, and 20% of submissions are international. Its acceptance rate varies between 15-21% depending on the year. The journal receives an average of 3,670 "hits" a day and over 110,500 "hits" a month.

In recent years the WSC has seriously explored the possibility of having a commercial publisher take over the journal and discussions occurred. But in the end, the recommendation of the publications committee, which included Hank Fradella, Kim Richmond, Paul Kaplan and Stuart Henry, was that at least in the short-term, the journal would continue to be published by the WSC and to continue to be made available for free online (which was one of the issues that commercial publishing would have compromised).

So while this is our last issue as WCR editors (for the past three years), we are passing the torch to the new editors of the retitled journal: Hank Fradella, Aili Malm

and Christine Scott-Hayward from California State University, Long Beach. We wish them every success in taking the journal to its newest iteration.

Before we turn out our lights, we'd like to thank the School of Public Affairs at San Diego State for funding the publication of the journal by supporting its managing editor (also Nicole L. Bracy) and its editorial assistants (Adrian Ehrlich, and Nicole Sherman). Thanks are also due to our co-editor for the first year, Karen S. Glover from California State University San Marcos.

The current and past issues of *WCR* are available at http://wcr.sonoma.edu/. Manuscripts for the new journal: *Criminology, Criminal Justice, Law and Society* should be submitted to https://scholasticahq.com/criminology-criminal-justice-law-society.

This last issue of the *Western Criminology Review* opens with an article by Rick Ruddell, Dheeshana S. Jayasundara, Roni Mayzer, and Thomasine Heitkamp on crime in resource-based boom counties. Despite common perceptions that crime in these communities increases following a boom, the authors found little evidence of this when examining crime rates in oil-producing counties in Montana and North Dakota pre- and post-boom. They also discuss the challenges of doing this kind of research when longitudinal crime data don't exist in many of these small, rural, boom counties.

Kendra N. Bowen, Jennifer J. Roberts, Eric J. Kocian, and Aaron Bartula's article on Social Information Processing Theory (SIP), Emotions and Violence examines how SIP, emotions, and other individual and situational variables influence the escalation of violence in a sample of newly incarcerated offenders. Their results reveal that situations in which respondents report poor or ineffective SIP were more likely to end in violence, lending support for a situational-level examination of violence among adults and suggesting further research is warranted in this area.

Risk factors for violent, chronic adult offending are considered by Johanna M. Thomas, Shaun A. Thomas, Kyle A. Burgason, and Lillian C. Wichinsky in their article which tests some of the assumptions of Terrie Moffitt's Developmental Theory of Crime. Examining the adult criminal records of a cohort of more than 500 youthful offenders twelve years after their release from juvenile correctional facilities, the authors found that age at first contact with the criminal justice system and intellectual functioning (as measured by the Wechsler Intelligence Scale for Children) were strong and robust predictors of chronic and violent offending over the life-course.

Finally, Jennifer Armstrong, Joseph Clare, and Darryl Plecas employed an experimental design to examine the physiological responses of the Royal Canadian Mounted Police during scenario-based use-of-force simulations used in their skills refresher training. They found that heart rate patterns of officers during the training exercises were consistent with those generated during real world policing – reinforcing the utility of the simulations for helping officers prepare for actual situations when use of force is required.

In closing, we have enjoyed working collaboratively together in editing this journal for the last three years. We have managed to publish issues on time in line with our publication schedule, addressing substantive issues in the field, and innovated with some very interesting Special Issues. We respect and appreciate each other's incredible work ethic, and composure under stress, perhaps captured by our shared spirit of problem-solving rather than crisis-making. We are unanimous in the view that after the challenges and successes of the past three years we would welcome the opportunity to work together on other projects. That said we wish Hank, Aili, and Christine great success in their exciting new collaboration to move the WSC onto greater heights through the launch of its new journal.

Stuart Henry, Christine Curtis, and Nicole L. Bracy

Drilling Down: An Examination of the Boom-Crime Relationship in Resource-Based Boom Counties

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Abstract*: The expansion in natural resource development in rural communities has led to a number of social problems in these places. The media, community stakeholders, as well as law enforcement and human service personnel have reported that the rapid growth in these communities leads to increased crime and other social ills. In order to better understand the boom-crime relationship, index crimes in oil and natural gas producing counties in Montana and North Dakota were examined. Comparison of 2012 crime rates in a matched sample of counties revealed that crime rates were higher in oil-impacted counties. A pre-post analysis found that violent crime in boom counties increased 18.5% between 2006 and 2012 while decreasing 25.6% in a matched sample of counties that had no oil or gas production. Inconsistent with the media portrayal of these communities as a new "wild west" we did not find a significant association between oil or natural gas production and property or violent crime in a series of OLS regression models. Missing crime data was a significant limitation in this study and precludes us from making any broad generalizations about the boom-crime relationship. Implications for further research are described.*

Keywords: boomtowns, resource-based booms, rural crime, boomtown effects

INTRODUCTION

The rapid population and economic growth associated with resource-based exploration and extraction has contributed to a number of social ills which have been called boomtown effects (Government of New Brunswick 2012). Unlike normal population growth, resource-based booms have resulted in the influx of young male newcomers who earn large salaries and have little stake in these communities (Ruddell and Thomas 2012). In some cases these workers drive-in and drive-out (DIDO) or fly-in and fly-out (FIFO) to their worksites and live in temporary housing or man camps that may house a thousand or more workers (White 2012). As a result of these demographic changes, there has been an imbalanced population sex ratio, a disruption in normal patterns of interaction (e.g., less informal social control or density of acquaintance – see Freudenburg 1984; 1986) and damage to the social fabric that may be criminogenic in small communities (Lee and Thomas 2010).

Prior research has shown that the rapid population growth linked with resource-based booms contributes to increased levels of antisocial behavior and crime in rural

Australia (Carrington and Pereira 2011; Scott, Carrington, and McIntosh 2012), Canada (O'Connor 2011; Ruddell 2011) and the U.S. (Archbold 2013; Montana All Threat Intelligence Center & North Dakota State and Local Intelligence Center [hereafter: MND Report] 2012; Perry 2007; Ruddell and Thomas 2012).[1] In addition, there are a growing number of studies that have shown that the quality of life decreases in these places due to non-criminal acts and problems with traffic. Boomtown residents report being fearful of dangerous or drunk drivers (Ruddell, Ortiz and Thomas 2013) and scholars have found that resource development can result in traffic congestion (Archbold 2013; Petkoba-Timmer, Lockie, Rolfe, and Ivanova 2009) and a greater number of accidents (MND Report 2012).

Law enforcement agencies in resource-based boom communities often find themselves stretched thin as demand for services increase (Archbold 2013; Ruddell 2011). The authors of the MND Report (2012: 2) noted that, "Increases in calls for service, arrests, index crimes, fatal and non-fatal motor vehicle crashes, and sexual offenders, as well as significant turnover and recruitment issues have exacerbated the challenges experienced by law enforcement agencies." There is less agreement on the magnitude of these changes and a number of investigators have reported that changes in levels of crime in boom counties were modest or not significantly different than in surrounding counties (Brown 2010; Forsyth, Luthra, and Bankston 2007; Kowalski and Zajac 2012; Luthra 2006; Luthra, Bankston, Kalich, and Forsyth 2007).

Although investigators have not reached a consensus on the degree to which resource-based booms influence antisocial behavior and crime, there is more agreement that this challenge will persist as the value of commodities increases and development intensifies around the globe. Technologies that enable horizontal oil drilling and hydraulic fracturing ('fracking') are also making it profitable to extract oil and natural gas from places that might not have been considered decades ago or oilfields thought to be exhausted. As a result, there will be a corresponding growth in exploration and extraction activities and they will be carried out in out-of-the-way places that may be vulnerable to boomtown effects.

Few rural or remote communities that have resource wealth possess the infrastructure for rapid industrialization and population growth. Morrison, Wilson and Bell (2012) observed that many local governments in small towns or counties do not have the capacity or expertise to respond to rapid social changes. Consequently, a lack of knowledge about boomtown effects and an inability to anticipate these impacts could result in lost opportunities to ameliorate these conditions. The Government of New Brunswick (2012) makes a compelling argument that increasing our knowledge of boomtown effects enables community leaders to anticipate these changes and implement strategies to mitigate the negative effects of this growth.

When it comes to boomtown effects, it is sometimes difficult to separate the true picture of what is actually occurring in respect to crime from media sensationalism. Over three decades ago, Wilkinson, Thompson, Reynolds, and Ostresh (1982: 275) observed that many claims about boomtown effects were based on "undocumented assertions, questionable interpretations of evidence, and superficial analyses." Empirical work has not established a clear boom-crime relationship in jurisdictions undergoing natural resource development. In order to respond to that gap in our knowledge, the current study focuses upon changes in levels of police-reported index crimes in oil impacted counties in the Bakken region, a shale rock formation that stretches across Western North Dakota and Northeastern Montana, and straddles the Canadian border. Media accounts about the Bakken typically report high levels of antisocial behavior, disorder and serious crimes (see for instance, Associated Press 2012; Daily Mail 2013; Eligon 2013; Ellis 2011). The question that guides this research is whether these perceptions of lawlessness are accurate. In order to carry out this study we first present the results from prior research on the boom-crime relationship, describe the data and methods used in our analyses, and discuss our findings following the analyses.

CRIME AND RESOURCE-BASED BOOMS

Investigators examining crime in resource-based boom communities have observed that social disorganization may increase during the early stages of a boom in rural areas (Dooley and Ruzicka 2012; Goldenburg 2008; Hanson and Limerick 2009; Hunter, Krannich and Smith 2002; Pooley, Cohen and Pike 2004; Shandro, Veiga, Shoveller, Scoble and Koehoorn 2011). Research suggests that this is largely the result of rapid population and economic growth associated with that industrialization. Few small communities have the infrastructure or leadership capacity to accommodate waves of rapid population growth, leading to a stage of crisis where local resources are strained by a number of social ills that the Government of New Brunswick (2012:5) identified as: crime, substance abuse, health problems and the stress placed on human service organizations and public services due to increased demand for services and an insufficient capacity to meet those demands. Some scholars contest that all boomtowns go through a phase of community upheaval and especially that crime always follows a boom. A number of researchers have found an inconsistent association between crime and resource development, or only minor increases in crime (Brown 2010; Forsyth et al. 2007; Kowalski and Zajac 2012; Luthra 2006; Luthra et al. 2007). The relationships between rapid population growth and crime due to natural resource development, however, could have different effects depending on community structure and

resilience to crime, the composition of the population (e.g., transient or long-term residents), the duration of the boom, and the nature of exploration or extraction activities within counties.

In terms of the Williston Basin (in Montana and North Dakota), the MND report (2012: 6) noted that the number of Part I Violent Index Crimes in oil producing counties increased by 121% from 2005 to 2011, although a comparison group of counties showed an increase of 98%. When the total Part I offenses were considered, the number of offenses in oil producing counties increased by 32% while the comparison group grew by five percent. Crime in some boom counties may ebb and flow as development evolves and community leaders are better able to respond to problems (Archibald 2006; Carrington, McIntosh and Scott 2010; Ruddell et al. 2013). Moreover the number of required workers decrease and populations stabilize (e.g., transient or temporary workers are replaced by long-term residents). Freudenburg and Wilson (2002) also remind us that extractive industries can run in cycles of boom and bust in response to the value of commodities, which also has an impact on county populations.

One of the challenges for justice systems officials today is that crime rates in some contemporary boomtowns have not stabilized. While the boom in the Bakken started between 2006 and 2008, crime rates are still increasing and Nowatzki (2014: 1) reported that "the number of criminal defendants charged in federal court in western North Dakota jumped by 31 percent in 2013 and has nearly doubled since 2011." In Fort McMurray, a Canadian boom town, crime rates were much higher than the provincial or national averages for decades (Ruddell 2011) and, although they have decreased since 2008, the crime severity index remains almost 50% higher than the national average (Ruddell et al. 2013).

While scholars question whether crime rates are proportionate to population growth, *perceptions* of crime shape feelings of safety and the quality of life (Ruddell et al. 2013). Researchers have examined the impacts of oil booms drawing upon the perceptions of community leaders (Anderson and Theodori 2009), service workers (Bohnenkamp, Finken, McCallum, Putz, and Goreham 2011; Heitkamp and Jayasundara 2012a; 2012b; Shandro et al. 2011) and community residents (Brasier, Filteau, McLaughlin, Jacquet, Stedman, Kelsey and Goetz 2011; Ruddell et al. 2013; Wynveen 2011). All of these investigators have reported a decreased quality of life and some have identified an increased fear of crime after these booms occur.

Archbold's (2013) interviews of police officers from the Bakken region mirror the perceptions of boomtown residents. One-third (33%) reported that community members were fearful of crime and those perceptions influenced their behavior (e.g., residents took more precautions to guard against crime). Over one-quarter

(27%) of Archbold's respondents reported that community members expressed to them that their quality of life decreased after the boom. In terms of crime, officers overwhelmingly reported that alcohol-related offenses had increased, illicit drugs were more prevalent, property crimes and domestic violence had increased, and there were a growing number of traffic incidents, including accidents, driving under the influence (DUI), and hit and run offenses in their jurisdictions.

Given those findings, many indicators of crime, disorder or community dysfunction might not appear in the official crime statistics reported by the Federal Bureau of Investigation (FBI). The MND Report (2012: Table 25), for instance, reported that police calls for service increased by 82% between 2005 and 2011 in 22 county and police agencies in Montana and North Dakota oil producing counties (for which there were data for all seven years) and that data is presented in Figure 1. It must be acknowledged that these calls for service and arrest data are summed and mask the fact that some jurisdictions were stable while other counties experienced substantial growth. Not all studies of resource-based counties have produced similar results. Zajac and Kowalski's (2012) study of police calls for service in Pennsylvania oil producing counties showed a 33.8% increase between 2006 and 2010. While that difference might not have been statistically significant, responding to that growth in citizen demands for assistance presents meaningful challenges to law enforcement and other human service agencies.

It is plausible that boomtown offenses are dominated by offenses other than those reported in the Part I Uniform Crime Report (UCR) index crimes (homicide, aggravated assaults, rape, robbery, burglary, larceny and arson). Kowalski and Zajac (2012: 8-9) reported that the top five arrest classifications in Pennsylvania oil counties were non-aggravated assaults, DUI, disorderly conduct, all "other" offenses (except traffic) and larceny-theft. These investigators reported that the crime category with the greatest increase between 2006 and 2010 was DUI. Therefore, it is likely that increases in crimes in boom counties are driven primarily by the 21 Part II UCR offenses that are inconsistently reported to the FBI.

The MND Report (2012) also revealed that traffic accidents increased substantially in the 33 oil producing counties they examined, and from 2006 to 2011 the number of crashes increased from 5,696 to 8,972 (57.5%). Traffic fatalities in the oil producing counties increased 81% in North Dakota and 47% in Montana between 2006 and 2011 (MND Report, 2012 Tables: 48, 49). These statistical findings about traffic collisions validate the perceptions of civic leaders (Anderson and Theodori 2009), community residents (Ruddell et al. 2013) and police officers (Archbold 2013) about the dangers of increased traffic in resource-based boom communities.

Figure 1. Calls for Service, 2005 to 2011
22 Montana and North Dakota Agencies
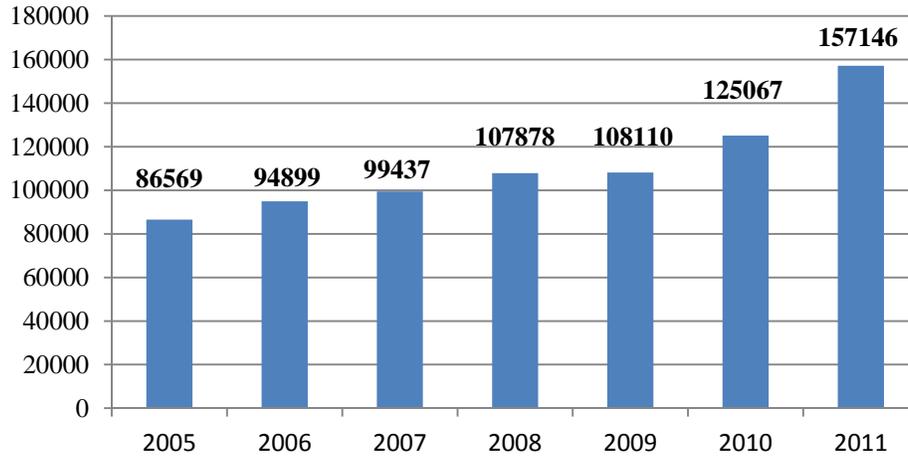
Some populations may be at elevated risk of victimization in boom communities. For example, Hunter and colleagues (2002) found that boom migrants and women expressed greater fear of crime than long-time residents or post-boom migrants; others have found that perceptions of social problems may change over a boom-bust cycle (Shandro et al. 2011). Female respondents in O'Connor's (2011) study of young people in a Canadian boomtown also expressed a greater fear of victimization than their male counterparts. Studies that examined the perceptions of human service agents (Heitkamp and Jayasundara 2012a; 2012b) and the police (Archbold, 2013) in the Bakken region found that incidents of domestic violence were increasing.

Altogether, the extant research reveals that the police in boom communities are expected to respond to a growing number of calls for services and that crime in some jurisdictions has greatly increased. Furthermore, while the media, and to some extent, the police are reporting that there are an increased number of serious and violent offenses, many of the crimes that are occurring may be common assaults, larceny, public order and traffic offenses. In order to shed light on whether UCR Part I crimes are associated with booms, we examine offenses reported in oil producing counties in the Bakken between 2006 and 2012.

DATA AND METHODS

This study examined crime, demographic, justice-system and economic characteristics for all 109 Montana and North Dakota counties. Data to conduct the analyses were obtained from the U.S. Census Bureau (2014), Bureau of Economic Analysis (2014), Federal Bureau of Investigation (2013) and the Montana and North Dakota state governments. In terms of methods, three analytical strategies were employed. First, crime rates in 26 oil producing and a matched sample of 26 non-producing counties were compared for 2012 using t-tests. Second, pre- and post-boom crime statistics were examined for 13 oil producing and a similar sized sample of non-producing counties between 2006 and 2012. Third, ordinary least square (OLS) regression was estimated to evaluate the contribution of oilfield activity on rates of police-reported crime. Two dependent variables, property and violent crime rates for 2012, were examined in those analyses. The names of the counties included in the different analyses are reported in Appendix A.

With respect to the selection of counties for the matching sample, all counties that had at least 20,000 barrels of oil production annually were included in the development of the database and this excluded several cases with very small annual oil production. Those counties were removed from the analyses as it was hypothesized that the activities associated with a limited number of oil wells would not make a meaningful contribution to population growth, crime or disorder. Five counties that had oil production in excess of 20,000 barrels per year were also excluded as crime data were not available. In terms of the 52 oil and non-producing counties, the two comparison groups had a total population of 505,868 residents, or 27.7% of the total population of the two states. The cases were matched on state and population size for 2012 using census data. Most of the counties had small populations, with an average size of less than 10,000 residents. Further examination of the county characteristics revealed that there were no statistically significant differences in the population size but that the oil producing counties had a higher rate of growth between 2008 and 2012. Furthermore, there were no significant differences in the proportion of males in the

county population or per capita personal income when the 2012 data from these counties were compared.

Similar to the analytical strategy employed by Kowalski and Zajac (2012), the second series of analyses examined levels of police-reported crime in the pre- and post-boom eras. This task was challenged by a lack of crime data for the entire seven years of the series, and we were left with only 13 oil producing counties matched to 13 non-producing counties from the original sample (consistent with the first set of analyses these counties were matched on state and population). In the analyses county-level crime data from 2006 to 2008 were contrasted against 2010 to 2012.

Last, a series of OLS models were estimated using total UCR property and violent crime rates in 2012 as dependent variables. While census data for all 109 counties were collected, the FBI (2013) only reported crime data for 102 counties for 2012. Of the seven counties for which crime data were not reported, five had high levels of oil production (over 20,000 barrels per year). Again, this is a limitation in this research as we do not have a true picture of the extent of police-reported Part I crimes in all of the oil producing counties.

In terms of the analytical strategy, a baseline regression model was created that included six independent variables and then three indicators of oilfield activity were added in subsequent models to determine whether oilfield activities were associated with index crime. The six independent (control) variables were selected on the basis of prior theoretical work on boomtowns identifying population change and instability (see Freudenburg, 1984; 1986). Two indicators of county population heterogeneity and change were included in the models; the change in the size of the White population between 2010 and 2012 (percentage) and the county population change between 2008 and 2012. Population stability was indicated by county residents who had lived in the same residence one year prior to 2012 and the percentage of owner-occupied homes. Consistent with studies of the structural covariates of violent crime (see McCall, Land, and Parker 2010) an indicator of resource deprivation (median household income) was also included in the baseline model. Last, because levels of crime were higher in Montana, we controlled for that difference by including a dichotomous variable for state.

It was hypothesized that there would be a significant association between oilfield activity and crime after controlling for demographic and county characteristics. Three variables of interest related to oil and natural gas production were examined using data retrieved from the Montana Board of Oil and Gas Production (2014) and the North Dakota Department of Mineral Resources (2014). The first indicator was oil production in barrels while the second indicator was natural gas production for 2012. As some counties had different volumes of natural gas or oil production, principal components analyses was used to

create a single variable and this explained 96.4% of the variance between the two indicators (both gas and oil had equal weights of .982 in the component matrix). These three indicators were added to the baseline model to determine whether there was a significant association between oilfield activity and crime.

RESULTS

Part I Crimes in a Matched Sample of Counties

In the first set of analyses, Part I crime rates were compared between 26 oil producing counties and a matched sample of 26 non-producing counties. An initial examination of the county-level characteristics showed that these two groups of counties were very similar. There were no statistically significant differences between the counties in respect to population, per capita personal income, or proportion of males although the change in the population (percentage) between 2008 and 2012 in the oil producing counties was higher. Consistent with expectations, the results, shown in Table 1, demonstrated that levels of UCR reported property and violent crime in 2012 were higher in the oil and gas producing counties. With respect to violent crime the oil producing counties had a mean rate of 151.7 offenses per 100,000 residents whereas the rate for the matched sample was 124.2 offenses, which was 22.1% higher. Examination of property crimes revealed that property crime rates were 24.6% higher in the oil producing counties. Despite the fact that violent and property rates were higher in the oil producing counties t-tests revealed that those differences were not statistically significant.

Part I Crimes: Pre-Post the Boom

Several investigators have used pre-post research designs to examine crime prior to resource-based booms and after they occurred (Kowalski and Zajac 2012; MND Report 2012). The comprehensiveness of our analyses for the Montana and North Dakota counties, however, was limited by missing crime data. By examining seven years of Part I offenses from 2006 to 2012, almost one-half of the oil producing counties was lost due to missing data. Table 1 shows that the crime data were disaggregated into two temporal eras: 2006 to 2008 and 2010 to 2012. The selection of those dates is somewhat arbitrary as there is no universally agreed upon date for the onset of the boom and in some counties the population growth occurred earlier than in other places. The pre-post analyses revealed that levels of UCR violent index crimes were higher in the non-producing counties in the 2006 to 2008 era, but while they decreased by 25.6% in the post-boom era (2010 to 2012), violent index crimes increased by 18.5% in the oil producing counties. With respect to property crimes, in the non-producing counties, the rate decreased by 22.1% between the two eras, while in the oil-producing counties,

Table 1. **Oil Producing and Matched Sample of Montana and North Dakota Counties, 2012**

	Oil Producing Counties (n = 26)	Matched Sample (n = 26)	*p* value
	Mean (s.d.)	Mean (s.d.)	
UCR Crime Rates (2012)			
• UCR Violent Crime Rate	151.7 (145.8)	124.2 (104.1)	.438
• UCR Property Crime Rate	1,333.8 (878.1)	1,070.2 (771.7)	.256
County Characteristics			
• Population (2012)	9,883 (13,026)	9,572 (13,305)	.932
• Population change (2008-2012)	1.85% (1.62)	.13% (.80)	.000
• Per capita personal income (2012)	$54,387 (21,041)	$44,784 (13,839)	.058
• Male population (2012)	51.49% (1.89)	50.95% (1.03)	.205
Pre and Post Boom Comparison **UCR Crime Rates (2006-2012)**	Oil Producing (n = 13)	Non-Producing (n = 13)	
• Violent Crime Rate Pre-Boom (2006-2008)	313.9	511.5	
• Violent Crime Rate Post-Boom (2010-2012)	372.0	380.4	
• Percent Change: Violent Crime	+18.5%	-25.6%	
• Property Crime Rate Pre-Boom (2006-2008)	2,122.3	2,661.5	
• Property Crime Rate Post-Boom (2010-2012)	2,369.7	2,074.0	
• Percent Change: Property Crime	+11.7%	-22.1%	

there was an 11.7% increase. In order to put the pre-post boom change statistics into perspective, the FBI crime statistics from 2006 to 2012 for non-metropolitan counties of less than 10,000 residents for the entire nation showed an 11.1% decrease in violent crime and a 6.9% drop in property offenses.

Figure 2 shows the changes in UCR Part I offenses between 2006 and 2012 in the 26 Montana and North Dakota counties. The trend shows the biggest increase occurred after 2010. Again, because of the missing cases and incomplete data, these results should be interpreted with some caution, as they are unlikely to present a true picture of the changes. These results are, however, consistent with the perceptions of law enforcement (Archbold 2013; MND Report 2012) and the human service personnel who respond to victimization (Heitkamp and Jayasundara 2012a; 2012b).

Multivariate Analyses

OLS regression was used to examine the relationships between oilfield activity and property and violent crime rates. Prior to these analyses bivariate correlations were conducted and these results are presented in Appendix B. The results revealed that the indicators significantly associated with violent crime were similar to those related to property crime and there was a strong relationship between the two dependent variables. Violent and property crime rates were significantly associated with the state variable (Montana had higher crime rates). With respect to the control variables, violent crime was negatively associated with changes in the White population. Violent and property crime were negatively related with population stability (persons who had been in the same home one year previously) and residential stability (owner occupied houses). Both dependent variables were positively associated with population change. While there was a positive relationship between median household income and property crime, that indicator had a non-significant relationship with violent crime. In terms of the indicators of oil and gas production, oil production was positively associated with violent crime, while natural gas production and the oil/gas factor had a positive relationship with both dependent variables.

Table 2 reports the results from the estimation of the OLS models. The first series of analyses reports the results from the four models examining violent crime. The baseline model was first estimated, and the three resource variables added in subsequent models. The initial model revealed a modest model fit, with an adjusted r^2 of .318 and Montana counties as well as population stability were

**Figure 2. Total UCR Part 1 Offenses,
2006 to 2012 (n = 26 Counties)**
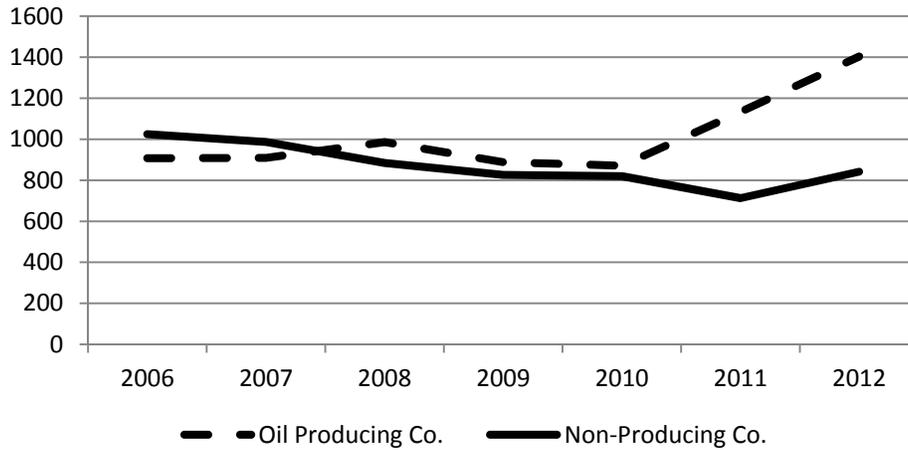
significantly associated with UCR violent crime. Each of the three indicators of oil and gas production was added in subsequent models, although none had a significant relationship with violent crime.

The second series of analyses, displayed in panel two of Table 2, shows the results using property crime as a dependent variable. Again, the baseline model reveals a modest model fit, with an adjusted r^2 of .310. Similar to the analyses reported above, population stability was negatively associated with property crime. These results also revealed a statistically significant association between median household income and property crime. Inconsistent with expectations, adding the resource related

variables did not produce a statistically significantly association in the three subsequent models that were estimated.

Altogether, the results using three different methodological strategies reported above provided modest support for the proposition that crime is higher in oil producing counties and that crime increased after the boom. Inconsistent with expectations, there was not a significant association between oil and natural gas production and police reported property and violent crimes. There are a number of possible explanations for those findings, and they are highlighted below.

Table 2. **OLS Regression of UCR Index Crime Rates in Montana and North Dakota Counties, 2012 (n = 103)**

	Violent crime					**Property crime**			
	Model 1	Model 2	Model 3	Model 4		Model 1	Model 2	Model 3	Model 4
	Baseline	Oil	Gas	Oil/Gas Factor		Baseline	Oil	Gas	Oil/Gas Factor
State	-.412***	-.417***	-.419***	-.419***		-.142	-.145	-.149	-.147
White population change	-.160	-.125	-.107	-.111		-.097	-.083	-.048	-.062
Same house 1 yr. ago	-.221*	-.227*	-.232*	-.230*		-.370***	-.372***	-.380***	-.377***
Population change	.103	.040	.005	.013		-.023	-.049	-.116	-.089
Owner occupied home	-.087	-.102	-.108	-.108		-.172	-.179	-.193	-.188
Md. Household Income	.153	.144	.145	.143		.264*	.260*	.256*	.257*
Oil Production		.102	-----	-----			.043	-----	-----
Gas Production			.153	-----				.144	-----
Oil/Gas factor				.139					.102
Constant	761.3	801.2	819.3	820.1		8093.2	8223.3	8520.2	8430.3
Adjusted r^2	.318	.314	.319	.317		.310	.303	.310	.306

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

DISCUSSION

Prior research has demonstrated that calls for service, arrests, and traffic accidents increased substantially between 2005 and 2011 in oil producing counties in the Bakken region (MND Report 2012). Interviews with police officers and sheriff's deputies in these counties revealed that they are overworked and stretched thin (Archbold 2013) which is similar to the findings reported in Canadian boomtown research (Ruddell 2011). Those perceptions about crime and disorder are shared by the staff members of human service agencies who are often tasked with responding to those who were victimized (Heitkamp and Jayasundara 2012a; 2012b) and the media has echoed these perceptions (Associated Press 2012; Eligon 2013). The analyses conducted in this study revealed that UCR index crimes increased between 2006 and 2012 in oil impacted Montana and North Dakota counties, while in the matching sample of counties the number of crimes decreased during the same era.

Although the findings reported in this study support the perceptions of law enforcement, community residents and the media about the Bakken region as being impacted by crime, it falls short of the sensationalist label of a new "wild west." Almost every scholarly article ends with a call for further research, and since our knowledge about boomtown effects is under-developed we present a number of recommendations for future investigators. Perhaps the biggest obstacle to boomtown research is that tests of the boom-crime hypothesis are limited by a lack of longitudinal crime statistics. In this study, for example, five oil producing counties did not report any UCR statistics for 2012 and when a pre-post design was used to examine UCR data from 2006 to 2012 almost one-half of the oil producing counties were lost due to missing data. As a result, we made interpretations about the longitudinal boom-crime relationship based on only 13 of 35 (37%) oil producing counties in these two states.

The lack of information about crime and justice systems is not surprising given that many of the counties where natural resource development is occurring may have only a few thousand residents and gathering and disseminating crime statistics is not a priority for local government officials. This lack of complete information is exacerbated in tribal lands affected by booms as statistics from these agencies are inconsistently reported to the FBI (Indian Law & Order Commission 2013). The challenge is that if investigators find a clear and consistent boom-crime relationship it is likely that it will be established using calls for service, arrests, and Part II UCR arrest data for offenses such as "other" (simple) assaults, DUI, disorderly conduct, and drug possession. It is unlikely that these data will be readily available for these smaller counties due to a lack of infrastructure in these organizations to collect and disseminate this information. While this lack of data about crime is frustrating to academic researchers, the inability

for smaller law enforcement agencies to accurately report their activities also makes it difficult for them to justify additional funding that would help respond to these offenses. Yet, given a choice, few sheriffs would hire a data analyst when the same funds could be used for another deputy or to replace aging equipment.

Crime statistics are also influenced by the practices of justice system personnel and organizational factors. It is possible that some offenses are handled informally whereas prior to the boom officers responded more formally. An officer in Archbold's (2013: 11) study stated that "Right now, we have to pick and choose arrestees. Years ago, we would arrest people in two seconds for things that we would not arrest for today. There is simply not enough room for everyone in the jail." As a result, the threshold for formal sanctions may have increased in some counties and such changes are not easily captured in quantitative methodologies.

A challenge – albeit a positive one for county residents – in the study of structural covariates of serious crime in rural communities is that these offenses rarely occur. In the 109 Montana and North Dakota counties, UCR violent crime data were missing for seven cases and 21 counties reported no violent crimes in 2012. A second obstacle of this research is that the factors that are correlated with serious crimes in urban areas, which is the focus of most criminological research, may be different than what occurs in the countryside (see Deller and Deller 2011; 2012; Donnermeyer and DeKeseredy 2014; Wells and Weisheit 2004). As a result, investigators might consider using variables other than census data in their analyses. Other indicators that might prove fruitful in future studies include indicators of disorder, such as admissions to domestic violence centers, traffic accidents, reports of truancy, referrals for child protective services, juvenile delinquency referrals and emergency room visits due to overdoses or assaults.

In addition to understanding the extent of crime in boom communities, our knowledge of who is actually committing these acts is also underdeveloped. While much of the crime increase has been attributed to newcomers we also have to acknowledge that some offenses are committed by local residents (Archbold 2013; Heitkamp and Jayasundara 2012a; 2012b). In addition, organized crime offenders and gang members are also drawn to boom communities to supply residents with illicit drugs, and the presence of human trafficking in Montana boom counties led to the enactment of new legislation in 2013 (Johnson 2013). Moreover, we have very little knowledge of the extent of juvenile crime in boom counties and how juveniles are adapting to booms since Freudenburg's (1984) seminal work (although see O'Connor 2011).

Last, there is a need to better understand the characteristics of communities that have mitigated boomtown effects. That endeavor might involve

developing indices of community functioning, social capital/reciprocity, or collective efficacy. Lee and Thomas (2010) argue that crime occurs more frequently in places with a weaker social fabric, and their work has a theoretical association with both social capital and social disorganization (see Deller and Deller 2012). Brown, Forsyth and Berthelot's (in press) study of the offshore oil industry suggests that community integration between newcomers and long-term residents can mediate the negative impacts of rapid population growth. In addition, the organizational responses of local governments may play a significant role in reducing boom-related harms. As such, identifying the community-level and government-related factors that contribute to lower dysfunction and crime rates should be a key goal of future studies.

CONCLUSIONS

Our analyses did not reveal a consistent statistically significant boom-crime relationship using UCR Part I data, although we noted several data-related challenges that contributed to that finding, and especially a lack of comprehensive county-level data and the inability to track Part II offenses in boom communities. The bane of a researcher's existence is a lack of valid data that enables one to properly investigate crime and the justice system responses to those offenses. As a result, we are often forced to work with the data that we have. This challenge is exacerbated in rural counties and tribal lands where data about crime and the responses to those acts is often missing or incomplete. As a result, investigators may have to use alternative methods of examining boomtown crime, including surveys, focus groups, and interviews of community members, service providers (including the police and other justice system officials) and representatives of the firms profiting from resource development. While these undertakings require a more significant investment in time and resources than analyses of secondary data, these mixed methods will provide the rich contextual information that enables academic researchers to better identify the boom-crime relationship and how it manifests itself in different communities. This research is an important first step in developing responses to mitigate boomtown effects.

Note

[1] Antisocial behavior refers to non-criminal but objectionable conduct, such as drunkenness and rude behavior that may be threatening or disturbing to others.

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Appendix A: Counties and Agencies Included in the Analyses

The 22 counties included in the analyses presented in Figure 1 were: Tioga Police Department (PD), McKenzie County (CO), Ward CO, Williston PD, Stark CO, Killdeer PD, Minot PD, Stanley PD, Dickinson PD, Grant CO, Burlington PD, Divide CO, Morton CO, Morton CO, Billings CO, Fallon CO, Prairie CO, Richland CO, Dawson CO, Glendive PD, Glasgow PD, Wolf Point PD, Baker PD.

Of the 52 counties included in the matching sample analyses, the 26 oil producing counties were: Billings (ND), Bottineau (ND), Burke (ND), Golden Valley (ND), McHenry (ND), McLean (ND), Mountrail (ND), Slope (ND), Stark (ND), Ward (ND),Williams (ND), Carbon (MT), Carter (MT), Dawson (MT), Fallon (MT), Glacier (MT), Musselshell (MT), Pondera (MT), Richland (MT), Roosevelt (MT), Rosebud (MT), Sheridan (MT), Teton (MT), Toole (MT), Valley (MT), and Wibaux (MT). The matched sample of 26 non-producing counties were: Adams (ND), Benson (ND), Dickey (ND), Grand Forks (ND), LaMoure (ND), Logan (ND), Morton (ND), Oliver (ND), Sheridan (ND), Stutsman (ND), Traill (ND), Beaverhead (MT), Blaine (MT), Broadwater (MT), Custer (MT), Deer Lodge (MT), Granite (MT), Jefferson (MT), Judith Basin (MT), Madison (MT), Mineral (MT), Phillips (MT), Prairie (MT), Sanders (MT), Stillwater (MT), and Sweet Grass (MT).

The 26 counties in the longitudinal analyses (matched sample) presented in Figure 2 were: Oil producing counties (n = 13) were: Bottineau (ND), McHenry (ND), McLean (ND), Ward (ND), Williams (ND), Dawson (MT), Glacier (MT), Roosevelt (MT), Rosebud (MT), Sheridan (MT), Stillwater (MT),Teton (MT) and Toole (MT). The 13 non-producing counties were: Dickey (ND), Stutsman (ND), Traill (ND), Blaine (MT), Broadwater (MT), Deer Lodge (MT), Jefferson (MT), Madison, (MT), Mineral (MT), Phillips (MT), Sanders (MT), and Sweet Grass (MT).

Appendix B: Correlations, Means, and Standard Deviations, Montana and North Dakota Counties, 2012 (n = 102).

	Variable	1	2	3	4	5	6	7	8	9	10	11
1	Violent Crime	-----										
2	Property Crime	.602*	-----									
3	State MT=1, ND=2	-.403*	-.152*	-----								
4	White Pop. Change	-.227*	-.157	.041	-----							
5	Same House last yr.	-.400*	-.524*	.164*	.009	-----						
6	Pop. Chng (2010-2)	.258*	.260*	.107	-.269*	-.273*	-----					
7	Owner Occ. Homes	-.314*	-.362*	.218*	.240*	.473*	-.215*	-----				
8	Median HH Income	.085	.238*	.395*	-.045	-.173*	.480*	.197*	-----			
9	Oil Production	.188*	.159	.207*	-.464*	-.051	.711*	.004	.463*	-----		
10	Gas Production	.212*	.190*	.183*	-.476*	-.043	.714	-.020	.427*	.930*	-----	
11	Oil/Gas Factor	.203*	.178*	.198*	-.479*	-.048	.725*	-.008	.453*	.982*	.982*	-----
	Mean	142.5	1242.5	1.49	-.109	87.7	.739	73.3	45,658	2,474.5	2,788.3	.000
	Standard Deviation	121.4	948.2	.50	.727	4.8	1.58	7.48	7,978	9,993.6	11,162.9	1.00

* $p \leq .05$

Data Sources: Crime data for 2012 were obtained from the Federal Bureau of Investigation (2013); county demographic data were obtained from the U.S. Census Bureau for 2012 and the Bureau of Economic Analysis. Oil and gas production data for 2012 were obtained from the states of Montana and North Dakota. Columns 9 and 10 are rounded and expressed in 1000's.

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An Empirical Test of Social Information Processing Theory and Emotions in Violent Situations

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Abstract*: Criminological research has favored the rational choice perspective in studying offender decision making. However, this theoretical approach does not take into account the complex interplay of situational, cognitive, emotional, and person factors that likely influence criminal decision making. To that end, the current study examines decision making in high-risk-for-violence situations focusing on social information processing and emotional state variables. The current study utilizes a sample of 236 newly incarcerated jailed inmates who provide personal level data and situational reports of violent and avoided violence situations (n=466). Hierarchical generalized linear modeling (HGLM) is applied to analyze the data and the findings show that several situational, social information processing, and emotion variables, such as intent interpretation, goal, and response generation, are significant predictors of the escalation of violence.*

Keywords: decision making, emotions, situation, social information processing theory, theory, violence

INTRODUCTION

In recent years, there has been a renewed interest in studying the situational components of crime (e.g., Horney 2006). Often grounded in symbolic interaction (Mead 1934), researchers from this perspective focus on a wide variety of situational (e.g., substance use, presence of bystanders, weapons), and personal factors (e.g., demographics), that influence situational outcomes (Birkbeck and LaFree 1993; Horney 2006; Sampson and Lauritsen 1994). This perspective has merit in that it allows researchers to examine traditional individual-level (or person-level) factors, while also examining how people interact with, and are influenced by, their current environment. Despite this interest, there has been a dearth of research regarding decision-making processes in these situations. Some researchers, in attempting to understand the escalation of violence, have argued that there is a cognitive stage where offenders interpret situational cues and/or decide on a course of action to pursue in that situation (e.g., Felson and Steadman 1983; Oliver 1994). However, to date, these stages have not received much empirical exploration.

Traditionally, individual-level explanations for offending and decision-making in criminology have focused on the rational choice perspective. However, this perspective is challenged for being overly simplistic and: failing to account for (1) the complexity of decision

making, (2) the role of high emotionality, and (3) environmental influences (Boudon 1998; De Haan and Vos 2003). For example, De Haan and Vos (2003) suggest that the rational choice perspective is too narrow. They also argue that individuals' actions are not the sole product of intention, but rather a social process outcome of complex decision making. Secondly, De Haan and Vos (2003) suggest that the rational choice perspective does not clarify the offenders' experiences before (or during) the offenses are committed. When this is neglected, opportunities to explain motive and thought processes are diminished. Rational choice assumes motivation but does not account for motivation (Jacobs and Wright 1999).

Objective assessments of situations are difficult when rationality is bounded (Walsh 1986), when it simply does not exist (Jacobs and Wright 1999), or when it is compounded by emotions. Copious and objective responses may not be available due to the limited capabilities of individuals (Johnson and Payne 1986). Offenders' alternatives or choices are subjective; therefore, a rational, objective assessment of possible alternatives to committing a crime may not exist.

Within this literature it has been a major obstacle to empirically identify decision making on an individual level since the underlying cognitive processes are not readily observable (Glockner and Betsch 2008). Despite this, researchers in psychology have attempted to articulate this process through decision-making theories of aggression, deviance, and criminal behavior.

One such attempt is Crick and Dodge's (1994) reformulated social information processing (SIP) theory. The theory is a social cognitive approach based on the assumption that people "come to a social situation with a set of biologically limited capabilities and a database of memories of past experiences" (Crick and Dodge 1994: 76). This model was further updated by Lemerise and Arsenio (2000) to account for the role emotions play in decision making. This theory (and we argue, the update) articulates the steps individuals take to arrive at a judgment (Ybarra 2002) and is, therefore, useful in understanding offender decision making during violent encounters.

Thus, the purpose of this paper is to assess the utility of social information processing and emotion for understanding offender decision making in a sample of 236 newly incarcerated inmates in multiple facilities. Specifically, we asked these respondents to recall violent and avoided violence situations that they participated in, up to 24 months prior to incarceration.

SOCIAL INFORMATION PROCESSING THEORY

Social information processing (SIP) theory is broadly concerned with the mental processes used by individuals to create a behavioral response during social interactions (Crick and Dodge 1994). The theory suggests that all individuals go through six sequential processing steps, which are relatively independent of each other, during their processing of a social situation, to arrive at a decision. These steps include: (1) attention to social cues, characteristics of intent, goal generation, accessing scripts of past behavior from memory, (2) decision making, and (3) enacting the decision through behavioral responses (Dodge and Rabiner 2004; Zelli et al. 1999). Adding to the complexity of this decision-making process is that emotions are hypothesized to occur with each sequential step and, therefore, play a vital role in each decision (Crick and Dodge 1994; Dodge 1991; Dodge and Rabiner 2004). However, the theory does not articulate the specific role that emotions play (see Crick and Dodge 1994). Lemerise and Arsenio (2000) offer a model that combines the cognitive components of Crick and Dodge's model with emotional processes deemed important in decision making. In discussing the theory, we include aspects from each.

Specifically, the first step in social information processing theory is the encoding of cues in a situation. These cues are both internal and external (Crick and Dodge 1994), where internal cues are those the person brings with them into the situation, while external cues are taken from the immediate situation (Lansford et al. 2006). For example, any prior knowledge or with-in person trait variables, like biases to certain behaviors, constitute internal cues. Any new cue is an external cue and could include non-verbal, affective or verbal communication with another person from the immediate situational context.

The second step, interpretation, is a complex stage whereby the person interprets the current situational cues in light of information stored in their individual "database" of memories. The database contains earlier experiences that are stored in the form of associations, schemata, scripts, and social knowledge (Crick and Dodge 1994; De Castro 2004). During this second step, the motive/intent of others' behaviors is interpreted (Lansford et al. 2006). This interpretational process may result in changes or revisions to the individual's database (Crick and Dodge 1994).

Past researchers have examined the intent attributions of others and have found that aggressive youth, in ambiguous situations, are more likely to attribute hostile intentions to others in the situation (De Castro et. al 2002; Fontaine et al. 2010; Halligan et. al 2007). This has been coined hostile attribution bias (Dodge 1980). Hostile attribution bias is particularly salient in *reactive aggression* (as opposed to proactive aggression) where the individual misinterprets the social cues of others thus becoming frustrated, angry, and aggressive (see for example, Arsenio, Adams, and Gold 2009; Arsenio and Lemerise 2004). Further, Coccaro, Noblett, and McCloskey (2009) assessed attributional and emotional responses to socially ambiguous situations and found that hostile attribution had a significant relationship with an individual's emotional response to provocation.

Specifically, hostile attribution bias was associated with the inability of an individual to regulate and express emotions. Additionally, negative emotions, such as anger, have been positively correlated with aggressive behavior and with the inability to solve problems (Chen, Coccaro, and Jacobson 2012), and have also been found to be associated with hostile attribution bias and aggressive behavior (Arsenio and Lemerise 2004; De Castro 2004).

The third step in social information processing theory is the clarification of goals in a situation: "Goals are focused arousal states which function as orientations toward producing (or wanting to produce) particular outcomes" (Crick and Dodge 1994: 76). Individuals bring goals to a social situation, but they can revise or construct new goals in response to immediate social stimuli. Goals can be categorized as intrapersonal or interpersonal. Intrapersonal, or instrumental, goals are self-serving and promote individual gains (Crick and Dodge 1994; Lansford et al. 2006; Losel, Bliesener, and Bender 2007). These intrapersonal goals tend to be more egocentric and antisocial, whereas, interpersonal goals pertain to "between person gains" that promote dealing with, and thinking about, others. *Proactive aggression* (in contrast to reactive aggression) is marked by a preference for intrapersonal/instrumental goals and viewed as a means to attain valuable goals or items (Arsenio, Adams, and Gold 2009; Arsenio and Lemerise 2004; Dodge, Coie, and Lynam 2006).

More/less positive goals can be formed based on emotional processes. For example, the prior relationship with the other(s) present can impact goal formation (Lemerise and Arsenio 2000). Individuals may consider less harmful goals in tense situations involving a close friend or family member in an effort to preserve that relationship. However, individuals who are proactively aggressive may favor intrapersonal/instrumental goals over relational ones (Arsenio et al. 2009). Further, the emotional states of others involved in the situation can influence goal formation. If the opponent is perceived as being angry, for example, this may negatively influence the goal selected.

During step four, individuals access plausible responses from memory, or construct new behaviors, in response to the immediate social situation. During step five, the response decision, an individual evaluates the previous responses (which can be accessed from memory or newly constructed), and selects the one most positively evaluated to enact during the situation. This decision can be made based on a number of factors, including: (a) the expected outcomes based on past experiences, (b) individual self-efficacy, and (c) an evaluation of the appropriateness of the response (response evaluation). Lemerise and Arsenio (2000) suggest that negative emotions (like anger) can facilitate hostile attribution bias, especially for individuals who are reactively aggressive, and make it difficult for effective response generation or

evaluation to occur. The sixth, and last, step is the enactment of such response through a given behavior (Crick and Dodge 1994). Individuals initiate the behavior that seems most appropriate to obtain their goal in the situation (Losel et al. 2007).

Empirical Support

SIP theory suggests that deficits in one or more of the steps can result in socially unacceptable behavior, including aggression and violence, in a situation (Losel et al. 2007). Research has shown that aggressive children exhibit these processing deficiencies across a variety of situations. Several longitudinal studies have also confirmed that patterns of deviant processing lead to aggressive responses (Zelli et al. 1999). However, the majority of longitudinal and cross-sectional research on social information processing theory has been focused on children and adolescents (see Crick and Dodge 1996; Crozier et al. 2008; Losel, et al. 2007; Quiggle et al. 1992; Shahinfar, Kupersmidt, and Matz 2001; Zelli et al. 1999). To date, SIP has been effective in accounting for child and adolescent aggression (e.g., Dodge et al. 1995; Fontaine, Burks, and Dodge 2002).

While most SIP studies have focused on children, there have been a few studies testing social information processing and violence/aggression with older adolescent samples. For example, Crozier et al. (2008) investigated 585 adolescents over a three year period, from ages 16 to 18. This was the first study to examine the relationship between processing patterns and antisocial behavior in a group of later adolescents. Using mail questionnaires and videotaped vignettes, the researchers found that deviant social information processing predicted antisocial behavior and proactive aggression. The study also that found social information processing variables significantly predicted future antisocial behavior, even when controlling for past behavior(s).

Further, Losel and colleagues (2007) prospectively studied 102 adolescent boys in in seventh and eighth grade, and again in ninth and tenth grade. Using vignettes to measure the steps of SIP, the vignettes presented respondents with conflicts that could trigger more or less aggressive-prone cognitive schemata. The researchers found SIP variables explained approximately 20 to 34 percent of individual differences in aggression after 20 months. Likewise, in one of the largest studies to date, a 12-year prospective study was conducted by Lansford et al. (2006) to assess social information processing on a community sample of 576 children in kindergarten, with follow-up assessments in grades 3, 8, and 11. Using video vignettes to assess social information processing of the respondents at each wave, the researchers found that SIP problems in eighth grade predicted externalizing behaviors (which included measures of delinquency and aggression) in 11th grade.

Similar to aggressive children and adolescents, adults who have committed violent crime have expressed deviant interpretations (i.e., hostile intentions) of ambiguous social situations. Topalli (2005) conducted a quasi-experiment using videotaped Point Light Displays (PLD) to compare the extent to which offenders and non-offenders perceive situations differently. PLD videos have actors in darkened areas, use point-light sources (typically reflective tape or light bulbs) on joints, and perform ambiguous actions which leave viewers to interpret the situations taking place.

The study was composed of three groups: (1) known offenders,(2) a comparison group of individuals matched on demographics of the offender group, and (3) college students. Known offenders perceived the PLD's to be more aggressive than did college students and the comparison group. The offender group and the comparison group however, similarly perceived crimes taking place in the ambiguous PLD's at 72 percent and 69 percent of the time compared to college students perceiving a crime taking place 12 percent of the time.

This study was significant because it highlighted the importance of social cognitive decision making in offenders, in particular, how different individuals interpret the intentions of others. However, it did not detail the process of decision making nor did it ask offenders to relate their decision making to crimes.

The studies reviewed so far used vignettes, or standard scenarios of some form, to measure social information processing. Although vignettes or scenarios are often used as a standard for measuring social information processing and provide important information, self-report can offer different insights into offender decision making. Using vignettes, the respondent has to "pretend" he is part of a situation and then predict his or her behavioral outcome. While this approach allows researchers to examine how individuals interpret/respond to a wide array of novel situations, some individuals may not be able to relate to the vignettes, and the vignettes cannot adequately portray the wide range of situational and emotional cues that accost a person in any given situation (e.g., presence of bystanders, substance use, and weaponry).

A different and more direct way to measure social information processing, is to ask respondents to describe recent aggressive situations in which they were involved followed by questions about the situational context and their decision making.

Importantly, the lack of SIP studies using adult samples is also problematic. Developmentally, as individuals' age their experiences with different social situations increase, as does their social knowledge (Crick and Dodge 1994). There has not been a study, to date, that has tested SIP in adult offenders, specifically focused on aggressive and violent situations. Studies utilizing adult and criminal samples are needed to examine these issues, as well as the importance of the theory in explaining aggressive and criminal behavior.

THE CURRENT STUDY

In the current study, the researchers analyze 466 violent and avoided violence situations described by newly jailed offenders in order to assess decision making in these situations.

Here we advance the study of decision making through a within-person analysis that takes into account emotions and cognition, in order to examine whether there are variations in individuals' decision-making processes, using social information processing theory (SIP), affect situational outcomes.

Test of Hypotheses

Our hypotheses examine the differences in decision making, using social information processing theory. Specifically, we expect situations where respondents report poor or ineffective SIP to be more likely to end in violence as opposed to avoid violence. We hypothesize that in violent situations (compared to avoided situations), respondents attribute more negative intentions to the opponent(s) at the second step of processing (interpretation of cues), select more intrapersonal goals (compared to interpersonal goals) at step three, generate fewer behavioral responses at step four, and admit that their action got them what they wanted in the situation. Building on Lemerise and Arsenio's (2000) study, we also hypothesize that emotions play a role in these situations, in terms of anger and hostile attribution bias, at the situational level. Specifically, the more anger and hostile attribution bias in a situation, the more likely the situation will result in a violent outcome.

Finally, with the addition of situational variables, the social information processing and emotion variables will not be as significant as in the previous models. Previous research suggests that situational variables such as substance use and weaponry, can be significant predictors of violence (see Boles and Miotto 2003; Chambers et al. 2009; Felson, Burchfield, and Teasdale 2007; Graham, West, and Wells 2000; Krienert and Vandiver 2009; Phillips and Maume 2007; Wells and Horney 2002). However, the extent to which SIP, emotion, and situational variables interact is unknown due to the lack of previous research that examines all variables in one study.

METHODOLOGY

Sample and Procedures

The sampling frame for the current study includes 330 newly incarcerated males, age 18 and older, located in four county jail facilities in Western Pennsylvania. A total of 236 of these inmates participated in the interviews regarding violent and avoided violence situations. As the literature review indicates, prior research on social information processing theory has focused on adolescents.

Less is known about adults' social information processing in relation to violent behavior.

For this study, newly incarcerated offenders include all male offenders, regardless of committing offense, who are housed in jails for three months or less. Sampling newly incarcerated inmates is largely grounded in prior literature that shows it is ideal to ask individuals about their past behaviors in a timely manner for the best recall (see Bradburn, Rips, and Shevell 1987; Wells and Horney 2002).

While the researchers originally intended to interview all available inmates who met the sampling criterion, due to security purposes, only one jail allowed the researchers to engage with inmates. A second jail gave the researchers a list containing the sampling frame of potential respondents, and made all of these inmates available for the interviews. These approaches led to a 90.82 percent and 94.73 percent response rate respectively. In the remaining jails, the researchers were not privy to the list of potential respondents. If an inmate was called by a correctional officer but decided not to meet with the researchers, then the researchers were not privileged to this information and, thereby could not count these individuals who declined to participate, as respondents. Of those who met with the researchers at these two facilities, 92.92 percent participated in the study. Overall, in all four facilities, the study had a 93 percent response rate (236 respondents). This is similar to previous studies that also report a high degree of participation in institutionalized settings (ONDCP 2011; Wells and Horney 2002).

As past research has shown, offenders participate in multiple offense types (see, for example, Bennett and Brookman 2008; Brookman et al. 2007; Jacobs, Topalli, and Wright 2000; Jacobs and Wright 2008; Pizarro 2008; Topalli, Wright, and Fornango 2002). For this study, inmates were invited to participate, regardless of their committing offense. While inmates are not representative of the overall population, they offer valuable insight into the study of violence. For example, offenders are likely to have numerous experiences with violence compared to the general population (Horney 2001), both as victims and offenders (see, for example Sampson and Lauritsen 1990, 1994; Wells and Horney 2002). Because of this exposure, offenders can be studied in order to gain a better understanding of decision making, emotions, and contextual factors present in high-risk-for-violence situations.

In the present study, two researchers conducted all of the interviews from June to October 2010. The average interview took approximately one hour to complete. In three of the jails, the interviews were conducted in separate, private rooms, with only the interviewer and respondent present. In the fourth and largest jail, the interviews were conducted in one large room designated for attorneys and clients to meet. The attorney client room had approximately eight tables laid out against the walls of the room. In this room, both interviewers were conducting interviews with different respondents, while attorneys (at times) were also meeting with clients. However, the layout of the room optimized the privacy of each respondent. Additionally, correctional officers remained outside of the attorney-client room providing further privacy.

The survey was computerized and the interviewers recorded the respondent's answers directly into an Excel program. Interviewers sat next to the inmates, pointing out different things on the screen in order to eliminate any suspicion by the inmates about what was being recorded (Wells and Horney 2002). All respondents provided informed consent and voluntarily agreed to participate.

The interviewers asked each respondent to report multiple situations, both violent and avoided violence (defined below), in which they had been involved in the 24 month period before the arrest that brought them to jail. Each individual was asked to report up to three situations for each category, for a possible analysis of six situations per respondent. If a respondent had more than three of either of these situations, then he was asked to report the three most recent situations. We utilized a life events calendar to aid the respondents recall. The cueing used with life events calendars helps respondents remember general events in the specific time frame, which then serve as cues for more specific events. In addition to the situation reports of the specific violent and avoided violence situations, the interviewers also collected important individual level information (e.g., trait level hostile attribution bias and anger). Thus, these data are nested (situations nested in person).

Key Variables

Dependent variable

In this study, we examine how social information processing, emotions, and other individual and situational variables influence the escalation of violence. In order to do so, we collected data from respondents about violent and avoided violence situations. This approach has been recommended (see for example, Sampson and Lauritsen 1994) and used by a number of researchers in the past (see, for example, Felson 1996; Horney 2001; Short 1998). A violent situation is defined as a physical confrontation by a person upon another person for the purpose of inflicting bodily harm to that person. Violent situations include use of a weapon, hitting, punching, slapping, kicking, choking, or throwing something at someone. Avoided violence situations are similar situations in that the respondent perceived there was a high risk of violence but, for whatever reason, violence did not occur. Avoided violence might include situations where the respondent grabbed, pushed, or threatened someone; where someone encouraged the respondent to become involved in violence, but he did not; or situations where the respondent was so angry he could have hurt someone but did not. The

violent and avoided violence definitions were taken, with permission, from Horney's (2001) study. The line between these two situations is drawn to discern between more and less serious acts of violence. While being grabbed or pushed could certainly be regarded as violent, the researchers wanted to have a sampling of situations that varied on the severity of the gravity of violence used. Thus, this distinction was made. Respondents were given definitions and examples of each type of situation and then were asked to report whether or not they had been involved in any of these types of situations. If they had been involved, the interviewers collected specific situation reports for up to three of each type of incident. The dependent variable is dichotomous with avoided violence coded as 0 and violence as 1.

Independent variables

The primary independent variables assessed in this study were measures of social information processing theory (SIP) that were used to tap into the decision making of respondents. While social information processing theory suggests that people go through six cognitive processes to enact a behavioral response, only four of the six steps were measured quantitatively in the present study. Due to measurement difficulties, the other steps were measured at the descriptive level. Thus, this is a partial test of SIP. The SIP measures used here have been taken from prior literature on social information processing theory (see Arsenio and Lemerise 2004; Losel et al. 2007) and extended by the researchers.

The first SIP item measures step two of the theory, which is the respondent's interpretation of social cues of the opponent(s) in the violent or avoided violence situation. As indicated in prior research, SIP asserts that people (especially those who are reactively aggressive) are more apt to act aggressively if they perceive the opponent's intent to be negative. The survey item asked the respondent to indicate what he perceived the opponent's intent to be in the situation ("How positive or negative was the opponent's intent?"). This "Intent Interpretation" variable is measured on an 11 point scale from zero to ten, with zero indicating the opponent's intent was negative, five indicating neutral, and ten indicating positive. A second measure of stage two is collected for descriptive purposes, and asks the respondent to identify how he knew the opponent's intentions. The "Encoding of Cues" variable's response choices are: past experiences with the opponent(s), past experiences with others, you just knew, the opponent(s) told you, the opponent(s) behavior, or other. The next SIP item measures step three of the theory, or the goal (referred to in the models as Goal) of the respondent in the situation. The goal refers to what the respondent wanted to get out of the situation. This question was open-ended to allow the respondent to list any goal(s) they had in the situation (e.g., "What did you

want to achieve in this situation?"). Based on the goal(s), responses were categorized into two response choices: intrapersonal (0) or interpersonal (1). SIP literature suggests that individuals (especially those who are proactively aggressive) are more likely to enact a violent behavioral response if they pick goals that are more intrapersonal or self-serving and promote individual gain.

The next SIP item measures step four of the theory, which concerns the respondent's response generation. The theory suggests that people who act more violently are less likely to think of alternate ways to deal with situations. The item representing the "Response Generation" variable asks the respondents if they thought of any other ways to deal with the situation ("At that time, did you think of other ways to deal with the situation?" 1=yes/ 0=no). Although there were follow-up questions asked to determine what these response generations were and if the respondent thought the response generations would get them what they wanted, these are not included in the statistical analysis but are instead, included in the descriptive statistics below. The last SIP item measures step six of the theory (behavioral enactment of the decision) and asks the respondent if his behavior got him what he wanted in the situation ("Did (action) get you what you wanted in this situation?" 1=yes/0=no). This variable is referred to as "Action Benefit". This question relates back to the goal clarification step. The theory asserts that individuals enact the behavioral response they feel will get them the goal(s) they want to achieve in the situation.

Hostile attribution bias is measured at both the trait (i.e., individual) and state (i.e., situational) level. Hostile attribution, at the trait level, is the respondent negatively evaluating other individuals' emotions toward the respondent across situations and time. At the situational level, it is defined as the respondent negatively evaluating other individuals' emotions toward the respondent in a given situation (Topalli and O'Neal 2003). Two scales, the Trait Hostile Attribution Bias and State Hostile Attribution Bias Scales, were used. Topalli and O'Neal originally utilized the state scale in their study on provocation and retaliatory motivation. For the purposes of this study, we maintain the original scale for the State HAB measure, and we changed the wording slightly in order to create the Trait HAB scale. Trait and state hostile attribution bias were each measured using a six-item scale. These questions for both scales were all answered on a five point Likert scale of "Strongly Disagree (1)" to "Strongly Agree (5)." The score range for both scales is 6 to 30, with higher scores representing more hostile attribution bias. For the trait scale items, the respondent was asked to report how he perceives most people feel about him most of the time. Examples include, "Most people are angry with you" and "Most people are hostile with you." The internal validity of the Trait HAB scale is very good with a Cronbach's alpha of .81. For the state scale items, the respondents

reported how they perceived the opponent(s) felt during the situation. Examples include, "The opponent(s) was angry with you" and "The opponent(s) was hostile towards you." The State HAB scale has a Cronbach's alpha of .89.

To test Lemerise and Arsenio's (2000) proposed model of integrating emotional processes into Crick and Dodge's (1994) social information processing theory, this study utilizes additional independent variables in Model 2 (presented in Table 3 below). To measure differences in emotional processes at the trait or individual level, we focus on trait anger. Trait anger was measured using a ten item scale originally developed by Spielberger et al. (1983) and updated by Spielberger (1999). Included on the trait anger scale are items such as: "You are quick tempered", "You have a fiery temper", and "You get angry when you are slowed down by others' mistakes". Responses range from (1) "Almost Never" to (4) "Almost Always" and were summed to form the final score. Score ranges on this scale were from 10 (for a respondent who marked mark "Almost Never" on all items) to 40 (for a respondent who marked "Almost Always" on all items). The Trait Anger scale has a Cronbach's Alpha of .87.

In the current study, anger was measured at the state (situational) level using a subscale of Spielberger's (1999) State-Anger Scale. The "Feeling Angry" scale was a five-item scale measuring how the respondent felt in the situation. It contains items such as "I was furious" and "I was mad" with response choices from "Not at All" (1) to "Very Much So" (4). The final scores on this scale range from 5 to 20. The five item state anger scale has a Cronbach's alpha of .96.

The last variable introduced in Model 2 was "Harm". As discussed above, individuals who are more proactively aggressive are more likely to state intrapersonal goals while also being more likely to harm, and be less concerned about, the harm done to the victim (Arsenio et al. 2009). The survey question measuring harm was "How bad did you want to physically harm the opponent?" This variable was measured on an 11 point Likert Scale, 0 being "Not at All" and 10 being "Very Much".

The last model (Model 3) includes situational level variables that past criminological research has shown to be important factors to consider in high risk situations. These variables include whether the respondent or opponent(s) were under the influence of substances (alcohol or drugs) at the time of the situation, as well as whether the respondent or opponent had a weapon in the situation. All four variables are measured dichotomously (0=No, 1=Yes).

Since this study collected data on situations that were nested within individuals, there is a need for hierarchical modeling. Hierarchical linear modeling (HLM) provides a means to test individual- and situational-level data simultaneously. Specifically, due to the dichotomous outcome variables (violent outcome = 1, avoided violence outcome = 0), hierarchical generalized linear modeling (HGLM) is applied (see Raudenbush and Bryk 2002). This statistical technique is utilized to address the lack of independence in situation reports, as one respondent could have experienced multiple situations. This study was a contextual analysis that focused on individual behaviors across situations. For this study, one respondent could have experienced both avoided violence and violent situations or multiple situations of one or both types. These experiences were different for all respondents. Therefore, situations varied within the individual and across individuals, so the situational units of analysis were nested within the individual units of analysis. The level-1 model in the current analysis contains variables obtained from the situation reports while the level-2 model contains individual-level variables. As suggested in Raudenbush and Bryk (2002), Level-1 variables were clustered around the group mean, while level 2 variables were clustered around the grand mean (see Raudenbush et al. 2004).

RESULTS

Before proceeding into the discussion of the statistical models, it is important to describe the characteristics of the study sample. Table 1 provides descriptive statistics for the sample of 236 respondents. The mean age of respondents was 28 years-old and study respondents' predominately self-reported being Caucasian (58.5%) or African American (34.7%). Almost half of all respondents reported receiving a high school diploma or GED (49.60%), while over 27% had not completed eleventh grade. Additionally, the majority of respondents identified as lower or working class (66.5%), with the remainder identifying as middle (29.9%) or upper class (3.0%). In terms of their criminal history, the number of prior arrests and convictions self-reported varied widely with the median respondent reporting five arrests and three convictions.

The 236 respondents in the study reported 466 avoided violence and violence situations. A total of 100 respondents (42%) identified 159 avoided violence situations and 196 respondents (83%) identified 307 violent situations. Many of the respondents offered both violent and avoided violence situations. Over half (65.80%) of all situations reported were violent while the remainder were avoided violence situations. Table 2 displays the descriptive statistics for the social information processing variables that were not included in the HGLM analysis. As shown in the table, respondents determined the intentions of the opponent(s) from a combination of internal (e.g., prior knowledge or trait variables) and external cues (e.g., opponent told respondent or opponent's behavior). In the reported situations, the majority of cues are external, specifically taken from the opponent's behavior for both types of situations recorded (42.91% in avoided violence and 48.23% in violent situations). The

Table 1. **Self-Report Descriptive Statistics for the Sample of 236 Inmates**

VARIABLE	FREQUENCY	PERCENT
RACE/ETHNICITY		
Caucasian/White	138	58.50
African American/Black	82	34.70
Other	16	6.70
EDUCATION		
8th Grade or less	3	1.30
9th-11th Grade	62	26.30
HS Diploma or GED	117	49.60
Some College	19	20.80
College Graduate	4	1.70
Post-Grad Study	1	.40
FINANCIAL STATUS		
Lower/Working Class	157	66.50
Middle Class	70	29.90
Upper Class	7	3.00
RELATIONSHIP STATUS		
Single	117	49.60
Partner	96	40.70
Married	23	9.70

VARIABLE	MEAN	STD. DEVIATION
Age	28.71	9.27

VARIABLE	MEDIAN	STD. DEVIATION
Arrests	5	11.64
Convictions	3	6.17

second most retrieved cue is internal, in that the respondents accessed past experiences with the opponent(s) (21.82% in avoided violence and 15.80% in violent situations). This is followed by another external cue with the opponent(s) telling the respondent his or her intentions in the situation (17.82% in avoided violence and 14.55% in violent situations).

In 21.38% of the avoided violence situations, respondents had multiple response generations in the situation. In those situations, 91.17% of the time respondents admitted violence could have occurred, and 50% admitted they would have gotten what they wanted if they would have acted in other ways in the situation. Conversely, in fewer violent situations (13.68%), respondents had multiple response generations in the situation. Of those who did think of other ways in the situation, the majority (61.90%) admitted violence could have been avoided, and 52.38% admitted they would have gotten what they wanted if they would have acted in other ways.

Three separate HGLM models were run for this study (see Table 3). The situational level (level 1) predictors for social information processing (SIP) are intent interpretation, goal, response generation, and did action get you what you wanted (Action Benefit). These SIP variables are included in all three models, whereas the subsequent models gradually incorporate the remaining situational and emotion (level 1) variables of interest along with the level-2 (individual level) predictors. This was done to determine how the SIP relationships change with the addition of important situational, emotional, and individual (person) level variables. Table 3 presents the findings of the HGLM analysis. It is important to note that all results are discussed in odds ratios and all three models are found to be significant in the analyses.

The first model presented in Table 3 includes only social information processing variables at the situational level. Findings indicate that the intent interpretation, goal, and response generation are all significant predictors of situational outcome. Specifically, when the respondent interprets the opponent's intentions as more positive (less harmful), the odds are 11% less likely that the situation would end in violence (.8889). Similarly, when the respondent reports an interpersonal goal for the situation, there is an almost 77% reduction in the odds that the situation would end in violence compared to avoided violence (.2316). Lastly, if the respondent reports multiple response generations for dealing with the situation, the odds of the situation ending in violence decreases by

Table 2. **Descriptive Statistics for Social Information Processing Variables in Avoided Violence versus Violent Situations**

VARIABLE	AVOIDED VIOLENCE		VIOLENT	
	FREQUENCY	PERCENT	FREQUENCY	PERCENT
ENCODING OF CUES				
Past Exp. w/ Opp.(s)	60	21.82	76	15.80
Past Exp. w/ Others	6	2.18	17	3.53
You Just Knew	38	13.82	69	14.35
Opp.(s) Told You	49	17.82	70	14.55
Opp.(s) Behavior	118	42.91	232	48.23
Other	4	1.45	17	3.53
R MULTIPLE RESPONSE GENERATION				
No	125	78.62	265	86.32
Yes	34	21.38	42	13.68
OUTCOME OF RESPONSE GENERATION				
Avoid Violence	3	8.82	26	61.90
Violence Occur	31	91.17	16	38.09
ACTION BENEFIT				
No	17	50.00	20	47.61
Yes	17	50.00	22	52.38

almost 55% (.4514). More simply, the odds of the situation ending in violence decrease when the respondent did not interpret the opponent as having harmful intentions, the respondent had an interpersonal goal, and if the respondent generated multiple responses in the situation.

In addition to the predictors included in Model 1, Model 2 incorporates the individual level (level 2) measures of trait hostile attribution bias and trait anger, along with the introduction of state anger, state hostile attribution bias, and the intent to do harm at the situational level. When the individual level predictors were added to the model, only trait anger was found to be a significant predictor of situational outcome. Specifically, when trait anger increases, the odds of situational violence increases by 5% (1.0542). Additionally, in Model 2, each of the emotion variables at the situational level is found to be predictive of the situational outcome. When the respondent's level of anger increases, the odds of violence increases by 7% (1.0768). In situations where the respondent reports high hostile attribution bias the odds of violence decreases by roughly 5% (.9527); albeit both anger and HAB are significant at an alpha of .10. Further, the strongest predictor of a violent situation in the model is the intent to do harm. As the intent to do harm to the opponent increases the odds of the situation ending in violence increases by 23% (1.2316). Both goal and response generation variables remain significant and in the same directions in Model 1, but opponent's intentions is no longer a significant predictor of situational outcome. Models 1 and 2 suggest that decision making variables

from Crick and Dodge's (1994) social information processing theory, along with emotional variables suggested by Lemerise and Arsenio (2000), play a significant role in the studied situations.

In staying consistent with the situational factors literature, the final model (Model 3) also includes whether the opponent and/or respondent were using substances or had any weapons during the situation (Birkbeck and LaFree 1993; Horney 2006; Sampson and Lauritsen 1994). Of the four new variables, the respondent's substance use and the opponent having a weapon are significant predictors of the outcome variable. It should be noted that in total, the respondent's substance use has the single strongest effect on the odds likelihood of situational violence outcome. Specifically, if the respondent was using drugs or alcohol at the time of the situation, the odds of the situation ending in violence increases by more than 500% (6.1116). Similarly, when the opponent had a weapon(s) the odds of a violent situation increases by 134% (2.3421). Conversely, if the respondent had a weapon, the odds of a violent situation decreases; or rather the odds likelihood of avoided violence increases by 31% (.6969). The opponent's substance use does not significantly predict situational outcome in our sample. In agreement with respondent substance use, it is expected that if an offender was using a substance(s) at the time of the situation, it would more likely end in violence. However, this was not seen in our study. As seen in the previous models, in Model 3 trait anger is a significant predictor of outcome at the individual level, while goal and

Table 3. **HGLM Models Results**

VARIABLE	Model 1			Model 2			Model 3		
	Coefficient	SE	OR	Coefficient	SE	OR	Coefficient	SE	OR
INDIVIDUAL									
Intercept	.6844**	.1164	1.9826	.7437**	.1042	2.1038	.7839**	.1106	2.1900
Host. Att. Bias				-.0308	.0261	.9696	-.0321	.0279	.9684
Trait Anger				.0528*	.0184	1.0542	.0522*	.0200	1.0536
SITUATIONAL									
Intent Interpretation	-.01178*	.0567	.8889	-.0882	.0694	.9156	-.0900	.0753	.9142
Goal	-1.4628**	.3697	.2316	-1.1338*	.4615	.3218	-1.1021*	.4886	.3322
Resp. Generation	-.07954*	.3572	.4514	-.8882*	.4684	.4114	-.7491	.4969	.4728
Action Benefit	.2969	.2963	1.3457	.3247	.4197	1.3836	.6258	.4102	1.8698
Anger				.0740+	.0429	1.0768	.0589	.0438	1.0607
Host. Att. Bias				-.0484+	.0273	.9527	-.0526+	.0291	.9487
Harm				.2083**	.0569	1.2316	.2118**	.0577	1.2359
O substance							-.3441	.4165	.7089
R substance							1.8102**	.4199	6.1116
O weapon							.8511*	.3895	2.3421
R weapon							-.3612+	.5895	.6969

Note: **p<.01, *p<.05, +p<.1

intent to do harm remains significant at the situational level.

DISCUSSION

This research sought to examine the differences in decision making, using social information processing theory, in violent and avoided violence situations. As expected, situations where the respondents' report poor or ineffective SIP are more likely to end in violence. Specifically, in violent situations, respondents interpret opponents intentions more negatively, select more intrapersonal goals, generate fewer behavioral responses, and admit their actions benefitted them in the situation. As Lermerise and Arsenio (2000) suggest, emotions played a significant role in the studied situations. Finally, situational variables such as substance use and weaponry are significant predictors of situational outcome. Before discussing the implications of the current findings, we first address limitations of the study.

First, while the current study surveyed 236 newly jailed inmates and collected 466 situational reports, statistical power could be a problem. Although the sample size was considerable, Model 3 included a large number of

variables. This, in turn, could make it harder to find statistically significant relationships, as well as explain why significant predictive variables in Models 1 and 2 lost significance in the last model.

Second, generalizability for the current study is restricted due to the use of jailed inmates in four county facilities in Pennsylvania. Jailed inmates may have different cognitive and emotional abilities compared to the members of the free, general population. However, the general population does not participate in violent situations enough to conduct an adequate study. Though not generalizable to the entire population, the individuals studied have substantial contact with the criminal justice system, and they represent an interesting and compelling group for researchers to study. This type of sampling resulted in ideal coverage of potential respondents and studied situations.

Lastly, inmates were asked to retrospectively self-report these behaviors. Given that the respondents were asked to recall situations that took place up to 24 months before their incarceration, and that the respondents were incarcerated, creates some concerns with their willingness to truthfully/accurately answer survey items and recall

details of these specific events. Every effort was taken to reduce the respondents' concerns about detailing past illegal behavior, including reminding the respondents of strict confidentiality terms. Past research has shown that samples of incarcerated offenders accurately report their illegal behaviors (see Junger-Tas and Marshall 1999). For recall concerns, a life events calendar was utilized to help frame where, in time, these events occurred during the 24 month period. Research has indicated that individuals use "autobiographical sequences" to organize personal memories, and the recall of specific memories usually improves with cues (see Bradburn et al. 1987; Caspi et al. 1996; Roberts and Horney 2010; Wells and Horney 2002). While the events reported by the respondents may reflect some reconstruction and reinterpretation by respondents, we believe this is outweighed, given that respondents are reporting their actual involvement in high risk for violence scenarios rather than merely responding to hypothetical vignettes. We acknowledge these limitations but also argue that the study presents certain advantages over the typical tests of SIP.

The results of the present study suggest that studying violence among adults at the situational level warrants further examination. Situational analysis allows researchers to focus on an offender's decision making in high risk for violence situations. Decision making is unique to the social context in which it occurs, and involves a highly complex interplay between the individuals involved and environmental factors. The current study examined cognitive aspects of Crick and Dodge's (1994) social information processing theory, along with emotional aspects proposed by Lemerise and Arsenio (2000). While Crick and Dodge's (1994) social information processing theory is well studied in children and adolescents, it has yet to be adequately tested with adults. This research sought to examine the potential of social information processing theory with a group of adults who, arguably, have more defined and rigid "databases" compared to children and adolescents.

As the results indicate, there is a need to further study the theory as applied in violent and criminal situations. Three out of four of the SIP variables (i.e., intent interpretation, goal, and response generation) were significant predictors of violent outcomes in the first model. Two remained significant in the second model (i.e., goal and response generation) and goal remained significant in the third. When drugs and alcohol, as well as weapons variables, were included, the "response generation" variable lost significance at the .05 level. However, this variable could be interacting with the respondent's substance use. Past research has found that substances alter decision making capabilities of individuals in situations (see Chambers et al. 2009). Many tests of social information processing have utilized hypothetical scenarios. While this approach is useful, it does not allow for an understanding of how alcohol and drug use

influence decision-making in real life. With our sample of self-reported, high risk for violence situations, it appears that substance use by the respondent best predicts violent outcomes. This suggests, not surprisingly, a break-down in decision making with use. Future research should focus on this relationship to gain a better understanding of the interplay between SIP and substance abuse in high risk situations.

In addition to the SIP variables, our study examined the role of emotions as suggested by Lemerise and Arsenio (2000). We tested anger at both the individual and situational level. Trait anger reached statistical significance in Models 2 and 3, while situational anger approached statistical significance in Model 2, before the introduction of other situational variables. Our findings suggest that anger may be mediated by other variables (in the present study, perhaps intent to harm and substance use). In addition, given our sample of offenders, future researchers should examine the role of anger and other emotions with different population samples.

The findings from the present study suggest that indicators of proactive aggression (i.e., goal, harm) significantly influence the escalation from avoided violence to actual violence. In situations where an intrapersonal goal was stated along with the respondent indicating wanting to do more harm to the opponent, the odds of violence significantly increased. The findings however, show less support for reactive aggression variables (i.e., intent interpretation and HAB). While interpreting another's intentions more negatively increased the odds of a violent outcome in the first two models, this variable failed to reach statistical significance in the final two models. These findings may be the result of studying adult offenders. This sample is quite different from those that have been previously used in social information processing studies. It suggests that more research on SIP with adults, in general, is needed to determine if the findings from children and adolescents are consistent.

Additionally, state (situational) hostile attribution bias approached significance at the .05 level in Models 2 and 3. Contrary to our expectations, however, in all models it had a negative relationship with violence. As stated in the literature review, past research has found that aggressive youth (especially those who are reactively aggressive) are more likely to attribute hostile intentions to others in a situation. The current study's results concerning hostile attribution bias, counters this past literature. This difference may be, in part, due to methodological issues. Many of the past studies on hostile attribution bias have measured aggression, broadly, rather than violence specifically. In this sample of adult male offenders, we chose to have our "violence" measure clearly depict situations of more serious violence. In contrast our "avoided violence" measure mainly involved: threats of violence, pushing and shoving, and encouraging violence. Thus for this sample, reporting high situational HAB may

lead to more defensive and aggressive "avoided violence" reactions rather than violent ones. Thus, HAB may be associated with aggressive threats and verbal confrontations but may stop short of escalating to violence.

Thus, future research should examine this distinction more carefully. Additionally, future research should also examine the "moral domain" approach (see Arsenio and Lemerise 2004) to better understand how interpretations of the morality of the offender's actions can influence social information processing stages, the emotions that accompany these stages, and reactive versus proactive aggression.

It is important to examine weaponry in any high risk situation. We found that a violent situation was significantly more likely if the opponent had a weapon. A possible explanation for this result is that many of the respondents reported that the opponent was the initial aggressor in the situation. If so, these opponents possibly felt more secure in participating in violence because of the weapon. However, if the respondent had a weapon, the chances for a violent situation decreased. This finding contradicts Wells and Horney's (2002) weaponry study. This is of interest since we used Wells and Horney's operational definitions, and questions, to differentiate between violent and avoided violence situations. Future research should examine decision making, intentions to harm, injury, and weaponry more thoroughly to explain this unique relationship.

In conclusion, the findings of the present study provide partial support for social information processing as an explanation for violent outcomes in a sample of adult offenders. In particular, measures that could be associated with "proactive aggression" were particularly salient. Understanding decision making in high risk for violence encounters requires accounting for a wide array of person, cognitive, emotional, and situational variables. Social information processing theory seems to account for these complexities more easily than the rational choice perspective of crime. The results of the present study provide support for the continuation of utilizing social information processing theory in the study of decision making in violent situations.

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Early Contact with the Criminal Justice System and Intellectual Functioning as Risk Factors for Violent and Chronic Adult Offending

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Abstract*: Prior research suggests early contact with the criminal justice system and neuropsychological deficits are associated with a life course persistent offending trajectory. Prior analyses of this important subject matter in life course criminology have primarily relied on analyses of age cohorts and samples drawn from urban areas. Moreover, prior studies have primarily examined samples comprised largely of majority group members who have committed only minor offenses. Data for the current study were collected from the institutional files of a cohort of 817 males exiting a Louisiana juvenile correctional facility in 1976. This information was then merged with data on the official adult records of participants up to 1988. Logistic and negative binomial regression models were used to examine the effects of age at first contact with the criminal justice system and neuropsychological/intellectual functioning on chronic and violent offending during early adulthood. Age at first contact with law enforcement and intellectual functioning emerged as robust predictors of both violent and chronic offending over the life course. Controlling for race, family criminal history, number of juvenile convictions, juvenile offense type, and diagnosed conduct disorders, early contact with the criminal justice system and intellectual functioning were inversely related to the likelihood of being charged with a violent offense as an adult. Further, early contact with the system and intellectual functioning exhibited strong inverse associations with the total number of adult criminal charges.*

Keywords: adolescent limited offending, age of onset, intellectual functioning, life course persistent offending

INTRODUCTION

Examinations of criminal trajectories over the life course have long been a staple within the criminological literature. Although many juveniles commit minor forms of delinquency, theoretical perspectives have attempted to develop indicators to identify which youth will become violent and chronic adult offenders. A number of risk and protective factors, such as age at first contact with law enforcement, neuropsychological deficits, intellectual functioning, family make-up, attachment to mainstream institutions, peer relationships, previous offending patterns, and neighborhood conditions have been cited in the extant literature. However, because of the limited availability of longitudinal data on serious delinquents and

concerns over the generalizability of the extant research findings, it is critical that researchers continue to add to the foundation of this important subject matter in life course criminology.

Two consistent findings within prior research are that the early onset of antisocial or delinquent behavior and low levels of intellectual functioning increase the likelihood of violent and chronic offending over the life course. Such findings are consistent with Moffitt's (1993) developmental taxonomy in which she identifies two distinct offending trajectories. The majority of delinquent youth have a relatively short criminal career during which they commit primarily minor or status offenses. That is, most youth are Adolescence Limited (AL) offenders who do not progress to chronic or violent offending. A second group of offenders, Life Course Persistent (LCP) offenders, comprise approximately 6% of offenders who are responsible for a disproportionate amount of delinquency (Carroll et al. 2006). LCP offenders begin their criminal careers at an earlier age, have lower levels of intellectual functioning, often commit serious and personal crimes, and engage in antisocial and delinquent behavior throughout their lives.

Moffitt's taxonomic theory has received considerable attention and empirical support. The distinction between AL and LCP offending trajectories is critical to intervention and prevention efforts, which have limited resources and can be more effective when targeted toward those individuals most likely to become violent or chronic offenders. The current study adds to the foundation of this important subject matter in life course criminology by analyzing a unique data source for delinquent youth, many of whom have committed serious or violent offenses. Prior studies have primarily relied on age cohorts or relatively small samples of urban majority group members with low levels of delinquency. We address these limitations by examining a cohort of primarily black males who exited a secure juvenile correctional facility in Louisiana in 1976. In order to examine offending patterns from adolescence into early adulthood, data were collected at two time points, 1976 and 1988. We draw on these unique data on serious delinquents from diverse social settings to examine the associations between age at first contact with law enforcement, intellectual functioning, and patterns of chronic and violent offending in early adulthood.

THEORETICAL FRAMEWORK AND PRIOR FINDINGS

There is a rich literature examining the persistence and desistance of antisocial and delinquent behavior from youth into adulthood. Much of this literature is grounded in developmental theoretical frameworks centered on identifying distinct offending trajectories over the life course. Such analyses have important implications for intervention and prevention programs, which have limited

resources and are most effective when targeted toward individuals likely to become violent or chronic offenders (Tremblay et al. 1992; Tremblay and Craig 1995; Wasserman and Miller 1998). Translating research findings into effective programming may allow policy makers the opportunity to develop and implement programs that reduce the antisocial behavior of individuals over the life course. As such, it is imperative that researchers continue to add to the foundation of this important subject matter in life-course criminology toward identifying youth at risk of becoming chronic and violent adult offenders. It is, after all, chronic offenders that are responsible for the majority of criminal offenses.

Moffitt (1993) developed a theoretical explanation outlining two distinct trajectories of criminality from adolescence into adulthood, Adolescent Limited (AL) and Life Course Persistent (LCP). Each trajectory is grounded in a distinct developmental history. Moffitt's theory is anchored in concepts of normal development and behavior and recognizes that most juveniles will take part in anti-social behavior only during adolescence, a chaotic and challenging period of life. The majority of juveniles commit relatively minor forms of delinquency with such behavior declining during the transition into adulthood and many completely desisting by age 30 (Sampson and Laub 2003). Such youth primarily commit minor or status offense (e.g. drug use, vandalism, and theft) and often do not have a history of antisocial behavior. Moffitt attributes the antisocial behavior of AL offenders to the social mimicry or modeling of deviant peers as well as strain resulting from the gap between biological and social maturity. Many youth begin to commit delinquent acts during adolescence in an attempt to assert their independence and maturity and to attain social recognition from parents and peers (Caspi and Moffitt 1995). This behavior peaks around age 17 and quickly drops off as the adolescent matures, develops pro-social bonds, begins to understand the consequences of delinquency, and adopts a conventional and socially acceptable lifestyle (Aguilar et al. 2000; Laub, Nagin, and Sampson 1998; Laub and Sampson 1993).

A small group, approximately 4 to 6% of youth, exhibit a pattern of antisocial and criminal behavior throughout their life and are what Moffitt terms LCP offenders. Moffitt's identification of this group dovetails with research on chronic offenders, which suggests a small but hard-core group of offenders are responsible for a disproportionate amount of crime and delinquency (Carroll et al. 2006; Wolfgang, Figilo and Sellin 1972). Moffitt identified several risk factors that distinguish AL and LCP offenders, which have been empirically supported. Chronic or LCP offenders are aggressive, have a difficult temperament, are unable to regulate impulses, have low levels of intellectual functioning, and often begin committing antisocial and delinquent acts early in life (Moffitt 1993). Moffit attributes the criminal behavior of

LCP offenders to the confluence of neuropsychological deficits and negative social environments. Moreover, prior research suggests that age at first contact with law enforcement and intellectual functioning are particularly robust predictors of chronic or LCP offending (Blumstein et al. 1986; DeLisi and Piquero 2011; DeLisi et al. 2013; Farrington and Hawkins 1991; McCluskey, McCluskey and Bynum 2006; Moffitt and Caspi 2001; Moffitt et al. 2008; Ribeiro da Silva, Rijo and Salekin 2012; Vaughn and Howard 2005).

There are a number of rationales as to why youth who initiate their delinquent careers at an earlier age have an increased probability of becoming chronic or LCP offenders. This association may be representative of stable individual differences in anti-social characteristics and the propensity to offend (Bacon, Paternoster, and Brame 2009; Nagin and Farrington 1992; Nagin and Paternoster 2000). That is, contact with law enforcement at an earlier age may not have a direct causal effect on future offending, but rather those who have a greater propensity to commit delinquent acts do so over their entire life course. A second argument proposes that the early onset of delinquency may set in motion labeling, social control and other processes and mechanisms that may have a causal impact on the propensity to commit criminal acts over the life course. Specifically, individuals who exhibit criminal behavior at an early age are more likely to be labeled delinquent, perceive themselves as delinquent, develop bonds with delinquent peers, and experience a weakening of pro-social bonds and attachments (Bernburg and Krohn 2003; Laub and Sampson 1993; Nagin and Paternoster 2000; Smith and Paternoster 1990; Thornberry 1987). A middle ground was offered by Piquero and Chung (2001) in which early onset offending serves as both a marker of criminal propensity and a meaningful and dynamic event. That is, "individuals with high criminal propensity are more likely to incur an early onset and are more likely than those with low criminal propensity to attribute saliency to the experience of an early onset" (Piquero and Chung 2001:200). Finally, the delinquent behavior of high-risk youth may be moderated by neighborhood factors. Moffitt and colleagues suggest that ''life-course-persistent antisocial behavior originates early in life, when the difficult behavior of a high-risk young child is exacerbated by high-risk social environment'' (Moffitt et al. 2002:180). Regardless of the underlying process, a number of prior studies report that the early onset of antisocial and officially recorded delinquent behavior increases the likelihood that an individual will follow a LCP trajectory and become a chronic adult offender (Farrington 1992, 1997, 2003).

In addition to chronic offending, prior literature suggests individuals who begin their delinquent careers at an early age tend to be more physically aggressive and have an increased likelihood of committing violent offenses during adulthood (Loeber and Farrington 2000;

McCluskey, McCluskey, and Bynum 2006). Prior studies have found youth who begin offending before age 13 are two to three times more likely to become serious, violent, and chronic offenders (Loeber and Farrington 2000) and that juveniles convicted of a violent crime between ages 10-16 are more likely to commit violent crimes as adults compared to their non-violent counterparts (Hawkins et al. 2000). Findings from the Cambridge Study in Delinquent Development, a longitudinal survey of the development of offending and antisocial behavior in 411 boys followed from ages 8-46, showed that males first convicted at an early age tended to become the most persistent adult offenders. Those convicted between ages 10-13 averaged 8.8 convictions before the age of 40 and had an average career duration of 11.6 years (Farrington 1998). The sample also exhibited considerable continuity in their offending careers with 73% of those convicted between ages 10-16 recidivating during early adulthood (Farrington 1992). Moreover, 85% of recidivists were convicted of a violent crime and the probability of committing a violent offense was positively associated with the number of prior offenses (Farrington 1992, 1997).

Beyond early contact with the criminal justice system, prior research suggests chronic or LCP offenders exhibit deficits in neuropsychological abilities (DeLisi and Vaughn 2011; Eme 2009; Loeber 1990; Moffitt 1990; Moffitt and Silva 1988). Neuropsychological deficits can be identified in infancy and tend to manifest in areas such as reading, memory, attention, and impulsivity (Aguilar et al. 2000). In the absence of direct measures, such deficiencies are often gauged with proxy measures of intellectual functioning. Prior studies indicate that the verbal and non-verbal IQ scores of chronic or LCP offenders are about half a standard deviation lower, approximately 8 points, than AL offenders (Lynam, Moffitt and Stouthamer-Loeber 1993; Moffitt, Lynam and Silva 1994). While the causes, interpretation, and implications of the association between intellectual functioning and chronic and violent offending have been debated, it is clear that low scores on various intelligence exams are correlated with antisocial behavior, delinquency, and violence during adulthood (Piquero and White 2003).

In an analysis of longitudinal cohort data from the Dunedin Multidisciplinary Health and Development study, Moffitt et al. (1994) found that youth who began their delinquent careers before the age of 13 scored worse on neuropsychological tests than their non-delinquent counterparts. Moreover, juveniles with the lowest scores were also the most delinquent in a 5 year follow-up study when the young men had reached adulthood. The 12% of respondents with the poorest scores were also responsible for more than half of the officially recorded crimes committed by the entire sample. Analyses of longitudinal data on a cohort of 12 and 13 year old males from the Pittsburgh Youth Study offered similar findings.

Controlling for race, class, and test motivation, there was a strong inverse association between IQ score and delinquency and those with lower levels of intellectual functioning exhibited higher rates of overall delinquency (Lynam, et al. 1993). However, this relation did not hold among White youth. Although there was a relationship between IQ and school achievement for both White and Black youth, education proved to have differing effects on delinquency patterns. Most delinquents performed poorly in school, yet Black youth were found to be at the greatest risk for delinquency.

In sum, the extant literature suggests several developmental risk factors are associated with chronic and violent offending over the life course. Prior studies have found contact with the criminal justice system at an early age and intellectual functioning to be inversely associated with both the severity and frequency of adult offending. However, the effects of these factors on both violent and persistent offending remain important subject matters in life-course criminology and continue to be debated. There are certain limitations to prior research, in part due to the limited availability of data on serious delinquents, and thus researchers continue to explore the robustness and generalizability of prior findings. A number of prior studies have relied on convenience or age cohort samples comprised of predominantly White respondents that have committed no or relatively minor delinquent offenses. In such contexts, it is difficult to ascertain if predictors of distinct life course trajectories are applicable to serious or chronic offenders. In addition, prior research has primarily focused on samples drawn from a single community, often in urbanized areas. While such studies have highlighted the role of bonds and attachment to mainstream social institutions (Laub and Sampson 1993) the potentially differential impact of urban and rural environments is often overlooked. In the current study, we explore the robustness of age at first contact with law enforcement and intellectual functioning as predictors of both chronic and violent offending in early adulthood while addressing certain limitations in prior research. Specifically, we draw on unique data from a sample of serious delinquents previously detained in a secure juvenile correctional facility in Louisiana. We expect to uncover inverse associations between age at first contact with law enforcement, intellectual functioning, and both the total number and severity of offenses committed in early adulthood.

DATA, MEASURES AND METHODS

Whereas a number of prior studies have focused on large urban area, the current sample is comprised of individuals from both urban and rural locales. The current study examines data from Louisiana, which has and continues to be largely comprised of rural areas and small towns. Louisiana ranks 25th in the nation for population

size having only two large metropolitan areas, New Orleans and Baton Rouge. From 1979 to 1989, the time period during which the data for this study were collected, the state poverty rate increased from 18% to 23%, ranking Louisiana as one of the five poorest states during both decades (US Department of Commerce 1993). Louisiana schools, especially those in New Orleans, were among the worst in the country with more than 85% of 4th graders reading below their grade level (Currie 1998). In 1980, approximately 30% of state residents were Black and minorities comprised more than half of the population in six parishes (counties) (Louisiana Division of Administration 1990). Louisiana has also been plagued by high levels of violence and incarceration. Between 1970 and 1995 the New Orleans homicide rate increased by 325% while the state experienced a five-fold increase in incarceration rates, one of the fastest growing rates in the country (Currie 1998). By 1995, Louisiana reported an incarceration rate second only to Texas. Louisiana has and continues to be a state in which residents face persistent environmental and structural disadvantages and inequalities, have few educational and economic resources, and where many residents are isolated from mainstream socializing institutions.

The data examined in this study were originally collected under a legislative directive focused on prison overcrowding. Data were collected retrospectively from institutional files on a cohort of 817 male delinquents exiting the Louisiana Technical Institute (LTI) during 1976. Data on adult offending were collected during a follow-up period in 1988 on 508 of the individuals in the initial sample (Guin 1991)[1]. The institution had 11 sites across the state and housed youth from nearly every parish, representing a mix of urban and rural communities. All youth exiting this juvenile detainment system, which was the only set of facilities that housed juveniles who had been adjudicated and sentenced for their crimes in Louisiana, were included in this sample. The sample does not include youth who were detained in parish detention centers. In 1988, approximately 90% of the cohort was located utilizing state and federal databases containing official criminal records with the remaining individual being unidentifiable in official records or deceased[2]. Examinations of adult records indicated that more than 80% of the cohort had been charged with criminal offenses during their relatively early adult lives.

The youth in the original cohort ranged in age from 11 to 22 with a mean of 16. Racial minorities, particularly Blacks, comprised the bulk of the sample (71%). About three-quarters (73%) of the youth were either erratically or not attending school. Over 70% of the youth came from disrupted family structures and 60% had family members with an official criminal history. The youth had been housed in detention centers for a multitude of offenses, both property (59%) and violent (17%) and more than a quarter of the youth had previous convictions. The follow-

up study in 1988 showed that, as adults, 17 cohort members were charged with homicide, 154 were charged with burglary, 53 were charged with armed robbery, 158 were charged with robbery or theft. Among the cohort members who were charged with murder it is known that 3 individuals were eventually convicted of capital crimes and executed by the state. Overall, it appears that individuals who went on to violent and chronic adult criminal careers were over-represented in the cohort analyzed in the current study. Considering crimes, especially violent crimes, are relatively rare events, it is critical that analyses of the impact of predictors of criminal trajectories study actual criminal offenders rather than individuals who commit minor delinquent acts (e.g. smoking, curfew violations, etc.). As such, these data are uniquely situated to contribute to the extant literature on criminal trajectories over the life course.

These data also offer a unique blend of advantages often garnered from either self-report or official data. In addition to official offending records, the data provide indicators often available only in large scale and costly self-report data collection efforts such as the Cambridge and Dunedin Studies. These include indicators of intellectual functioning, mental disorder diagnoses, and parent and sibling criminal history collected by the institution from other official records. It is however important to recognize that official data suffer from certain inherent weaknesses. For example, it is impossible to definitively measure the true number of offenses committed by an individual using only official data. The police do not become aware of every offense and do not make an arrest for every crime that comes to their attention. Prior studies suggest only 13% of police contacts with youth lead to an arrest (Worden and Myers 1999). The quality of official data has also been questioned. Names, birthdates, social security numbers, aliases, and misspellings undermine data accuracy and quality (Geerken 1994). That said, an important strength of official data is the availability and comparability of relatively accurate and consistent data over time. Once individuals have entered into the system, it is relatively easy to follow their criminal careers. Despite inconsistencies across self-report and official data sources, prior research on criminal careers suggests the social correlates of offending are relatively concordant across data sources (Brame et al. 2005; Kazemian and Farrington 2005; Kirk 2006; Thornberry and Krohn 2003).

Dependent Variables

Among the 508 youth found in the follow-up of the original cohort 87.6% were charged with crimes during their early adult lives. However, there was considerable variation in both chronic and violent offending during early adulthood. The focus of the current study is twofold. We begin by examining the role of factors measured during the respondent's youth in predicting whether he was charged with a violent crime during early adulthood. Specifically, we analyze a binary indicator of adult violence in which those charged with a murder, rape, robbery, or aggravated assault as an adult were coded 1. In addition, we examine predictors of the total number of offenses respondents were charged with during their early adult years. Table 1 presents descriptive statistics for all measures included in the analyses. Of the 508 respondents included in the analyses, 27% (136) were charged with a violent crime as an adult. Although 12.4% of respondents were not charged with a crime during early adulthood, there is significant variation in the number of charges across the sample ranging from 0 to 55 with a mean of about 3.

Table 1: **Descriptive Statistics for Study Variables, 1976 & 1988 (N=508)**

	Minimum	**Maximum**	**Mean**	**Standard Deviation**
Adult Violent Crime	0	1	.27	.44
Number of Adult Crimes	0	55	3.08	4.36
Age at First Contact	5	17	13.17	2.27
WISC	-9.30	8.52	.01	2.83
JV Convictions	1	10	3.65	1.92
Property Off.	0	1	.57	.50
Urban	0	1	.61	.49
Black	0	1	.69	.46
Axis Category	0	2	.56	.73
Fam. Crim. Hist.	0	1	.55	.50
Adult Years	7	16	11.85	1.17

Primary Explanatory Measures

Our primary explanatory variables are measures highlighted in Moffitt's (1993) developmental taxonomy of offending trajectories. Moffitt (1993) proposed that, compared to AL offenders, LCP offenders begin their criminal careers at an earlier age and this has received empirical support (Blumstein et al. 1986; Farrington et al. 1990; Piquero and Chung 2001). Our analyses include a measure of the age at which a youth first came into contact with the criminal justice system, which is a proxy for the onset of antisocial behavior (Moffitt et al. 2008). An initial contact with legal authorities does not necessarily equate to an arrest. Such contact indicates law enforcement interceded in a juvenile's life as a result of a confirmed or suspected status or delinquent offense. In our sample, age at first contact varies between 5 and 17 with an average of approximately 13. More than 50% of respondents had their first contact with law enforcement prior to age 14, the traditional cutoff for early onset delinquency (Moffitt et al. 1994; Patterson, Crosby and Vuchinich 1992; Simmons et al. 1994; Tibbetts and Piquero 1999). In addition, intellectual functioning is expected to be inversely associated with both violent and chronic offending during early adulthood (Eme 2009; Moffitt 1997; Piquero and Chung 2001). We assess intellectual functioning with the Wechsler Intelligence Scale for Children (WISC), which has been described as one of the most psychometrically trustworthy measures of intellectual functioning in children (Caspi et al. 1996; Lynam et al. 1993). Our analyses include a standardized composite scale comprised of three WISC scales: summary measures of verbal and spatial ability and a full scale IQ as a general measure of intelligence. An Alpha value of .929 indicates the scale is internally consistent.

Control Measures

Beyond our primary explanatory measures, a number of control measures were explored. We include a binary indicator of the type of juvenile offenses committed in which property offenses are coded 1. Approximately 57% of respondents committed only property crimes during their youth as opposed to violent or both property and violent crimes. We expect youth who specialized in property offense to have a lower likelihood of committing a violent crime in early adulthood. We also control for the total number of crimes for which youth were adjudicated, a continuous measure that varies between 1 and 10 with a mean of 3.65[3]. Delinquency levels are quite high in this sample, as evidenced by an average of nearly 4 offenses and 28% of respondents committing more than 4. Prior literature suggests individuals with a greater number of juvenile convictions are likely to become chronic and violent adult offenders (Farrington 1992). Official files included an indicator of the criminal history of family members (i.e. father, mother, and siblings), which is likely to exacerbate an individual's criminality (Warr 1998; Laub and Sampson 1993; Akers et al. 1979). Individuals with close family members immersed in a life of crime may have a greater likelihood of becoming chronic and violent adult offenders. We control for such processes with a binary indicator coded 1 if a family member had been officially processed through the criminal justice systems. Approximately 55% of respondents had at least one family member processed into the system.

Our analyses also include indicators of respondent's race[4] (0= white / 1=black) and community type (0=rural / 1=urban). Consistent with prior research on disproportionate minority contact in the South (Thomas, Moak and Walker 2013), approximately 69% of respondents were black and 31% were white. In addition, 61% of respondents resided in urban centers with populations greater than 100,000 with the remaining 39% living in rural locales. A measure of mental health stability was also available. Mental health disorders, particularly personality disorders, have emerged as robust correlates of conduct problems, delinquency, and adult criminal offending (Harris, Rice and Cormier 1991; Ribeiro da Silva et al. 2012; Salekin, Rogers and Sewell 1996; Vaughn and Howard 2005). These disorders are categorized as Axis I or II based on the DSM III (American Psychiatric Association 1980). Axis I disorders include clinical disorders, such as oppositional defiant disorder, anxiety disorders, and depression. Axis I disorders often affect individuals over the short term, such as adjustment disorders, can be managed with counseling and medication, and do not permeate all factions of a person's life. Many of the youth in the cohort were diagnosed with disorders such as "adjustment reaction to adolescence" or "situational depression" both of which are considered to be appropriate developmental and situational responses based on their age and confinement (Guin 1991). Axis II disorders include personality disorders, such as antisocial and narcissistic personality. Axis II disorders are categorized as enduring patterns of maladaptiveness that endure across time and all social situations (APA 1980). Adaptation difficulties tend to permeate the individuals cognition and behavior, becoming apparent in almost every aspect of individual functioning (APA 1980). Personality disorders are often recognized in late adolescence, persist over time, are not considered developmentally appropriate for youth, and are considered more severe than situational disorders. Mental retardation is sometimes considered an Axis II disorder; however such diagnoses are excluded from the measure used in the current study. The measure used in the current study is a mental health diagnosis scale in which youth whom were never diagnosed with a disorder were coded zero, youth diagnosed with an Axis I disorder were coded 1, and individuals diagnosed with an Axis II disorder are coded 2[5].

Analytical Strategy

We begin our analyses with a logistic regression predicting variation in the relative likelihood that a formerly detained delinquent will commit a violent crime during early adulthood. In our analysis of chronic adult offending, we use a Poisson-based estimator to predict the number of crimes respondents were charged with as an adult (Osgood and Chambers 2000). The standard Poisson model assumes the mean and variance of the outcome are equal. When the variance exceeds the mean, as it often does with crime data, the distribution is said to be over dispersed, and an alternative Poisson-based estimator that allows for the introduction of an error term is appropriate (Long and Freese 2006). Tests for over dispersion indicated this was the case with these data, and so we use a negative binomial estimator to predict the adult crime count. Because age varies across the sample, the time each individual was at risk of being charged with an offense as an adult varies. It is plausible that time at risk impacts the number of offenses an individual is charged with; therefore we incorporate adult years, age at wave 2 minus 18, as an exposure variable. Respondents were between 25 and 34 in 1988 (wave 2) corresponding to exposure times ranging from 7 to 16 years with an average of approximately 12 years.

RESULTS

Model 1 of Table 2 presents the results of a logistic regression using indicators measured when the individuals were youth to predict the likelihood of being charged with at least one violent crime during early adulthood. Each of the primary explanatory measures but few of the control measures are significantly associated with the probability that an individual was charged with a violent crime as an adult. Combined, the predictors explain approximately 12% of the variation in the likelihood that an individual will be charged with a violent crime during early adulthood. Consistent with Moffitt's expectations regarding LCP offenders, the results indicate that the age at which a juvenile first came into contact with law enforcement is significantly and negatively associated with the likelihood of being charged with a violent crime as an adult. In terms of effect size, controlling for the other measures in the model, each additional year that a juvenile avoids contact with law enforcement reduces the odds of being charged with a violent offense as an adult by 16.3%. This effect is illustrated in Figure 1, in which the x-axis corresponds to the range of observed ages in which youth were first processed into the juvenile justice system and the y-axis represents the predicted probability that an offender will commit a violent crime during early adulthood. When all other measures are held constant at their respective means, the probability that an individual will be charged with a violent crime is approximately .6

for youth who first come into contact with the system at age 5 and the probability drops to approximately .15 when age at first contact occurs at 17.

Beyond age at first contact, it was expected that neuropsychological deficits and specializing in property offenses as a youth would significantly influence the likelihood of committing a violent crime during early adulthood. As expected, the results indicate that the index of WISC scores is significantly and negatively associated with the likelihood of being charged with a violent crime in early adulthood. In terms of effect size, controlling for the other measures in the model, a standard deviation increase (2.83) in the WISC scale score reduces the odds that an individual will be charged as an adult violent offender by 20.4%. That is, higher levels of intellectual functioning reduce the likelihood of being charged with a violent crime as an adult. In addition, the results confirm our expectation regarding the effect of the nature of the offense committed by a youth on the likelihood that they will become a violent adult offender. Youth who committed only property offenses are significantly less likely to be charged with a violent offense as an adult. Compared to general and violent offenders, the odds that an individual will be charged with a violent offense during early adulthood are approximately 40% lower for youth who specialize in property crimes.

The results have thus far confirmed our expectations; however, the impact of juvenile convictions and the criminality of family members on violent offending in early adulthood are not as expected. We expected individuals with a greater number of juvenile convictions to have an increased probability of violent criminality during adulthood. The results, however, indicate that, controlling for the other measures in the analysis, the number of juvenile convictions does not significantly influence the likelihood of being charged with a violent offense as an adult. In addition, we expected individuals whose family members have a history of criminal convictions to have an elevated likelihood of being charged as a violent adult offender. The results fail to support this expectation, instead indicating that the officially recorded criminality of close family members does not significantly influence the odds that an individual will be charged with a violent adult offense. The results also suggest that neither race nor mental health disorder diagnoses are significantly associated with the likelihood of being charged with a violent offense in early adulthood. However, location emerged as a strong predictor of adult violence with the odds of being charged with a violent crime being 121% greater for individuals residing in large urban centers as compared to rural areas.

The above results indicate age at first contact and neuropsychological deficits or intellectual functioning are strong and robust predictors of violent offending during

Table 2: **Regression Models Predicting Violent Crime and Total Charges as Adult, 1988 (N=508) [a]**

|	Model 1 – Violent [b]	Model 2 - Adult Charges[c]
Age at First Contact	-.178** (.046) [.837]	-.055* (.025) [.946]
WISC	-.081* (.041) [.923]	-.058** (.019) [.943]
JV Convictions	-.038 (.054) [.963]	.012 (.028) [1.012]
Property Off.	-.509* (.214) [.601]	.043 (.110) [1.044]
Urban	.793** (.241) [2.210]	.203+ (.109) [1.225]
Black	.233 (.281) [1.262]	-.031 (.114) [.986]
Axis Category	.202 (.143) [1.223]	.134+ (.082) [1.103]
Fam. Crim. Hist.	-.116 (.217) [.891]	-.322** (.114) [.852]
Constant	.959 (.750)	-.729+ (.405)
Nagelkerke Pseudo R^2	.12	.08

**p≤.01; *p≤.05; +p≤.10, 2-tail tests
[a] *Coefficients with standard errors in parentheses. Values in brackets are odds ratios (Model 1) and factor change in expected count (Model 2).*
[b] Binary logistic regression.
[c] Negative binomial regression (Exposure: Number of adult years).

Figure 1: Predicted Probability of Adult Violence by Age at First Contact
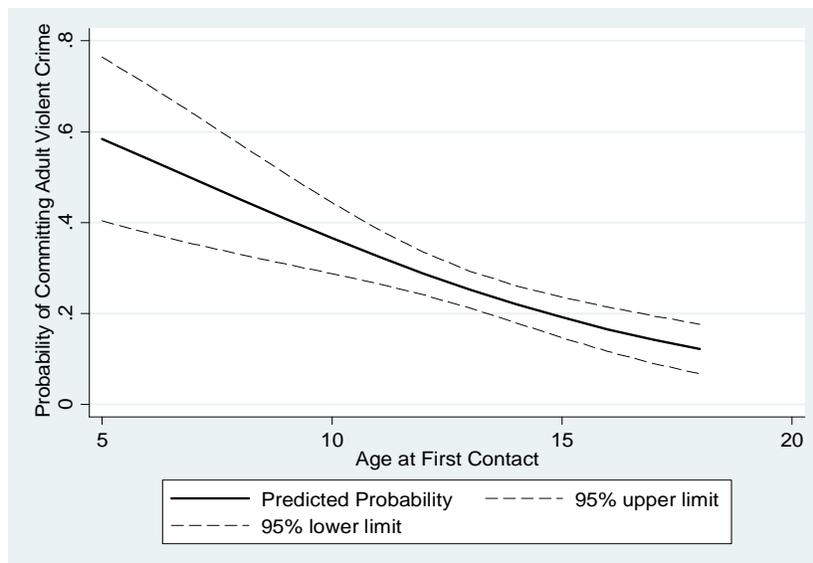
early adulthood. Moffitt (1993), however, proposed that such factors would be characteristic of chronic or persistent offenders. We test these propositions with a negative binomial regression analysis predicting the total number of offenses individuals were charged with during early adulthood. The results of this analysis are presented in Model 2 of Table 2. Time at risk (number of years as an adult) is incorporated into this analysis as an exposure effect (Long and Freese 2006). Combined, the predictors explain approximately 8% of the variation in the number of adult criminal charges[6]. As expected, individuals who first contact law enforcement at an earlier age are charged with significantly more criminal offenses as an adult. This finding is consistent with our analysis of violent offending and supports Moffitt's (1993) proposition that LCP or chronic offenders begin their criminal careers at an earlier age and are charged with significantly more offenses as adults. In terms of effect size, each additional year that a juvenile avoids official contact with the criminal justice system reduces the expected number of crimes he will be charged with as an adult by 5.4%.

Moffitt (1993) also proposed that LCP or chronic offenders would suffer from neuropsychological deficits. As such, we expected our indicator of intellectual functioning, a standardized composite index of verbal and non-verbal intelligence, to be negatively associated with the adult offense count. As expected, youth with higher scores on the WISC index indicating greater levels of neuropsychological or intellectual functioning were charged with significantly fewer offenses as an adult. In terms of effect size, controlling for the other measures in the model, a standard deviation increase (2.83) in the standardized WISC scale score reduces the expected number of crimes an individual will be charged with during early adulthood by 15.3%. Beyond age at first contact and neuropsychological functioning, we expected the number and type of juvenile convictions to be significantly associated with the number of adult criminal charges. The results however indicate that, controlling for the other measures in the analysis, the number of juvenile convictions and the nature of these offenses did not significantly influence the total number of adult criminal charges.

A number of control measures were significantly associated with chronic adult offending. Although race was not a significant factor, both urban location and diagnosed mental health disorders exhibited a marginally significant influence on total adult charges. Individuals residing in urban as opposed to rural areas and those with personality disorders were charged with a greater number of crimes during their early adult years. In contrast, the impact of the officially recorded criminality of family members, once again, did not conform to expectations. The criminality of family members did not exacerbate the likelihood that an individual would be a chronic adult offender. Instead, the results indicate that officially

documented criminal activity by family members is negatively associated with chronic adult offending. It is possible that such findings are the result of undetected offending due to the reliance on official data. That is, individuals may learn techniques from family members regarding how to successfully evade law enforcement. Alternatively, negative and costly interactions between family members and the criminal justice system may have attenuated the criminality of the individuals in this study. Similar findings from the Rochester Inter-generational Study have been attributed to differential levels of parenting style and contact (Laub and Sampson 1988; Thornberry 2009; Thornberry et al. 2003). That is, "when contact is ongoing, antisocial behavior in the earlier generation increases involvement in antisocial behavior by the later generation; when contact is low; however, there is no transfer of risk" (Thornberry 2009:320).

Supplemental and Sensitivity Analyses

We conducted a number of supplemental analyses to ensure the reliability and robustness of our results. Prior literature generally identifies ages 13 or 14 as a "cut-off" point to distinguish early and late onset delinquency (Moffitt et al. 1994; Piquero and Chung 2001). In addition, prior analyses often exclude or have no data on very young youth. As such, we explored potential "cut-off" points for the early onset of delinquency by creating binary indicators of whether a youth committed his first offense before age 13, before age 14, and we then recreated these measures after removing the small number of youth (n=14) who first contacted law enforcement between ages 5-8. Correlations between these alternative indicators of early onset delinquency and all other measures included in our analyses are presented in Appendix A. Without exception, supplemental analyses revealed age of onset or the early onset of delinquency to be significantly and negatively associated with both the number of adult criminal charges and the likelihood of committing a violent adult offense. Moreover, the magnitude of the effects of these alternative indicators increased when youth who first contacted law enforcement between ages 5-8 were removed from the sample. In a similar fashion, we conducted auxiliary analyses using alternative measures of intellectual functioning (i.e. WRAT scores). Again, the results were substantively the same as those presented.

Beyond exploring alternative measurement specifications for our primary explanatory measures, we took several steps to explore the robustness of our results. First, we inspected collinearity diagnostics for each model and variance inflation factors for all measures were below 2.5, a conservative criterion suggested by Allison (1999). Second, we probed extensively for the presence of outlying and influential cases. Removing cases with standardized residual values above ±3.0, a fairly conservative criterion, did not lead to substantively altered conclusions. Third, we

tested the sensitivity of the results to sample modifications by implementing a 10% random sample deletion and re-estimating the models. These modifications failed to uncover any substantive deviations from the reported results. Fourth, while we include an exposure measure capturing time at risk (number of years as an adult) in our analysis, it is possible that detention or incarceration time would limit exposure. The data do not provide an indicator of the total time an individual was detained or incarcerated, however, sentence length is linked to offense severity. As such, we conducted supplemental analyses after removing youth and adult homicide offenders. The results from these analyses were substantively the same as those presented. Finally, we explored the influence of additional control measures on both dependent variables. These data provided a number of potential independent variables; however, some measures were omitted from the reported analyses due to excessive levels of missing data. The additional variables included in auxiliary analyses include: school behavior problems, high school dropout, truancy, family public assistance, family disruption (single parent headed household), abuse and maltreatment, and drug or alcohol use. All supplemental analyses yielded results substantively similar to those reported in terms of coefficient sign, size, strength, and significance. Overall, the results are robust and relatively invariant to alternative model specifications and we are confident that the omission of such variables did not significantly bias the findings.

DISCUSSION AND CONCLUSION

Moffitt predicted that delinquent youth follow one of two criminal trajectories over the life course; adolescence limited (AL) or life course persistent (LCP). She asserted that a number of factors, including early onset delinquency and attenuated levels of intellectual functioning, could be assessed to identify individuals with an increased probability of becoming LCP or chronic offenders. Prior research largely supports Moffitt's contentions; however, it is imperative that researchers continue to investigate the robustness and generalizability of prior findings to add to the foundation of this important subject matter in life-course criminology. The current study contributes to the literature by assessing the offending patterns of individuals from youth through early adulthood. Specifically, data on a cohort of 508 youth exiting a group of Louisiana juvenile correctional facilities were examined for 1976 and 1988. This study serves as a good counterpart to the extant literature in that our sample includes a number of both violent and chronic offenders. Black youth are well represented in the sample and offenders were drawn from communities spanning the urban / rural divide. These data also offer advantages often garnered from either official or self-report data and are thus uniquely positioned to contribute to the literature on life course criminology and criminal careers.

In addition to providing official offending data, these data provide indicators pertinent to analyses of criminal trajectories over the life course, such as intellectual functioning, mental disorder diagnoses, and family criminal history. Although these data were collected 25 year ago, our findings are consistent with prior research and would likely be no different had more current data been available. In particular, the social and economic landscape of Louisiana has changed very little along a number of critical dimensions. In 2008, Louisiana had the highest murder and incarceration rates among all states with more than 40,000 adults incarcerated and 40% serving sentences greater than 10 years. Nearly 40% of inmates have been convicted of a violent crime, making Louisiana the 6th most violent state. Moreover, more than 4,200 juveniles are currently under state supervision, 12% in juvenile prisons (Council for a Better Louisiana 2011).

Whereas prior studies have focused on age specific cohorts of youth, many of which never commit a serious offense, the current study analyzed data on a cohort of serious delinquents exiting a secure juvenile correctional facility. Moreover, chronic offenders are likely over represented in the current sample. Due to considerable variation in age across the sample, it was necessary to control for age related opportunity effects. For example, an offender released in 1976 at age 10 would only have 4 years to offend as an adult when data were collected again in 1988, whereas a juvenile released in 1976 at age 18 would have a 12 years of opportunity to offend as an adult. Controlling for such opportunity effects and additional control measures, our analyses indicated that youth with neuropsychological deficits, measured with a summary scale of verbal ability, spatial ability, and a full scale IQ, were more likely to become violent and chronic adult offenders. In addition, age at first contact with law enforcement was significantly negatively associated with both the likelihood of committing a violent crime and chronic offending during early adulthood. That is, individuals who began their criminal careers at an earlier age are significantly more likely to be charged with a violent crime as an adult as well as significantly more offenses.

To put the criminal propensity of the respondents in the current study into context, youth who first contacted law enforcement between ages 9-11 committed, on average, 4 adult crimes. In comparison, youth whose onset of delinquency occurred between ages 12-14 and 15-17 committed an average of 3.17 and 2.44 crimes as an adult. While supplemental analyses revealed no evidence of an interactive or moderation association between age at first contact and neuropsychological deficits, an examination of the co-occurrence of these risk factors adds to the story told in these data. Sixty-five respondents first contacted law enforcement prior to age 14 *and* scored 2 standard

deviations below the mean on our measure of intellectual functioning. In comparison, sixty respondents first contacted law enforcement subsequent to turning 14 *and* scored 2 standard deviations above the mean on our measures of intellectual functioning. The group of respondents characterized by *both* early onset delinquency and neuropsychological deficits committed in excess of 140% more adult crimes compared to their counterparts characterized by late onset delinquency and above average intellectual functioning.

The ability to identify youth who may be headed down the path of violent or chronic offending over their life course can be critical to public policy and crime control efforts. If we can identify youth likely to become chronic or LCP offenders, it may be possible to develop interventions that interrupt this path. By understanding the relationship between age at first contact, neuropsychological deficits, and the seriousness and prevalence of adult offending, policy makers would have an opportunity to design and implement effective programs that postpone the onset of offending and reduce the propensity to offend, thereby reducing the likelihood of violent and chronic adult offending. The data used in the current study indicates youth who first contact law enforcement between ages 9-11 commit nearly twice the number of crimes during early adulthood compared to those who first contact law enforcement between ages 15-17. This suggests that programming directed toward early onset offenders could potentially impact levels of crime for decades to come. Such programming could pay dividends as chronic offenders likely influence the offending patterns of other adolescents through a process of social mimicry (Moffitt 1993). As such, interventions that reduce the criminal propensity of those likely to become chronic offenders may reduce the prevalence of criminal role models and thus their impact on the offending patterns of other youth.

Our primary findings support prior literature testing Moffitt's developmental taxonomy, suggesting early contact with law enforcement and neuropsychological deficits are robust predictors of violent and chronic offending in early adulthood. However, our results may underestimate the impact of these factors on chronic adult offending as we were unable to control for the time a respondent may have been incarcerated, which reduces offending opportunities. Although our findings are consistent with Moffitt's propositions, we cannot discount alternative explanations. Bacon et al. (2009) highlighted stable differences in individuals' propensity to offend over time, which may be supported by our findings. While we control for the nature and number of juvenile convictions, our analyses cannot thoroughly address the population heterogeneity versus state dependence debate (Nagin and Paternoster 2000) centered on the causal impact of age at first contact on adult offending patterns.

Additional limitations of the current study should be addressed in future research. First, the generalizability of the results may be affected by the fact that we analyzed data for a cohort of youth exiting a secure juvenile facility in a single state in one year. The results may be partially driven by the structural, social, and demographic realities of the time period the data were collected; however, Louisiana has changed little in recent decades. There may also be concerns as to whether Louisiana is representative of the U.S. population as it is a rural state with only a handful of urbanized areas but an enduring history of poverty, low education, and high incarceration rates. A second limitation concerns our measurement of neuropsychological functioning. In the absence of direct measures, we utilized scores from the WISC scale, which measures both intellectual and nonintellectual factors and has been described as one of the most trustworthy measures of child intellect (Caspi et al. 1996) and a popular test of executive deficits (Lynam et al. 1993). Numerous scholars contend that the WISC is more a measure of neuropsychological variation than of intelligence (Moffit 1997; Piquero 2001; Seguin et al. 1995). Although the association between intellectual functioning and both chronic and violent offending has been debated, it has been demonstrated that significant associations exists between low IQ scores and delinquency, antisocial behavior, and violent offending

A final limitation concerns the fact that our measures of age at first contact and offending patterns are drawn from official records, which introduces the potential for undetected offending and patterns of recidivism. That said prior studies have found considerable overlap in the risk factors associated with both official and self-reported delinquency (Farrington 1992; Kirk 2006). Self-report data may offer a more holistic picture, providing details on individuals, their families, and their environment. However, such data often suffer from several notable weaknesses. Due to focusing on a very specific time period (i.e. the prior 12 months) it is often difficult to develop a complete picture of an individual's offending over time. Moreover, many offenders inaccurately report their contact with police as an arrest when, in fact, they were only detained. Telescoping is also problematic as respondents may have difficulty recalling the timing of events, and therefore inaccurately report criminal activity for the recall period. Such issues have been found to be extensive in certain self-report data. Analyzing the Project on Human Development in Chicago Neighborhoods, Kirk (2006:125) reported that "45.5% of youth officially arrested did not report any arrests in the self-report survey during any of the three interview periods, and that 23.4% of those subjects without an official record nonetheless self-reported being arrested."

Several additional topics for future research can be taken from this discussion. First, additional research is necessary to elucidate the predictors and processes

underlying early onset and chronic offending. A number of explanations for the relationship between age of onset, neuropsychological or intellectual functioning, and offending trajectories have been offered (Bacon et al. 2009; Nagin and Farrington 1992; Piquero and Chung 2001). Unfortunately, our data were unable to address this issue but future research should attempt to develop our understanding of the social processes underlying this debate. Second, studies examining offending trajectories over the life course have largely neglected to examine whether predictors are similar across race and gender groups. Comparisons of predictors of chronic offending across race and gender lines would allow for the development of programming and intervention strategies best suited for diverse populations. Finally, because chronic offenders are over-represented in the current sample, an in-depth qualitative follow-up analysis of the offending patterns of these individuals some 35 years after their initial juvenile offenses could make substantive contributions to the extant literature on criminal career and offending trajectories, similar to works by Sampson and Laub (Laub et al. 1998; Laub and Sampson 1993).

Notes

[1] The data for this study were originally collected in 1988. The exiting cohort of 1976 was selected as this was the first year Louisiana institutional files were available in electronic format.

[2] Supplementary analyses indicated there were no significant differences between those included in the follow-up and those who could not be located in the search of official state and federal criminal records in 1988.

[3] Five youth committed more than ten offenses and were coded as ten to limit the skew of this measure.

[4] One respondent identified as neither black nor white and was removed from the sample. Supplemental analyses using an indicator of white vs. non-white respondents were substantively the same as those presented.

[5] In supplemental analyses, we considered separate binary indicators for Axis I and Axis II disorders. These results were substantively the same as those presented. There is also an inherent hierarchy of disorders, especially as they relate to criminal offending, therefore we retain the ordinal indicator in the analyses presented.

[6] Estimates of variance explained are based on Nagelkerke's pseudo r-square. While somewhat low, the results from the current analyses (.08 and .12) are comparable to the range of values reported in prior studies (.06 - .16). There are a variety pseudo r-square statistics available for regression models with categorical dependent variables, none of which are exactly comparable to r-square in the linear regression model (Long and Freese 2006).

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Appendix A: **Zero-Order Correlation Matrix**

	Total Off.	Violence	Age at first contact	AFC ≤13	AFC ≤14	AFC ≤13 (no 5-8)	AFC ≤14 (no 5-8)	WISC	JV Conv.	Property	Urban	Black	Axis Cats.	Family Crim History	Time at risk (Exp.)
Total Off.	1														
Violence	.21**	1													
Age at first contact	-.13**	-.97**	1												
AFC ≤13	-.12**	-.16**	.87**	1											
AFC ≤14	-.15**	-.15**	.82**	.72**	1										
AFC ≤13 (no 5-8)	-.14**	-.17**	.87**	1.0	.71**	1									
AFC ≤14 (no 5-8)	-.16**	-.16**	.83**	.71**	1.0	.71**	1								
WISC	-.18**	-.10**	.06	.07*	.08*	.09*	.10*	1							
JV Conv.	.15**	-.08*	-.27**	-.20**	-.20*	-.19**	-.20**	-.08	1						
Property	.02	-.10*	-.06+	-.04	-11**	-.05	-.12**	-.08*	-.14**	1					
Urban	.13**	.18**	-.12**	-.13**	-.07+	-.13**	-.07+	-.02	.13**	.00	1				
Black	.03	.10*	-.01	-.03	-.01	-.06	-.03	-.48**	-.02	.02	.20**	1			
Axis cats.	.04	.08*	-.00	-.00	-.02	-.00	-.02	.07+	.13**	-.19**	.07+	.07+	1		
Family Crim History	-.03	.03	-.20**	-.17**	-.15**	-.16**	-.14**	-.06+	.12**	.00	.12**	-.01	.05	1	
Time at risk	.06	-.03	.15**	.08*	.15**	.08*	.15**	.06+	.09*	-.09*	.21**	.03	.04	-.00	1

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Monitoring the Impact of Scenario-based Use-of-force Simulations on Police Heart Rate: Evaluating the Royal Canadian Mounted Police Skills Refresher Program

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Abstract*: This research aimed to establish the extent to which scenario-based use-of-force training undertaken by the Royal Canadian Mounted Police (RCMP) replicates aspects of the essential physiological characteristics of real-life, high-stress police activity. Using heart rate monitors, the physiological stress reactions of 132 officers were recorded while they completed one of four use-of-force training scenarios (including a control, where no use-of-force was required). Average heart rate information was used as a proxy measure for officer stress reactions at four time points during the scenarios: (a) 10 minute pre-scenario, (b) during the scenario when verbal contact was made, (c) during the scenario when physical contact was made, and (d) 10 minute post-scenario. Relative to pre- and post-scenario rates, heart rates were elevated during verbal and physical contact. No differences in this pattern were observed between scenarios, including the control scenario. Relative to previous use-of-force simulation evaluations, the strengths of this design are the size and quality of the sample of participants, the collection of the stress proxy measure during the scenarios, and the inclusion of a control scenario. Overall, this examination demonstrated that the RCMP's current scenario-based use-of-force skills refresher program produces heart rate patterns that are consistent with the elevated physiological stress produced by real-world policing as demonstrated in prior field research.*

Keywords: heart rate monitors, scenario-based training, police, physiological stress indicators, use of force

INTRODUCTION

Previous field research has demonstrated that on-duty Royal Canadian Mounted Police (RCMP) officers who encounter high-risk situations produce predictable physiological patterns that are consistent with elevated stress levels (e.g., Anderson, Litzenberger, and Plecas 2002, as discussed below). Given that these use-of-force situations occur infrequently, skills refresher training that police officers undergo must be relevant to ensure that police officers are optimally prepared to act under the high-stress they may encounter. Taking these factors into consideration, the purpose of this research was to examine whether RCMP scenario-based use-of-force skills maintenance simulations replicate the physiological patterns produced by police officers when faced with use-of-force situations (as measured by heart rate). The experimental design chosen for this study improves on previous similar work because of (a) the size of the sample of participants, (b) the measurement of physiological stress throughout the scenarios, and (c) the inclusion of a control scenario. To preview the conclusions, this research demonstrates that the scenario-based use-of-force skills refresher program used by the RCMP does produce heart rate results that are consistent with the elevated stress levels found in field research monitoring real-world policing situations (e.g., Anderson et al. 2002).

THE STRESS-INDUCING NATURE OF POLICE WORK

According to Anderson et al. (2002), a stress reaction involves two basic components: one of which is hormone-based (endocrine) response and the other is a nervous system response. Given the activation of the sympathetic nervous system and the release of adrenaline, the heart responds with an elevated rate. In conjunction with other system stress responses, increased heart rate prepares a person to fight for survival (Driskell and Salas 1996; Murphy and Ross 2009; Peters et al. 1998; Violanti et al. 2007; Weinberger, Schwartz, and Davidson 1979). During a life threatening event, perceptual information is quickly processed through the thalamus and an individual's emotion or level of perceived threat is attached and routed through the amygdala, which then alarms the rest of the body of the threat (Murphy and Ross 2009). A physiological stress response may include an elevation of heart rate, and increases in perspiration, stress hormones, and muscle tension (Driskell and Salas 1996; Murphy and Ross 2009; Violanti et al. 2007).

With respect to elevated heart rates, field research by Anderson et al. (2002) provides clear indication of the physiological impact of physical and psychological stress on police officers. In their study, Anderson et al. (2002) fitted 76 police officers with heart rate monitors, which were worn prior to and during their entire shifts. These officers were accompanied by research assistants who recorded the officers' actions for every minute they were on duty. This methodology enabled the researchers to determine: (a) an average resting heart rate for police officers, (b) an average heart rate for police officers when engaged in a list of specific events associated with typical non-threatening police duties (e.g., sitting, standing, walking), and (c) an average heart rate for police officers when engaged in high threat/use-of-force police duties. The findings of this field research indicated that the average heart rate for officers throughout their shifts (81 beats per minute) was 22 beats above the average resting heart rate of 59 beats per minute. When use-of-force activities occurred, officers demonstrated physical and psychological stress through heart rate increases of an average of 40 beats per minute above resting (when they placed their hand on their weapons in the presence of a suspect) to 65 beats per minute above resting (when wrestling with suspects). Although Anderson et al. (2002) differentiated between physical and psychological sources of stress that led to heart rate increases, their findings demonstrated that both types of stressors associated with use of force produced physiological outcomes for the police officers with respect to elevated heart rates.

Given the physiological indicators of stress and the findings from Anderson et al. (2002), it has been documented that officers are regularly exposed to acute stressors that exceed those experienced by members of the general public. From a training perspective, preparing officers to manage these stressful incidents in the optimal way, there are three major complicating factors: (a) the causes of these stressful incidents are highly unpredictable across time and space, (b) the onset of these events is often very sudden, and (c) the risk posed by these events could involve the individual officer, their colleagues, and members of the public (Anderson et al. 2002; Kureczka 1996). As a consequence, it is common practice for police forces to implement training scenarios designed to help prepare officers for these types of events, should they occur. The following section discusses some of the approaches that have been taken to determine the stress-inducing capacity of these types of training scenarios.

RELEVANT TRAINING ENVIRONMENTS FOR SKILL TRANSFER – THE UNDERLYING REASON FOR SCENARIO-BASED USE-OF-FORCE TRAINING FOR POLICE

The primary objective of scenario-based training is to provide a realistic environment that replicates what an officer would expect to encounter in a real-life situation in the course of duty. Simulation training allows for a controlled and safe environment in which officers can make errors and receive feedback on those errors, that if made in real life, could have serious consequences (Groer et al. 2010). This is particularly important for high-risk, use-of-force events, given the likelihood that they will be very infrequent, with potentially very significant safety implications for all involved in addition to possible legal (criminal and civil) implications for the officer (Groer et al. 2010; Murphy and Ross 2009). Through realistic training scenarios, officers will be able to develop appropriate cognitive schemas for response in high-risk situations that can be drawn upon automatically when confronted with those situations (Violanti and Aron 1995).

Some prior research has utilized aspects of the experimental design chosen within the current study (large sample size, measurement throughout, and control scenario) to examine the physiological relevance of use-of-force scenario-based training for police. Murphy and Ross (2009) aimed to assess the extent to which simulator systems induce measureable stressors in lethal force scenarios. A group of 150 officers went through three different scenarios: an outdoor vehicle stop with violence, a workplace scenario with violence, and a workplace scenario without violence. The stress response indicators selected in this study were four specific salivary biomarkers: immunoglobulin A (sIgA), cortisol, alpha amylase (salimetrics) and interkeukin-6 (e-bioscience). The releases of these biomarkers were measured pre- and post-scenario participation. Analysis indicated that the violent scenarios resulted in an increased release of the biomarkers, relative to the control scenario without violence.

Groer et al. (2010) built on Murphy and Ross's (2009) findings, and examined salivary biomarkers in conjunction with a range of other stress-detection equipment to determine the stress increase during a lethal force simulated training exercise. The additional equipment utilized by Groer et al. included eye-tracking devices, measurement of respiratory rate, electrocardiographs, skin temperature, heart rate, and heart rate variability. Groer et al.'s evaluation involved two scenarios: one high-threat use-of-force event that occurred outdoors and one high-threat use-of-force scenario that occurred indoors. The results of this study indicated that the simulated training did result in an increase in psychological stress for participants. Groer et al. took these results as indications that virtual reality scenarios are capable of producing physiological stress responses that successfully mimic occupational stress.

The Survival Scores research project, published as a research report by the US Federal Law Enforcement Training Center (FLETC, 2004) used a high-stress law enforcement scenario (involving a range of use-of-force and noise) to compare performance on a stressful scenario-based simulation to a range of physiological and psychological measures. The experiment was conducted over a two-year period and a total of 1,268 law enforcement students were involved in the study. In addition to heart rate, this study also collected blood pressure and cortisol, with measures taken at regular intervals throughout the scenario. Consistent with the previously discussed research findings, the results of this process demonstrated that the law enforcement students' performances degraded as all of these physiological measures increased.

In an earlier study conducted by the HeartMath Research Center (1999) heart rate monitors were used to examine the stress impact of simulated scenario training for police officers. This study determined that officer heart rates responded with hormonally-based increases to the simulated scenario training and that heart rates remained elevated well above the baseline for more than an hour after the scenario ended.

Despite these previous studies, it remains to be seen the extent to which real-world stress patterns associated with specific, high-risk activity (as demonstrated by Anderson et al. 2002) are being replicated during use-of-force training scenarios. Specifically, it is important to examine how the patterns of stress induced by the simulations change throughout the scenario as a consequence of the specific activity in which the officers are involved. The purpose of this study, therefore, is to conduct a specific evaluation of an existing skills refresher program to compare it to the heart rate findings of Anderson et al. discussed previously, by combining the optimal aspects of previous research (large sample size, measurement throughout and control scenario) into a single design.

THE CONTEXT FOR TESTING THE PHYSIOLOGICAL RELEVANCE OF USE-OF-FORCE SCENARIOS

The context selected to examine this issue was the RCMP use-of-force skills refresher program. The RCMP requires all officers to complete training and requalification in use-of-force methods every three years. An exception to this is officers with special duties who are required to complete the training and qualification every year. For RCMP officers in British Columbia, this training is provided under a standardized week-long block training model. The structure and activities of this training are varied, spanning a five-day curriculum intended to re-certify specific elements of police duties including firearm safety, carotid control techniques, OC spray and baton control, emergency response training, handcuffing, and physical fitness testing.

During this training, each officer participates in a variety of simulations, all designed to allow for tactical errors, with a view to learning from the constructive criticism provided by the course instructors. This process focuses on each officer's ability to assess risk, choice of intervention options, capacity to deploy the options that they select, assessment of the option's effectiveness, and the explanation of the rationale for actions taken. In combination, this is intended to provide the officer an opportunity to practice the skill of explaining why they did what they did, and specifically, what threat assessment was made and what it meant to the individual officer. This is crucial, as it relates to the justification of an officer's actions in any given use of force situation; justifications which are driven by policy and civil litigation agendas.

Training in general is intended to provide a knowledge base of both policy and technique which can be relied upon in regular duty. The assumption that underlies this training approach is that, in order for use-of-force training to be successful, it must be focused on a judgment and scenario based environment that exposes participants to the types of situations which could occur in the line of duty. The immediate outcome expected from this training is officer re-certification, reflecting the fact that officers have received refresher-instruction on particular elements of regular duty policy. Intermediate outcomes of the training are those which address the abilities of the officers to handle events which could pose a threat to themselves, other police officers or members of the public.

AIMS AND HYPOTHESES

The primary objective of scenario-based training is to provide a training environment that is realistic, to adequately prepare the officer for real-life use-of-force events that could occur. The first objective of this research was to establish to what degree the scenario training was

generating a physiological response similar to those experienced during real-life use-of-force events. Heart rate was chosen as the measure for physiological response in this case to allow comparison with the field research data produced by Anderson et al. (2002). Keeping in mind that the benchmark heart rate data presented by Anderson et al. did not include an actual shooting, OC spray, or baton deployment, the following hypotheses were being examined here: (1) the simulated scenarios are effectively reproducing the types of physiological responses observed from officers in the field when they encountered real stressful situations, and (2) there would be no difference in physiological reactions to simulation scenarios as a consequence of the scenario outcome, given the anticipation of pending use-of-force activity.

METHODOLOGY

Participants

One-hundred and thirty-two RCMP officers were involved in this study. The average age and years of service are displayed in Table 1, along with gender, policing specialization, past use-of force experience, and health. As indicated in the table notes, one-way ANOVA demonstrated some significant variation between participant groups with respect to age and years of service.

Table 1. **Descriptive demographic statistics for the police officers who participated in the use-of-force simulations** (for the total sample, and for each scenario group)

Demographic category	Total (n=132)	Outstanding warrant (n=34)	No insurance (n=28)	B&E in-progress (n=29)	Breach conditions - control (n=41)
Age (mean years)	38.0	41.8[a]	39.5	35.2[b]	35.8[b]
Years of service (mean years)	11.5	15.1[c]	12.7	10.9	8.0[d]
Female officers (%)	19.7	8.8	17.9	20.7	29.3
Uniform officers (%)	58.3	47.1	53.6	62.1	68.3
Plain clothes officers (%)	34.1	44.1	39.3	27.6	26.8
ERT officers (%)	3.8	2.9	7.1	3.4	2.4
Administrative officers (%)	3.8	5.9	0.0	6.9	2.4
Lethal force past experience (%)	10.6	8.8	14.3	3.4	14.6
Health - good/great (%)	87.1	88.2	89.3	96.5	78.1

Note: (a) Significant Age differences between groups, $F(3,128) = 5.21$, $p < .01$, with Tukey post-hoc comparisons indicating significant differences between *a* and *b*, and (b) significant Years of service differences between groups, $F(3,128) = 4.18$, $p < .01$, with Tukey post-hoc comparisons indicating significant differences between *c* and *d*.

Non-parametric tests did not reveal any significant differences between groups for any of the other measures. All officers who completed the skills refresher course during the data collection period were given the opportunity to participate. Final participation was voluntary and no officers refused to participate.

Use-of-Force Scenarios

There were four use-of-force simulation scenarios involved in this evaluation, each of which is summarized below. This was a between-subjects design, in which all participants were only involved in a single simulated scenario. Participants completed their scenario training within small groups (approximately 5 to 8 officers per group), and each group was randomly allocated to a scenario.

Outstanding Warrant Scenario

The officers were told that they were operating a police vehicle and conducting patrols when they observed a vehicle with a burnt-out brake light. The scenario commenced when the officer had pulled over the vehicle to investigate further. The driver was alone in the vehicle and was cooperative at first. During the scenario, while writing the violation ticket, the officer processed the driver's information on CPIC, and the officer was advised there was an outstanding arrest warrant for the driver that they needed to execute. A use-of-force situation resulted when the driver resisted arrest.

No Insurance Scenario

The officers were told that they were operating a police vehicle and conducting patrols when they observed

a vehicle that appeared to have an expired insurance decal. The scenario commenced when the officers had pulled over the vehicle to investigate further. The officers were informed that they had positioned their vehicle and advised dispatch of their status. The plate, vehicle and registered owner returned no alerts when queried by the dispatch. The officers were instructed to approach the vehicle and give the driver a ticket for no insurance. A use-of-force situation resulted when the driver became aware of the impending ticket.

Break-and-Enter In-Progress Scenario

The officers were told that they had been dispatched to a call of an unsecured business in the downtown core. The officers were also informed that the caller, a passer-by, had noted an open door and thought they saw a person inside. The passer-by had proceeded to work and was no longer on the scene. Officers were told that upon their arrival, they had located a door that was ajar, but that there were no obvious signs of forced entry and the business appeared to be closed because of the absence of activity. Once inside, the officers encountered a break-and-enter (B&E) in progress and a use-of-force situation resulted.

Breach Conditions (Control) Scenario

The officers were told that they were dispatched to a residence where a female caller had stated that her son just returned from the bar and had been drinking. The son had previously been charged with assault and was currently on conditions, one of which was no alcohol. The officers were told that the mother stated that he was not violent at the time, but that she was concerned he might go out and get into more trouble. In addition, the mother wanted him arrested and removed from the residence. The officers were instructed that upon their arrival he/she was invited into the residence by the mother, and that her son did not know that she called the police. When the officers encountered the son he was sitting in the kitchen. The officers completed the arrest without incident and no use-of-force was required. This acted as a control scenario, within which the expectation of the requirement for use-of-force was equivalent to all other scenarios tested here.

There were specific objectives that the trainers were looking to assess on each of these scenarios. Consistent with normal police activity, the range of use-of-force options that were available to the police officers during the scenarios ranged from physical control to baton/OC spray, up to lethal force. In broad terms, the assessment of the performance rested on the officer's ability to legally articulate the actions that were taken, detailing how they were reasonable and necessary, based upon a proper risk assessment.

PROCEDURE

Data were collected during a four-month period in mid-2011 in conjunction with week-long block training that was being conducted. Included in the range of activities that officers were required to complete during this training were the four use-of-force training scenarios selected for the purposes of this evaluation. Prior to participating in each of these scenarios, officers were placed in a holding/briefing area where they were fitted with a heart-rate monitor. Researchers recorded the timing associated with the involvement of each officer in each scenario with respect to the start, finish and timing of critical events that occurred during the scenarios. Heart rate data were collected in five second intervals prior to, during, and after the scenarios, including the debriefing and rest periods. To manage the logistical implications of fitting heart rate monitors and also minimizing the degree to which the evaluation interfered with the broader objectives of the training, each participant was only involved in one of the four scenarios. To an extent, this logistical constraint potentially resulted in a methodological benefit for the study, as no testing effects (stemming from individuals participating in multiple simulations of the course of the research) could influence the outcome of the research. As discussed previously, there are a range of physiological stress indicators that could have been selected for the purposes of this study. Heart rate monitors were selected in this case as they are very receptive to rapid physiological changes, they could be measured within the constraints of the testing environment, and they allowed direct comparisons with the Anderson et al. (2002) field research findings.

RESULTS

The average heart rates over four key periods of time were examined for each participant. These time periods captured: (a) the 10 minutes prior to commencing the scenario, (b) the 2 minutes directly following the verbal contact with the simulated perpetrator, (c) the 2 minutes directly following the initial physical contact with the simulated perpetrator, and (d) the 10 minutes directly after the scenario was completed. The questions here are: (1) to what extent did each scenario generate an increased heart rate in the participants, reflective of heightened stress levels, and (2) was there any difference in the stress induced by the control scenario (where no use-of-force was required) relative to the other three conditions. Table 2 displays the number of participants who completed each scenario, along with the average duration (minutes), and the average heart rates produced during each of the four time periods of interest.

There was significant variation in the duration of the scenarios, $F(3,128) = 30.5$, $p < .001$, with post-hoc Tukey tests revealing that the *Breach Conditions (Control)* scenario was shorter than all the others, and the *B&E In-progress* was longer than the other two use-of-force scenarios. Despite this variation in scenario duration, there were no significant differences between scenarios with respect to the average heart rates recorded during each of the time periods (with F's ranging from 0.3 to 1.5 across these four comparisons). From a stress perspective, the potential for use-of-force as simulated by the control scenario was enough to elevate the officers' heart rates to a level that was equivalent to that experienced during a use-of-force encounter.

Table 2. **Average heart rates across each time period for police officers involved in each of the four simulation scenarios**

Scenario	*n*	Duration (Min)	10 min pre-scenario Mean	(SD)	Verbal contact Mean	(SD)	Physical contact Mean	(SD)	10 min post-scenario Mean	(SD)
Outstanding warrant	34	10.23	95.1	(17.6)	112.7	(21.9)	112.2	(21.1)	95.7	(15.2)
No insurance	28	12.04	93.5	(21.4)	116.1	(26.1)	120.8	(29.2)	92.8	(15.5)
B&E in-progress	29	14.44	94.2	(17.5)	118.1	(24.4)	120.4	(24.8)	93.4	(14.0)
Breach conditions - control	41	8.08	101.7	(18.2)	115.0	(22.6)	114.2	(21.6)	96.7	(12.4)
Total	132	10.87	96.6	(18.7)	115.3	(23.4)	116.4	(24.0)	94.9	(14.1)

Variations in the heart rates between each of the time periods were then examined. Given the non-significant differences between the average heart rates produced by participants within each scenario across the time intervals, these comparisons were undertaken using a series of paired sample *t*-tests collapsed across scenario groups. These tests demonstrated (a) a significant overall increase in heart rate between the pre-scenario time period and the initiation of verbal contact, $t(131) = -12.3$, $p < .001$, (b) no difference between the heart rates recorded for verbal and physical contact, $t(131) = -1.30$, and (c) a significant reduction in heart rate between the point of verbal contact and the final measurement, $t(131) = 13.6$, $p < .001$.

Table 3. **Matrix displaying t-values comparing mean heart rates by activity from Anderson et al. (2002), Table V, with the combined mean heart rates (all four across scenarios) by time period for the current study**

				Combined mean heart rates by time period							
				10 min pre-scenario		Verbal contact		Physical contact		10 min post-scenario	
				Mean	(SD)	Mean	(SD)	Mean	(SD)	Mean	(SD)
Results from Anderson *et al.* (2002), Table V				96.6	(18.7)	115.3	(23.4)	116.4	(24.0)	94.9	(14.1)
Activity	*n*	Mean	(SD)	*t-score*		*t-score*		*t-score*		*t-score*	
Tussle	26	117	(25)	−4.78***		0.34		0.12		−6.30***	
Wrestling	7	124	(25)	−3.71***		0.96		0.81		−5.09***	
Handcuffing	32	104	(23)	1.92		2.46*		2.64**		−2.86**	
Hand on gun, no suspect present	17	88	(15)	1.82		4.68***		4.74***		1.89	
Hand on gun, suspect present	8	99	(9)	0.35		1.96		2.04*		0.81	
Average during full shift	66	82	(12)	5.77***		10.86***		10.97***		6.37***	

* $p < .05$, ** $p < .01$, and *** $p < .0001$.

Finally, the patterns of heart rates observed during the simulation scenarios were compared with the real-life baseline data obtained from the Anderson et al. (2002) field research with the RCMP. Given the lack of difference between groups, these comparisons with Anderson et al. were undertaken using the combined average heart rates recorded across all four scenarios. A series of independent sample *t*-tests were performed, comparing the average heart rates at each of the four time intervals produced within the current evaluation with a list of use-of-force activities identified by Anderson et al (2002). The results of these comparisons are summarized in Table 3, with the numbers in each cell indicating the *t*-value produced by the comparison between the row and column value (with sample sizes, mean

values, and standard deviations also listed). A negative *t*-value in this table occurs when the column heart rate value is smaller than the row heart rate value. Comparisons were only performed on the activities that Anderson et al. noted when the frequency of this event was greater than 3. This analysis demonstrates two main patterns. First, the heart rates produced during all four current scenarios were consistent with those produced during physical stress situations such as tussling, wrestling, and full fights. Second, the pre- and post-scenario heart rates induced during the scenarios were elevated relative to the average rates produced by officers during their shifts.

DISCUSSION AND CONCLUSIONS

Overall, this analysis demonstrated the following: (a) the physiological stress of all scenarios was equivalent, which reflected the fact that all participants were anticipating a use-of-force situation was about to unfold; (b) elevated heart rates were observed in all conditions at all time periods relative to resting heart rates established in prior research, and (c) variations in physiological stress were observed over time, with pre- and post-incident heart rates lower than those experienced during the scenarios. The fact that these rates were elevated during the post-incident period (relative to resting heart rates for officers demonstrated in prior research) was consistent with the previous research findings of Anderson et al. (2002) and the HeartMath Research Center (1999). Although there were some observed differences for the demographic characteristics of the participants in groups within this study, these did not translate to systematic differences in heart rate responses when presented with the stress-inducing scenarios.

The objective of this research was to examine the extent to which the current use-of-force skills maintenance scenario-based training employed by the RCMP mimics the relevant heart rate patterns produced by police officers when faced with use-of-force situations, utilizing the optimal aspects of previous experimental designs (large sample size, measurement during the scenarios, and inclusion of a control scenario), within a single study. This said, there were some limitations associated with the current methodology including: (a) despite random allocation of groups of participants to each scenario, there were significant differences between conditions with respect to participant 'experience' (as captured by age and years of service), (b) there were differences in the duration taken to complete the control condition relative to the scenarios that required a use-of-force encounter, and (c) heart rate was the only measure taken to examine the impact of scenario participation. It is unclear to what extent these factors influenced the overall patterns observed here and future research could seek to examine these issues.

As discussed from the outset of this paper, previous research has demonstrated that on-duty officers who encounter high-risk situations produce predictable physiological patterns that are consistent with elevated stress levels. Given that these use-of-force situations occur infrequently, the skills refresher training that they undergo must be relevant to ensure that police officers are optimally prepared to act under the high stress they will encounter. Taking these factors into consideration, the purpose of this research was to examine whether the simulated scenarios reproduce the relevant physiological reactions (as measured by heart rate) to ensure they are appropriate and useful. Based on the patterns of findings with respect to heart rate, it appears that this is the case in this instance. This will ensure that the training the officers are undergoing is providing them with a relevant context within which to develop appropriate schemas that can be utilized during times of high-stress when the use-of-force is required.

Unlike previous research examining this issue, the heart rate activity was examined before, during, and after the simulation, and also compared to a real-life baseline. Future research into this type of scenario-based training could consider the impact of other forensically-relevant issues associated with police use-of-force. One particular focus of this type of investigation would be cognitive capacity during periods of high-stress, with a view to exploring what is 'normal' with respect to recall and recognition memory performance following use-of-force. Such research could examine: (a) the significance of individual differences between officers for accurate memory for events (as a function of factors such as age, years of service, training, and prior use-of-force experience) (e.g., Ericsson, Patel, and Kintsch 2000), (b) the speed of decay of memories encoded under highly-stressful situations (Hulse and Memon 2006) and the corresponding significance of timing of questioning (Beehr et al. 2004; Hulse and Memon 2006), and (c) the potential benefits of context reinstatement (mental and/or physical) as a memory facilitator (Fisher and Geiselman 1992). Although these issues have been explored in previous research, replication of previous methodologies within this context of demonstrated physiological comparability (with respect to heart rate) would provide a valuable platform from which to extend past work.

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