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Unlocking the Violent Brain: A Sociological Analysis of Neuroscientific Research on Violent and Aggressive Behaviors

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Unlocking the Violent Brain: A Sociological Analysis of
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by

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DISSERTATION

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Unlocking the Violent Brain:
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Oliver E. Rollins

ABSTRACT

This dissertation examines the social and ethical implications of neuroscientific research on violent and aggressive behaviors (VAB). It describes how neurobiological research on the determinants of VAB are formulated, structured, and contested, and how neuroscientists understand and use race in neuroscientific VAB research. This dissertation employs a multi-sited methodology, which includes four interrelated methods: historical overview of biocriminology; qualitative content analysis of neuroimaging research on VAB (1990-2012); semi-structured, in-depth interviews with neuroscientists who research VAB, and ethnographic observation/neuroscience training.

One key focus of the dissertation is to examine specific critiques of the production and use of biological research on VAB and crime, and the reactions, rebuttals, and methodological steps taken by contemporary biocriminologists in an effort to address and/or resolve such objections. To help address this focus, I start with a historical examination of biomedical VAB research, which helps historically situate the dissertation by threading together specific continuities pertaining to epistemologies, methodologies, ideological debates and material consequences that underpin biological inquiries of VAB. I then provide a description of the increasing use of innovative imaging technologies in research on violence and crime, arguing that such transformations are part of larger processes of the biomedicalization of deviant behaviors. I argue that the use of neuroscience practices and technologies better positioned biocriminology to address critiques from its past. However, it has also produced newer, more discursive ways to construct and use biocriminology knowledges and to make and understand violent, aggressive and criminal bodies and brains.

Historically, the 'question of race' has always been intimately tied to research on VAB, and at times has helped reinforced both racism and sexism. Contemporary biocriminologists have acknowledged such misuses, and often expressed that such practices have been both denounced and rejected by biocriminologists today. Using interviews with neuroscientists who study VAB, this dissertation provides a greater understanding of the operation and impacts of race in neuroscience research on VAB. I address the way neuroscientists use race in the design and execution of their work, and provide an overview of the potential social impacts of biocriminological knowledge on the operation of race and violence in society. Overall, this research helps elucidate current and future impacts of researching, preventing, and potentially treating VAB through biomedical technologies, and it contributes new knowledge to the longstanding conversations on race and biomedicine, including the intertwined relationships between racialized/gendered inequalities, criminal justice, and mental health.

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CHAPTER I INTRODUCTION

What does it mean to be violent, aggressive, or criminal? What are the causes of such behaviors? How should we study, conceptualize, and possibly treat these behaviors within society? Criminal, violent and/or aggressive behaviors (VAB) are some of the most studied phenomenon in our society, and the complexity of causes for these behaviors has generated a number of explanatory frameworks. Most often, a sociological lens has been used to examine the causes of crime and VAB. These approaches have devoted much time arguing against micro-level causes in favor of more macro- or meso-level explanations for violence (Lilly, Cullen and Ball 2002). Through these accounts, specific social structures, political choices, cultural forces, and systemic disadvantages are framed as the best explanations for why and how, individuals engage in VAB (Hawkins 2003; Lilly et al 2002; Rafter 2008; Shaw and McKay 1942; Sutherland 1939; Wilkstrom and Sampson 2009; Wolfgang and Ferracuti 1967). In comparison, biological and psychological focused theories have consistently provided a different perspective on the causes of crime, one that focuses on individual-level and/or biological factors.

Since the formal start of criminology during the late nineteenth century, there has been incessant debates concerning how to study crime and VAB and the proper casual factors of VAB, (i.e., nature vs. nurture) (Becker and Wetzell 2006; Laub and Sampson 1991; Marsh and Katz 1985; Rafter 2008; Rose 2000; Spallone 1998). Historically, VAB studies that focused on anatomy and psychological functioning were discredited over time as reductionist, and/or racist and sexist (Becker 2008; Duster 2006a; Gould 1996; Marsh and Katz 1985; Moran 1992; Rafter 2008; N. Rose 2000; S. Rose 1996; Spallone 1998; Walby and Carrier 2010). Moreover, researchers who ascribed to a more social based understanding of crime argued that research on biological factors for VAB could be deterministic, thus ignoring larger social factors that influence conduct. More recently, however, biocriminologists have reconsidered the focus on biological determinants of VAB, insisting that neither biological *nor* social factors alone are sufficient to fully understand the incidence and distribution of VAB. Instead, they promote a "biosocial" model that views the interactions among biological and social determinants, including gene-environment interactions, as a more appropriate lens for understanding VAB (Caspi et al. 2002; Moffitt 2005; Raine 2002; Scarpa and Raine 2007; Simons et al. 2011; Walsh and Beaver 2009b). Using recently developed genetic testing and neuroimaging technologies, these scientists are working to articulate a new approach that eschews biological reductionism.

Yet, how should we evaluate the construction and potential uses of this re-formulated approach to VAB? How will this knowledge affect society's understandings of and policies addressing violence/aggression, particularly in reference to notions of culpability, possible treatments and punishment? As important, how can we be assured that these contemporary reformulations of biocriminology avoid the troublesome paths taken throughout its history? Moreover, in what ways has or will contemporary biocriminology address, or move past its historical misuses and negative impacts concerning race, gender, and other marginalized identity statuses?

This dissertation is concerned with the social and ethical implications of contemporary biocriminology, and specifically neurobiological research on VAB. This project builds upon previous studies and commentary on the reception, reflection, and operation of neuroscientific research on VAB. For example, researchers have asked whether and how research on VAB accounts for changes in behavior over time (Loeber and Pardini 2008), and the extent to which social factors can be measured and utilized (Becker 2008; Loeber and Pardini 2008; Dumit 2013; Singh and Rose 2009; Rose 2010 Pickersgill 2009, 2014). It also takes into account the work of legal scholars, who have become increasingly concerned with the potential applications *and* misuses of neurobiological knowledges in the legal system (Morse and Roskies 2013; Pustilnik 2008). However, few researchers have investigated the relationships among scientific practices and knowledges; the making and use of VAB classifications, definitions, and bodies; and the use neuroimaging biotechnologies (Becker 2008, 2010; Dumit 2013; Pickersgill 2009, 2010; Rose 2010). Moreover, although a few researchers have examined the potentials of and relationships between *genetic* research on VAB and race (Duster 2006a; Ossorio and Duster 2005; Rose 2000), no previous studies have empirically analyzed how *neuroscience* researchers themselves understand and use race in their research on VAB, or how they assess the impact of their work on society's understanding of racialized perceptions of VAB. To address these gaps, and to elucidate the potential benefits, misunderstandings, and risks of conducting this type of research on VAB, there are two specific aims for this dissertation.

The dissertation's first aim is to *analyze and describe how neuroimaging studies on VAB are designed, implemented and interpreted.* Relevant questions for this aim that helped ground the data collection procedures and inform the analysis and writing portions of the research included: How do researchers formulate research questions and hypotheses? What scientific procedures, study designs, and sample populations do they use? How do neuroscientists define and operationalize VAB for use in research? Three unique sources of data were used to address this aim: 1) content analysis of current neuroimaging studies on VAB circa 1990-2012; 2) in-depth interviews with neuroscientists who research VAB; and 3) ethnographic observation/neuroscience training (see section below, Research Methodology and Data Analysis).

The second specific aim for this dissertation is *to analyze and describe how neuroscientists who conduct research on VAB understand, define, and utilize race/ethnicity, as well as other socially mediated factors, in the design and execution of their research and interpretation of their results*. This aim allows the dissertation to investigate the following: the complexities of working with race as a variable in research; how neuroscientists deal with race in their design, procedures and execution; and how they interpret their results and the potential effects and applications of their work. Moreover, this dissertation is also interested in related questions on social factors including: How do neuroscientists incorporate and measure social factors? What types of social/environmental factors are operationalized in neurobiological models of VAB? What are the perceived challenges and advantages of including both biological and social determinants, as well as the interaction of such factors, in such research? Data for this aim was acquired primarily through semi-structured interviews and the content analysis of neuroimaging VAB research, and it was informed by the historical analysis of biocriminology (see section below, Research Methodology and Data Analysis).

FRAMEWORK FOR A SOCIOLOGICAL ANALYSIS OF BIOCRIMINOLOGY

In this dissertation, I utilize the sociology of knowledge as a foundational lens. While I do consider this project to be a contribution to science, technology, and medicine studies (STMS), the sociology of race and racism, and SOK, I purposely began with SOK because of the types of questions it generates at the level of knowledge production. Traditionally, SOK has been interested in the role social factors play in relation to the production and utilization of knowledge (Mannheim 1959). In part, this dissertation shares these concerns, although as I demonstrate throughout this project, this approach has expanded to investigating how social factors, institutions, and practices are themselves also structured and reinforced by knowledges (Berger and Luckmann 1966; Foucault 1970, 1979a, 1980, 1984McCarthy 1996).

On the other hand, STMS started as a branch of inquiry seeking to "show that knowledge(s) was constitutively social, and in so doing, it raised fundamental questions about taken-for-granted divisions between 'social versus cognitive, or natural forces'" (Shapin 1995: 289). STM focuses on issues such as: the authoritative features of science and biomedicine; the organization and production of scientific knowledges, practices and technologies; disrupting the lines drawn between the social and biological, including examining the social character of scientist, their tools, and the work/knowledges they produce; and the development of methods and techniques to study science, including following scientists into their labs in order to better capture the production scientific knowledge, and/or illuminate the infrastructural components that underpin the structure and help nurture the function of science, medicine and technology (Biagioli 1999; Bowker and Star 1999; Fleck 1935/1979; Hackett, Amsterdamska, Lynch, and Wajcman 2008; Knorr-Cetina 1981; Kuhn 1962/1996; Latour 1987; Shapin 1995). In the following sections, I present an overview of the definitions, theories and perspectives that ground this dissertation.

I start this section with an understanding of the definitions for violence. Here, I described my use of the acronym VAB throughout the dissertation when referring to the collection of behaviors understood as violent, aggressive and criminal. Next, I provide a review of SOK, including its traditional understandings and the methodological questions that emerge when utilizing such a paradigm. Finally, I end this section with an overview of medicalization and biomedicalization, which were important for this dissertation because of their ability to explain the role of medical—as well as scientific—authority, or social control, via biomedical knowledges, technologies and practices.

What's in a Definition

Throughout this dissertation, I use the combined phrase 'violence and aggressive behavior' (VAB) to denote the fluid nature of such definitions and the interchangeable use of these terms in research, policy and clinical settings. Defining violence and/or aggression, including the construction and maintenance of metrics to measure more reliably such behavioral aspects is imperative in VAB research, yet it is also a much-debated subject. The extremely popular World Health Organization (WHO) definition of *violence*, either in whole or parts, has been utilized widely in biological, sociological, criminal justice and clinical VAB research. WHO, and the Centers for Disease Control (CDC), defined violence as "the intentional use of physical force or power, threatened or actual, against another person or against a group or community that results in or has a high likelihood of resulting in injury, death, psychological harm, maldevelopment, or deprivation" (Dahlberg and Krug 2002: 5). WHO provided a very comprehensive definition of violence, touching on issues of intent, power, and a host of damages that may extend well beyond physical injury. This expansive understanding allows this definition to be used in array of disciplines and to speak to a large set of behaviors. In fact, the language used by WHO to define violence can be seen in the descriptions of violence and aggression used in neurobiological VAB research.

What is absent from WHO's official definition is any reference to the term aggression which is used only sparingly throughout out the complete report on the state of violence and health. However, the term aggression is much more important for psychiatric and neuroscientific studies. Through my initial assessment of biologically based VAB articles, I found that few articles provided any formal definition of *violence,* and more often the term aggression, or variants of this term, was employed. While significant, this finding is not so surprising. The favored use of a particular term, violence or aggression, for deviant/criminal behaviors may actually be more of a consequence of disciplinary preference than oversight. Psychiatrist Jan Volavka (2002), author of the book *Neurobiology of Violence*, argued that the term *violence* has been employed more in sociological and legal research, and by comparison, the term *aggression* is the more accepted term in psychological, psychiatric and biological research. Volavka's statement speaks to the difficulties of using consistent, agreed upon definitions for these behaviors across disciplines. It also suggests that the two terms have been used interchangeably to refer to the same types of behaviors.

These terms are thus difficult to distinctly separate, as demonstrated in Jana Bufkin and Vickie Luttrell's (2005) review of neuroimaging research on aggressive and violent behavior. Bufkin and Luttrell (2005:177), a criminologist and psychologist respectively, defined *violence* as behaviors that violate social norms and inflict physical injury, and *aggression* as threatening or actual assaultive behavior toward a person or environment. While the definitions are not identical, the differences between them are negligible. The two definitions alone do not provide much clarity about how to apply such understandings, and it would be difficult to conclusively define a person's behavior as aggressive and not violent, or vice-versa. In fact, with the exception of their definitions of these terms early in the article, Bufkin and Luttrell (2005) opted to use the phrase "aggression and/or violence" throughout the remainder of the article. I point this out not as an indictment of Bufkin and Luttrell's research, but to demonstrate the difficulties in clearly defining these behaviors, and the pervasive uncertainties inherent in the use and comprehension of terms to describe these behaviors.

In contrast, University of Colorado, Denver Neurologist Christopher Filley and colleagues' (2001) definition of aggression and violence provided a greater understanding of interchangeable use of the terms in neuroscience research. In their consensus statement on the state of neurobehavioral research on physical aggression,[1] Filly and colleagues (2001) defined aggression similarly to Bufkin and Luttrell (2005), as an adaptive and intentional act that causes physical and/or mental harm. However, they defined violence as a subset of aggression, arguing that it can be characterized as an *aggressive act* that leads to unwarranted physical injury. Filley and colleagues' (2001) description of violent behavior as part of the *aggressive behavioral spectrum*, characterizes violent behavior as the ultimate negative expression of aggression. While this does not settle the questions surrounding the construction or use of such terms, it does provide an understanding as to why the terms are often used interchangeably in research.

The works of Bufkin and Luttrell (2005) and Filley and colleagues (2001) offer important understandings about my use of the term VAB. As noted above, VAB captures the more expansive and interchangeable use of concepts like criminal, violent, and aggressive. However, I use VAB to help capture how these behaviors have been reworked through the lenses of biology and/or psychiatry/psychology. That is, they may be presented in contemporary terms not as definitions per se, but as DSM classified disorders and/or behavioral risk factors and traits. Such DSM categories are part of a larger pervasive system of knowledges embedded within the infrastructure of the psych-sciences and more commonly utilized in biological research on violence and aggression. Thus, the phrase VAB may also be understood as capturing how classifications, risk factors, and biotechnologies remake and reinforce understandings, uses, and causes of behaviors in biocriminology. Additionally, a more detailed analysis of the uses and definitions of VAB, and their operationalization in neuroimaging research (see chapter 2).

Sociology of Knowledge

According to the rich tradition of the sociology of knowledge, the processes of production, dissemination, and acquisition of knowledge play critical roles in determining both the construction and maintenance of society's structure (Berger and Luckmann 1966; Mannheim 1959). E. Doyle McCarthy (1996) stated that the sociology of knowledge is actually best understood through two distinctive themes. First, knowledge is socially determined. Essentially arguing that knowledge—how it is defined and the types of "knowledges" valued— is a product of the social world, more specifically a product of the constructed reality of social life. The second theme argued that knowledge itself constructs the social world, or that knowledge shapes and conditions of our perceptions of the social world.

Knowledge as a Social Product

The idea of social determination was first introduced by Karl Mannheim (1959) as the theory of "existential determination" and is regarded by many as the principal theme of the sociology of knowledge (McCarthy 1996). His work concentrated on the modes, or processes, of knowledge production and he defined existential determination of knowledge as both an 1) empirical investigative tool to elucidate the ways social relationships influence thought, and as 2) an epistemological tool concerned with the construction of what is understood as "truth," in the production of knowledge. These two points influenced both the preparation (e.g. the development of structured interviews and thematic codes) and execution (e.g. the interview phase and content analysis) of this dissertation.

As an empirical investigative tool, Mannheim (1959) stated that the concept of existential determination can help show that 1) the processes leading to the construction of knowledge—and therefore produced knowledges—are *not* objective or natural in any way, but instead arise from numerous outside social factors, and 2) that these outside social factors contribute to the structure of specific perspectives and/or points of view used during the knowledge production processes. The notion of existential determination served as a starting point for this study's attempt to elucidate which social factors are in play, as well as the consequences of such forces, during the production of biomedical knowledge of VAB. This includes examining how lived experiences (Mannheim 1959) and the training/education of the producers of such knowledges influence their perspectives and understanding on: the types of data they utilize (or do not use) during the development of knowledges, their understandings of VAB in society, and the influence of sociocultural and historical contexts on such processes of knowledge building and dissemination.

Mannheim (1959:289-292) was also concerned with particular models of thought—especially the role of scientific knowledge and the "facts" produced through the "natural" sciences. Mannheim (1959) stated that the processes of knowledge building (i.e., fact-finding) actually have little if any bearing on what is understood as truth or validity of the produced knowledge. Moreover, the specific procedures and methods utilized by science do not lead to the "discovery" of some hidden objective truth, or *a priori* knowledge that is divorced from its social-historical background (Fleck 1935/1979; Mannheim 1959). This investigation of biocriminology included questions concerning what *has* been defined as VAB and what behaviors *have not*. The "answers" to these questions are certainly not outside of social-historical factors, and part of this dissertation is concerned with how these definitions have been constructed, how they travel and/or shift over time, and to what purpose did these ideals of violence serve in the making, consumption and use of such knowledges?

Knowledge as a Determinant of Social Reality

Peter Berger and Thomas Luckmann (1966) stated that the social structure is a continual product of human action. It was their contention that the sociology of knowledge, as discussed by Mannheim and others, was limiting in its ability to analyze all forms of knowledge, and therefore in its ability to analyze the effects of knowledge on the construction of social reality. Their work attempted to move pass the simple understanding that knowledge was a social product and moved toward a discourse on the functions of knowledge within society.

They started by pointed out that understanding, recognizing and/or defining reality is a difficult task because, "the reality of everyday life is taken for granted as reality. It does not require additional verification over and beyond its simple presence. It is simply *there*, as self-evident and compelling facticity" (Berger and Luckmann 1966:23, emphasis in original). They asked, what is the relationship between knowledge—the items utilized and produced to see, understand, and operate in the world, i.e. language, symbols, signs, interactions—and the constructed milieu understood as social reality? They concluded that knowledge serves as a conduit that feeds into an incessant dialectical between the individual and the social world, which construct understandings of social reality (Berger and Luckmann 1966).

Berger and Luckmann (1966) essentially moved away from the more macro level theorizing provided by early sociology of knowledge theorists to a meso/micro level analysis that took into account the interactions among humans, signs, language, and symbols. This move also opened up a new conversation in the sociology of knowledge, in which knowledge was now framed as a *determinant* of the social world. As E. Doyle McCarthy (1996) stated combining both of these strains of thought—knowledge as social product and knowledge as determinant of the social reality—implies that knowledge and the social world operate within dialectically. The social world is only understood through its relationship with knowledge, yet the very same social world produces the knowledges we used to comprehend our realities. Therefore, it is a reasonable question to ask how this dialectical relationship applies to our understanding of VAB. How does this dialectical operate, stay viable, or be challenged? How has, or does, biomedical knowledges of VAB impact society's understandings of who is violent/aggressive, how to treat VAB, or the utilize ideas about the sources of VAB?

Power/Knowledge and Knowledge Value

The relationship between power and knowledge has been detailed out the most through the work of Foucault ([1978]2004, [1979]1995, 1980, 1984). Foucault ([1978]2004, 1980) argued that power and knowledge were inseparable, that in order to understand the role of power, its "conditions of possibility", and its distribution within society, one has should focus on its entangled relationship with knowledge. Foucault's ([1978]2004:465-6) perception of power differed from traditional understandings of power in a "top-down" fashion, instead he argued that power has no center, that it emanates from a multiplicity of force relations, is immanent within any societal relationship ,and can be utilized from an infinite number of positions within society. Foucault's analysis of power/knowledge also focused on the role of discourse, and discursive elements, within society and their ability to discipline and condition human behavior. Therefore, it can be argued that by focusing on the manner in which knowledge is produced, utilized, and recognized one could also begin to comprehend: its power to construct societal order; the tactical authority utilized by particular types of knowledges, especially through the guise of "truth," "normalization," and "discipline;" and the patterns in which force relationships operate, specifically between the institutions and individuals.

In her contribution to SOK, McCarthy (1996) argued that the sociology of knowledge is the perfect method in which these types of questions can be explored. She understood knowledge as culture, implying that the existence of knowledge not only arises from the social, but that it is also communicated through the social by signs, symbols, actions, ideologies and practices which both "constitute meaning and create entirely new objects and practices" (McCarthy 1996:1). McCarthy (1996) added that a student of the sociology of knowledge should ask: "What kinds of symbols and knowledges are used and by whom?, How are they reproduced and disseminated?, What do they teach?, and How are they linked to strategies of action and opportunity? Therefore, to answer the question of knowledge value, a framework based on the sociology of knowledge should concentrate on the *processes* that comprise, and enable, the production of knowledge. In a similar argument, Sociologist Troy Duster (2006b) argued that new sociological inquiry regarding scientific knowledge should start with collecting data at the "sites of production." This suggests working at the level where knowledge is constructed. Thus, moving beyond just the assertion that knowledge is socially constructed toward an analysis of the way socially constructed knowledges shape perceptions of social reality. Shelia Jasanoff (2008:761) contended that one way to approach such a challenge is for "STS scholarship…to expand its theoretical repertoire and adopt methods that go well beyond what scientist do in or out of their own workplaces." Jasanoff's comments suggest that social science research on the production of scientific knowledge must go beyond 'following scientists' in order to really elucidate the impacts of such knowledges and practices on society. This includes focusing on the structuring of knowledge and its producers (both humans and technologies broadly conceived), examining the effects such knowledge have on social institutions, culture, identities, and bodies. This requires examining the function of knowledge at the level of interaction—the processes that both help produce knowledge and bind knowledge to the knowers, and those who apply it in other settings. Therefore, gaining a better understanding of how knowledges are operationalized within society, the consequences for such conceptualizations, as well as the logic behind, and forces at play, within the construction of knowledge help elucidate the function of power/knowledge within society.

Medicalization and Biomedicalization

This dissertation will demonstrate that the use of biologically based theories and technologies to examine VAB quickly increased in from the late 1960s through the 1970s (see chapter 2). The continuation and expansion of this research is in part the results of the larger *medicalization* era of medicine (Conrad and Schneider 1992; Moran 1992). Irving Zola (1972) coined the term medicalization to capture the expanding influence and authority of medicine. Historically, the medicalization era, c1940-1985, can be characterized as the second of three major periods in American medicine (Clarke 2010; Clarke et al. 2010), emerging alongside the increasing organization and growth of medical practice and professionalism after World War II (Clarke 2010; Conrad and Schneider 1992; Freidson 1970; Starr 1982). In their book, *Deviance and Medicalization: From Badness to Sickness*, Peter Conrad and Joseph Schneider (1980/1992) took up more specifically the concerns over the growth and consequences of the medicalization of deviant behaviors—including criminal and violent behaviors.

Conrad and Schneider's (1992) critique of medicalization described how socially defined deviant behaviors (e.g. homosexuality, alcoholism, child delinquency) that were traditionally addressed in legal or moral terms had been gradually subsumed under medical jurisdiction. In contrast to these medicalized meanings of deviance that were starting to emerge, Conrad and Schneider (1992) proclaimed that deviant behaviors do not represent objective and/or static sociocultural understandings of 'unacceptable' behavior, nor are these behavioral characteristics embodied within particular persons in society. Instead, they understood deviance to be socially constructed and relative to actors, societal interactions and historical time. This understanding of deviance elucidated how powerful actors help construct and legitimate specific definitions of deviance. Thus, Conrad and Schneider contended that deviant categories are socially constructed and defined, and while dynamic, these understandings are contextualized according to specific cultural and socio-historical factors.

Using this interactionist approach, Conrad and Schneider (1992: 248-254) criticized the medicalization of deviance for individualizing and depoliticizing deviant behaviors, and essentially operating as an agent of social control. The argued that medicalized definitions excused larger social forces at play. Medical models of deviant behaviors concentrated on diagnosing and treating at the individual level, and such approaches ultimately helped expand the authoritative role of medical institutions and the power of medical professionals to control those exhibiting such behaviors. Therefore, medicine—as represented through health care organizations, health/social policies and physicians—became a significant instrument of social control by redefining *certain* social behaviors as medical problems (Conrad and Schneider 1992; Lock 2004).

Recently, there has been greater attention to the way scientific methods and biotechnologies play in reconstituting perceptions about medical professionalism and dominance (Burri and Dumit 2008; Clarke et al. 2003, 2010; Conrad 2005; Lock 2004). Similarly, this investigation focused on elucidating if, and how, technoscientific instruments construct, sustain, and employ of differing definitions of deviant behavior. This project takes the work Conrad and Schneider—the relationships among medical professionalism, social control, and the construction of health—as a starting point, and following Clarke et al. 2003, 2010 expands the investigation on the medicalization to biomedicalization, and more specifically the biomedicalization of VAB (see chapter 4).

Biomedicalization is a term derived from Adele Clarke and colleagues (2003, 2010) to help better capture the *transformation* of American medicine since the mid-1980s. Biomedicalization captures the, "increasingly complex, multisited, multidirectional processes of medicalization that today are being both extended and reconstituted through the emergent social forms and practices of a highly and increasingly technoscientific biomedicine" (Clarke et al. 2003:162, 2010). Clarke and colleagues (2003:166-183; 2010:57-82) outlined five key overlapping processes that can be used to help better elucidate biomedicalization. These include: 1) new biopolitical economy of medicine; 2) intensifying focus on health and risk, and surveillance; 3) the technoscientization of biomedical practices; 4) transformations of biomedical knowledge production, and 5) transformation of bodies and the production of new identities. Essentially, these more contemporary processes of biomedicalization help differentiate it from classic medicalization critiques, which emphasized the practices of social control through medical expansion via the reconceptualization of the social world in medical or health terms (Conrad 1992; Conrad and Schneider [1980]1992; Zola 1972). In contrast, biomedicalization is concerned with the *transformations* of health, illness, and the body from the "inside out," through the rapid rise of and ever more dependence on technoscientific practices (Clarke et al. 2003, 2010). By focusing on the increasing technoscientific influence on illness, health, *and* well-being (or what it means to be healthy), and not only the expanding jurisdiction of medicine, biomedicalization sets out to address the influential effects of biomedicine and science on everyday 'ways of knowing' and practices of 'living' in society.

Biomedicalization highlights the continued importance of the work of Michel Foucault (1970, 1973, 1978/1990, 1979/1995, 1980, 1984) in medical sociology and science and technology studies. Particularly, contemporary scholars have helped advance his contributions on the ‘conditions of possibility,’ and the intertwined relationships with power/knowledge. His work on the production and experiences of the “abnormal,” are also important for biomedicalization theory. Foucault (1997b) argued that through the production of fear—both through sustaining and employing definitions of deviance/abnormality and producing new meanings and conceptualizations of such concepts—the perception of who is, and who is not “abnormal” is solidified and reconstituted within society. Foucault (1997b) went on to state that these processes are extended through particular practices, and in conjunction with the utilization of both positive and negative reinforcements—including correctional facilities, law enforcement methods and laws, stripping or enabling of other “guaranteed” social rights—that work both to help correct the “abnormals” as well as discipline others on how not to behave. In the case of violent behavior and technoscientific biomedicine, the role of these technologies should be investigated in order to elucidate if, and how, they play a role in normalizing particular types of behavior, and this dissertation pays special attention to the corporal politics of examining *abnormal* bodies and behaviors via *normal* brain structure and function (Canguilhem 1991; Foucault 1978/1990, 1997b). Moreover, Foucault’s work on the notions of *bio*power and *bio*politics are key to helping understanding the ways in which biomedicalization helps reconstitute and discipline our interactions and practices of life, especially through the organization and economics of health care institutions and pharmaceutical industries via *bio*capital (Rajan 2012; Dumit 2012), and the overall refashioning and remaking of bodies and identities through technoscientific transformations and biomedical promise (Burri and Dumit 2008; Clarke et al. 2003, 2009, 2010; Clarke and Shim 2011; Duster 2006a; Rose 2007).

RESEARCH METHODOLOGY AND DATA ANALYSIS

This dissertation employed a multi-sited methodology. George Marcus (1995) first outlined the idea of a 'multi-sited' research approach in an effort to better define and assess ethnographic methodologies that utilize multiple sites of data collection. These systematic anthropological approaches enable researchers to better illuminate more holistic understandings of their phenomenon of study. As stated by Marcus (1995:95) this type of "ethnography moves from its conventional single-site location, contextualized by macro-constructions of larger social order…to multi-sites of observation and participation that cross-cut dichotomies such as 'local' and the 'global,' the 'lifeworld' and the 'system.'" Later, sociologist Adele Clarke (2005) expanded the understanding and use of this methodological approach beyond just ethnography in her retooling of grounded theory, what she called "situational analysis." Clarke argued that multi-sited research (as well as multiple sources of data such as: ethnographic, interview, historical, narrative, and visual) provide a greater opportunity to capture the highly complex, diffused, and discursive aspects of research topics, and ultimately help reveal a better understanding of all multifaceted processes at play. Thus, a multi-sited approach helps capture a more complete understanding of the discursive social processes and phenomena, and how society produces, reproduces, and operationalizes such mechanisms.

In this dissertation project, I used four interrelated methods: 1) historical literature review; 2) qualitative content analysis; 3) semi-structured, in-depth interviews with *neuro*-criminologists; and 4) ethnographic observation and neuroscience training. This project secured internal review board (IRB) approval from the University of California, San Francisco's (UCSF)

Committee on Human Research (CHR). The data collected and methodology employed provided a better opportunity to capture the intricate processes—including multiple sites of (re)production and legitimation—among the practices of and approaches to violence and crime; the scientific technologies, methodologies, sites and classifications used to make knowledges about the etiology of VAB; and the bodies and brains through which VAB knowledges are configured and mapped upon. Therefore, following Clarke (2005), I argue that this approach allowed the dissertation to take more seriously the complexities, differences, and multiplicities that contribute to the complex assemblage of discursive uses, negotiated practices, and 'conditions of possibilities' that organize, and make viable biologically-based approaches to VAB and crime. Below, I described each of these four methods in more detailed included specific data collection procedures and data used for the project.

Concentrated Historical Literature Review

A historical review of biocriminology is imperative to this dissertation. This historical review was more than just an overview of the literature, instead it served as a key methodological component within the larger multi-sited methodology, or what Clarke (2005:254-265) has termed 'historicizing' contemporary research. Employing a 'historicizing' methodological approach helps elucidate and contextualize historical meanings and practices of the studied phenomenon in lieu of a more extensive historical project (Clarke 2005). The historical data used in this dissertation targeted key publications, researchers and technologies from the *1900s to the early 1980s*.[2] Data for this chapter included: original peer-reviewed articles and books, pertinent edited volumes from criminology, major contemporary reviews and analyses on the history of biocriminology, and governmental reports, legal documents, popular magazine and newspaper articles all pertaining to the biology of VAB in human populations.

Instead of covering *all* biocriminology, research produced during this era, this review systematically targeted a sub-set of influential biological theories of and technologies for VAB to best address the larger specific aims of the dissertation. Specifically, this method selectively concentrated on: several key researchers in biocriminology circa 1900-1980s, identified through both current and historical criminology textbooks and journal publications; the development of novel corporeal technologies to study VAB starting at the turn of the twentieth century; and the significant socio-historical movements, practices, and scientific philosophies that helped legitimize, advance and/or popularize the discipline throughout this selective era. Thus, the historical review presented in this dissertation is better described as a *historicizing project* (Clarke 2005), or a *concentrated review*.

This type of historicizing project of biocriminology was most useful as a way to help complete and complement the overall analysis throughout the dissertation by helping to better situate and make sense of claims made and practices used in contemporary biomedical research on VAB. The analysis of this data also allowed the dissertation to employ an ongoing comparative methodology that focused on the continual development of useful analytic themes for the rest of the research. This process informed the construction of useful questions for my interviews with contemporary neurocriminologists, and the helped refine productive codes and themes for the content analysis of contemporary neuroimaging research on VAB. Moreover, as mentioned above, the justifications for the uses and promises of contemporary biocriminology have been based on the insistence that contemporary inquires have moved beyond the marred past of the discipline. Thus, this dissertation's examination of the historical linages of biocriminology also helped better contextualize the theories and methods that helped structure and preserve misguided and/or racist and sexist practices of biocriminology in this era; situate the seemingly counter views by contemporary researchers in biocriminology; and helped contextualized the points of departure that they argued gave rise to, and better described, modern practices biocriminology. Therefore, this historicizing approach enabled the dissertation to better trace and evaluate the discursive practices, negotiations, and the overall infrastructural practices or 'infrastructural work' (Bowker and Star 1999) employed through and/or relied upon by contemporary research procedures and disciplinary practices—actualized via modern *technoscientific* practices rooted in genetics and neuroscience—to ostensibly moved on and/or rejected archaic modes of biological examination.

Qualitative Content Analysis

Traditionally, content analysis has been described as a methodological tool that focuses on making *replicable* and *valid* inferences from written texts and/or visual images. Drawing on these textual or visual sources and systematic and rigorous approach this method can provide a conceptual model or framework of a particular phenomenon or practice (Krippendorff 2004). Conceptually, this technique was intended to be a 'scientific tool,' and thus its reliability was said to be demonstrated through its ability to be *objective*, *quantifiable*, and *repeatable* (Berelson 1952; Krippendorff 2004). However, this dissertation used a more a *qualitative* or *interpretive* approach to content analysis, which emphasized and more *inductive* and *interpretive* approach to the data (Crawford 2007; Graneheim and Ludman 2004; Hsieh and Shannon 2005; Mayring 2012).

A qualitative content analysis approach focuses on rigorous continual comparison of analytic codes and themes generated from each source of data (Crawford 2007; Hsieh and Shannon 2005; Mayring 2012). This study analyzed and coded published peer-reviewed contemporary biocriminology articles as unique and rich sources of data. Collectively, the data that emerged from these published articles generated an overall picture of the practices and assumptions that enable, foster, and legitimate the production and uses of neurobiological knowledges on VAB. Like other methods employed in this dissertation, the qualitative content analysis was not intended to stand-alone. Instead, its inclusion rested on its ability to assist, be incorporated in, and to be informed by other data throughout the dissertation. By going beyond a traditional approach to content analysis, this method allows the dissertation to disrupt normative and or binary understandings of the production, meanings, and work of VAB, bioscience, and race.[3] Below, I provide more details pertaining article selection and coding for the content analysis.

Content Analysis Inclusion Criteria and Article Selection Process

The content analysis used 126 peer-reviewed articles on VAB that were published between 1990 and 2012. Studies were identified through key word searches using PubMed, PsychINFO, the NIH Reporter online search tool, citations from key publications and authors, and other relevant psychology, health, law, and criminology journals. Key words for these searches focused on different combinations of terms related to VAB including violence, aggression, brain, neurobiology, genetics, neuroimaging, psychopathology, crime, antisocial behavior, and psychopathy. These initial searches were purposely broad to capture a more dynamic range of reviews, commentaries, meta-analyses, and empirical articles. This approach also allowed for a much more comprehensive understanding of contemporary biocriminology research. The initial search yielded over 1700 potential articles, which were narrowed down to just over 400 articles based the exclusion of articles that: 1) were duplicates, 2) not printed in English, 3) focused on non-human populations, and/or 4) with study objectives that were *not* specifically concentrated on violent, aggressive, or criminal behaviors. These 416 publications were then subsequently re-analyzed and re-sorted based three other inclusion criteria: 1) the 'type' of research article (see below), 2) neuroimaging technologies used in the study, and 3) the psychological diagnosis used to identify the study's population(s) (if applicable), until I reached a final dissertation sample of 126 articles. Each of these three inclusion criteria are explained in detail below.

First, I divided the larger sample of 416 articles into two groups: 1) review/meta-analysis biocriminology articles and 2) empirical neuroimaging articles. Review/meta-analysis biocriminology articles refer to the subset of articles that I used to help provide a more expansive understanding or overview of contemporary biological research on VAB, to generate appropriate content analysis themes and codes, and to develop subsequent inclusion criteria for the larger set of empirical articles. I coded 119/416 of the articles as review articles. These reviews, editorials, and/or meta-analysis studies were published in key psychiatry, psychology, neuroscience, genetics, criminology, and/or law texts. For final inclusion into the dissertation, I systematically selected a sub-set of these 119 studies based on 1) author(s); 2) suggestions or citations from interview participants and key texts; and 3) influential journals (based on the number of publications related to biocriminology in the journal and the journal's five-year Impact Factor). Using these criteria, I selected *37 articles* for the initial content analysis (see Appendix A).

Empirical Neuroimaging Articles on VAB

Empirical articles, on the other hand, refer to the remaining 293/416 research articles on VAB that employed neuroimaging technologies. I excluded journal articles that were commentaries, editorials, reviews or meta-analyses from this set of content analysis articles. The final content analysis sample for this dissertation included *89 empirical articles* (See Appendix B). The coding criteria for the empirical subset can be divided into four main areas: Article information; Study Sample; Study Procedures; and Neuroimaging Findings (see Appendix C). From these foci of interests, I was able to develop a number of codes more specific to the dissertation's main aims. My main selection criteria for these articles was based on the type of imaging technologies used and the types of behaviors or psychiatric disorders that were the focus of the study. The final sample excluded articles that: a) broadly focused on cognitive or emotion processes and the brain; b) focused on the relationship between suicide and neurobiology; c) used populations defined by traumatic brain injury (TBI); d) only employed EEG technologies to examine the relationship between the brain and VAB; and/or e) used a study population(s) defined by psychological disorders that did not have VAB as a primary diagnostic criteria. Below, I described the inclusion criteria for the empirical articles used in the content analysis in more detail.

Articles that broadly focused on emotion or cognition were including *only* if a key aim of the study was to elucidate the relationships between cognitive and/or emotional neurobiological processes *and* violent, aggressive or criminal behaviors. All other studies that focused solely on the neurobiology of emotions or cognition were excluded from the final sample. Articles that focused on suicide were also excluded in order to focus specifically on a more narrow understanding of VAB, as a characteristic of deviant, criminal, or harmful behavior(s) *against others*, or what World Health Organization (WHO) defines as *interpersonal violence*.[4] Furthermore, studies that focused on traumatic brain injury (TBI) or that used populations with prior brain injuries or lesions were also excluded from the final sample. The Center for Diseases Control (CDC) website states that TBI is "caused by a bump, blow or jolt to the head or a penetrating head injury that disrupts the normal function of the brain" (CDC 2014). The presence of TBIs and/or brain lesions has been linked brain dysfunction, and these brain abnormalities have been correlated to an increased risk for VAB and criminality (Luukkainen et al. 2012; Max et al. 1998; McKinlay et al. 2010; Moffitt 1993). However, the studies focused on for the content analysis *excluded* individuals from their samples who had a TBI or observable brain lesions. These researchers contended that such sample criteria helps isolate what is believed to be *organic* brain (dys)function and/or abnormal structure. Essentially, these brain abnormalities are described as key correlates of VAB, which predispose individuals to a higher risk for VAB or crime (see Raine 1993).

The final sample also excluded articles based on the *neuroimaging technologies* the study used examine VAB. General neuroscience or neuropsychological studies that did not use imaging technologies were excluded from the final sample. Moreover, I excluded articles that focused on genetics alone, but articles that focused on a combination of neuroimaging *and* genetic technologies were included. The final sample included studies that used the following imaging technologies: Positron Emission Tomography (PET), Single-Photon Emission Computed Tomography (SPECT), Magnetic Resonance Imaging (MRI), Functional Magnetic Resonance Imaging (fMRI), and Diffusion Tensor Imaging (DTI). While other imaging technologies such as electroencephalograph (EEG) have been used in imaging studies on VAB, articles that *only* used EEG technologies were excluded from the final sample. Computer Tomography (CT) scans were also excluded from the final sample. CT scans played an important role in the development of brain research on VAB; however, the use of CT scans declined during the mid-1980s with the emergence of more sophisticated imaging technologies, specifically PET scans (Kelves 1997). Therefore, articles that *only* used CT scans to examine VAB were excluded from the final sample due to publication year limits (1990-2012). In addition, more recent neuroscientific brain technologies, such as deep brain stimulation (DBS), Magnetoencephalography (MEG), or transcranial magnetic stimulation (TMS), were excluded because the search did not yield any studies that used this technology in reference to VAB. These exclusion criteria specific to imaging technologies were enforced to help better capture and highlight the increased use, value, and 'conditions of possibility' made through technoscientific imaging practices, and their impacts on the development of neuropsychology and biomedicalization (Clarke et al. 2003, 2010).[5]

Finally, the sample of empirical articles was also limited to studies that focused on specific VAB related diagnoses as described in the Diagnostic and Statistical Manual of Mental Disorders (DSM). The DSM defines these VAB related diagnoses as psychopathologies, and it classifies them as personality disorders. Personality disorders are associated with how individuals think, feel and correspondingly behave or function (APA 2000). I limited the articles included for content analysis to personality disorders that are explicitly characterized by VAB. The content analysis included the following personality disorders: antisocial personality disorder (ASPD), conduct disorder (CD), intermitted explosive disorder (IED), and oppositional defiant disorder (ODD). In addition, two other *non*-DSM categories were also included: psychopathy and callousness unemotional (CU) traits. However, two personality disorders that have been linked to VAB through neuroimaging and genetic studies were *excluded* from the final sample. These two disorders, schizophrenia and borderline personality disorder were excluded because their DSM diagnostic criteria do not *require* the presence of violent or aggressive behavior.[6]

The most popular DSM classification used in neurobiological VAB research is ASPD. ASPD is defined as a diagnosis that "must be distinguished from criminal behavior undertaken for gain that is not accompanied by the personality features characteristic of this disorder. Only when antisocial personality traits are inflexible, maladaptive, and persistent and cause significant functional impairment or subjective distress do they constitute antisocial personality disorder" (APA 2000:706).[7] Psychiatrists describe antisocial conduct as behaviors that may go undetected by criminal justice laws, but are still harmful and/or detrimental to a person's health and/or other's well-being (APA 2000). On the other hand, most people recognize the term psychopathy (or psychopath). Although very similar to ASPD, psychopathy is described as being a distinct diagnosis. Its origins as a term to describe VAB actually outdate ASPD (Pickersgill 2010) and, due to popular news media, crime shows, and the internet, it is often used colloquially within both lay and professional circles. As a classification, psychopathy has never been recognized as an official DSM diagnosis. Instead, it is primarily diagnosed using Canadian psychologist Robert Hare's Psychopathy Checklist (PCL)—and/or the PCL-R or PCL-YV, the revised and youth version s respectively. The PCL-R, the most commonly used version, is a unique quantitative scale for antisocial behavior that takes into consideration a host of emotional and cognitive factors.[8] As a diagnostic classification, psychopathy is well utilized in psychiatric/psychology research on VAB. Through both traditional psychological behavioral research and contemporary neurobiological research, psychopathy is characterized by antisocial behavior *and* compromised emotional responses, particularly empathy and remorse (Anderson and Kiehl 2012; Blair 2006). While psychopathy is often diagnosed from emotional factors (persistent patterns of a lack of empathy and remorse), Intermitted Explosive Disorder (IED) is a disorder said to affect impulse control. According to one of the leading experts on IED University of Chicago psychiatrist Emil Coccaro (2011), this disorder is often characterized by behaviors such as reoccurring aggressive outbursts, repeated patterns of verbal or physical aggression toward others or property, and /or aggressive behavior that is out of proportion to its stressors.

Three other classifications included in the content analysis are primarily associated with youth populations (under 18 years old). These diagnoses are conduct disorder (CD), oppositional defiant disorder (ODD), and callous-unemotional traits (CU). CD is used to describe youths with antisocial traits. Since ASPD can only be diagnosis in individuals 18 years or older, CD is often seen as the youth version of ASPD (Blair 2001; Sterzer et al. 2005). The "essential feature of CD is a repetitive and persistent pattern of behavior in which the basic rights of others or major age-appropriate societal norms or rules are violated" (APA 2000: 93). Similarly, the DSM-IV-TR defines ODD as a recurrent pattern of disobedience and hostile behavior toward people in authority. ODD and CD are often used in neurobiological research to differentiate youths who exhibit aggressive behaviors without psychopathic traits. Youth who exhibit psychopathic traits as well as antisocial behavior fall under the diagnosis callous-unemotional traits (CU) (Blair 2003, 2006; Viding and McCrory 2012). CU is a diagnosis for children with severe conduct problems and, like psychopathy, is associated with a lack of both guilt and empathy with others (Frick and Viding 2009; Frick and White 2008; Viding and McCrory 2012; Viding et al. 2005). Again, like psychopathy, CU is not an official DSM classification. Instead, it is defined through the Callous-Unemotional Trait Scale of the Antisocial Process Screening Device, a screening tool used to assess youth for antisocial behavior and psychopathic traits (Frick and Hare 1999).

Semi-Structured In-Depth Interviews with Neuroscientists

Semi-structured interviews provided in-depth rich narratives of biocriminologists' own perceptions and rationales regarding recruitment strategies, study design(s), imaging procedures and interpretation of results. Interviews allowed this dissertation to gain a better understanding of the types of people/bodies used in biocriminology research; the imaging processes and *neuro*-knowledges made, and advanced, through these biotechnologies; and overall helped to address gaps in literature that are difficult to ascertain through content analysis alone. I conducted ten semi-structured interviews with neuroscientists that research the neurobiological correlates of VAB. The term “neuroscientists” is used here to capture the diverse group of neuroscientists, psychologists, psychiatrists, geneticists and other related professionals and brain researchers who have been trained to use neuroimaging technologies, and who employ these techniques when studying VAB. Therefore, this group of interviewees can also be characterized as *neuro*-criminologists.

To be included in this portion of the study, participants had to 1) be a neuroscientist (as broadly described above); 2) conducted research on the neurobiological underpinnings of VAB with specific focus on brain structure and/or functioning; and 3) utilized neuroimaging technologies to help study such neural processes or structure. Interviewees were identified primarily through PubMed and NIH Reporter tool searches; citations from published neuroimaging research on VAB, including my initial content analysis of review literature on biocriminology; and through snowball recruitment techniques using information provided by peers during interviews and participant observation at talks, meetings, and neuroscience trainings. All interviews were recorded and each interviewee signed a consent form, approved by UCSF CHR, prior to the interview. I provided participants the choice to have our interview conversation 1) “off the record,” 2) “on the record,” or 3) “selectively on the record.” If a participant chose to be “selectively on the record,” they were given the option to select specific statements or phrases that they wanted “on” the record, and any statement not identified by the interviewee was treated as “off the record.” Moreover, these interviewees were also required to review all statements they selected as “on the record,” and an additional signature was required before such material would be printed or published. However, due to the small sample size, I treated *all* interviews as "off the record" for the purpose of this dissertation, and all of the neuroscientists interviewed were given pseudonyms to protect their identity.

Several themes emerged from the interview data that helped detail understandings of how socially mediated concepts/variables (e.g. violence, aggression, self-control, and maturity) are defined, measured and utilized, and these themes helped generated greater knowledge of perceived advantages and disadvantages of employing such concepts/variables in VAB studies. Interview codes and themes also provided a more detail description of specific procedures of neuroimaging research. Including how research designs were implemented and specific complexities that may have occurred during sample recruitment and experimental phases of the research. However, the codes and themes I developed were primarily employed in this dissertation to help understand the discursive ways in which social practices, identities, and negotiations help to construct and make meaning of biological knowledges of VAB. Specifically, my interviews with neuroscientist helped elucidate questions concerning: the practices and knowledges said to help differentiate contemporary biocriminology from its past; the operationalization of social and environmental factors in biocriminology; and the lingering uncertainties and difficulties surrounding the implications for and use of race (and ethnicity) in biocriminological research and practices (see chapter 5). Thus, by talking directly with these researchers this dissertation provided a more detailed understanding of the current and potential future ethical and social impacts of contemporary neurobiological research on VAB.

Ethnographic Observation and Neuroscience Training

The final method employed in this study was ethnographic observation and neuroscience training. First, I was able to attend two events on neuroscience and law at the University California, Hastings: February 10th 2012 *Law and Policy of the Developing Brain: Neuroscience* *from Womb to Death Conference,* and on April 16, 2013, Dr. Kent Kiehl's presentation "The Usual Suspects Magnetized: When Neuroscience and Law Collide!" Each event highlight key researchers and/or research related to the neuroimaging of VAB, and provided a more detailed understanding of the future implications of applying neuroimaging research in the legal arena. Although both of these events were specific to the law and neuroscience, each also had a distinct focus related to this dissertation's concentration on the ethical implications of neuroimaging research on VAB.

The primary observation/training for this dissertation took place in the summer of 2013 when I was selected to attend Neuroscience Boot Camp (Penn Boot Camp), hosted by University of Pennsylvania's Center for Neuroscience and Society on July 29^{th} – August 7^{th}. The Penn Boot Camp was an intense 10-day interactive neuroscience training experience designed for non-scientists. Each session lasted about 8 hours per day, and included interactive lab and imaging scanner visits, in-depth lectures and discussions, journal club style small group discussions, as well as less formal conversations with both Boot Camp presenters and trainees. Penn Boot Camp presenters were all prestigious neuroscience researchers from the University of Pennsylvania's Department of Psychology, the Biological Basis of Behavior Program, the University's Law School and the Perelman School of Medicine's Neurology Department. Trainees included professionals from law, philosophy, marketing, and a diverse host of others all interested in applying the training and knowledges from Boot Camp to their own professional careers. I also gained additional neuroscience training through a 6-week Coursea online class that focused on reading and interpreting functional MRI (fMRI) statistics. The course was taught by Martin Lindquist, Associate Professor of Biostatics at John Hopkins University. It was designed to provide introduction of neuroimaging fMRI research design and how to read and interpret statistical data from neuroimaging research.

Observation and neuroscience training served as both an important methodological tool as well as an ongoing educational preparation. Thus, this method significantly enhanced my ability to engage the literature on neuroimaging of VAB, and my understanding of current and potential future emerging projects, technologies and debates that are not always captured by printed journal articles. In addition, the provided an exclusive space to engage researchers and gain insight of potential future projects, obtain informal advice on the direction and potential gaps in my dissertation project, and to recruit neuroscientists for interviews. Each observation/training site was documented using field notes, as well as subsequent memos, and all observational/training data was coded and analyzed in the same fashion as data from the content analysis and interview portions of the project.

Data Analysis

The data obtained in this dissertation was analyzed using a grounded theory approach to qualitative data (Charmaz 2006; Clarke 2005; Glaser and Strauss 1967; Strauss 1987). The principles of grounded theory involve the following: a continual concurrent method of data collection and analysis (including memo-writing), the systematic construction of codes and themes from the data, and the use of an inductive constant comparison method of analysis. Data analysis begins as data for the study are collected, and in fact, early analysis helps inform subsequent data collection and analysis. The use of an ongoing constant comparative method informed the development of more purposeful interview guide questions—and other data collection processes—and helped in the continual development of further analytic codes and themes for the content analysis. Moreover, grounded theory compels the researcher to constantly compare collected data in an effort to better focus and enhance their future knowledge of the data collection and analysis processes, ultimately leading, to "an empirically based *substantive* *theory*" (Clarke (2005:xxxi). Thus, as noted by Anslem Strauss (1987:5), grounded theory is much more than a research technique, it is a "style" of research; one that enables the researcher to better magnify, reflect on, and ultimately construct a more complete and/or refined theoretical model of the studied phenomenon (see also Clarke 2005; Charmaz 2006; Glaser and Strauss 1967).

In addition, the grounded theory analytic approach for this dissertation was also informed by Adele Clarke's "situational analysis," particularly in the early stages of the research project. Situational analysis is a postmodern extension of ground theory analysis. It allowed for a more nuanced, analysis of the complex situations of research focus by incorporating studies of "discourse and agency, action and structure, image, text and context, history and the present moment" (Clarke 2005:xxii). Clarke emphasized the use of "mapping" as an extension of traditional grounded theory analysis, in order to better organize and analyze collected data, and to better elucidate particular discourses and conditions that structure, characterize and frame the phenomena of study. This approach was especially useful for this project because 1) it provided a framework to assemble and analyze multiple sources of data, and 2) it provided a starting point to help the dissertation systematically elucidate the relationships between discourses, technologies, and multiplicities in knowledges (and knowledge production and uses).

OVERVIEW OF THE DISSERTATION

Moving beyond the Nature vs. Nurture Debates

This dissertation examines the social and ethical implications of neuroscientific research on VAB. It describes how neurobiological research on the determinants of VAB are formulated, structured, and contested, and how neuroscientists understand and engage potential social impacts, specifically racial implications, of neuroscientific VAB research. Importantly, the dissertation is also designed to help elucidate specific critiques that have been made against scientific inquiry of VAB, and the rebuttals that contemporary researchers have made to address such criticism.

This inquiry utilizes historical and current research to help better illuminate potential consequences of neuroscience research on VAB. Therefore, this dissertation takes seriously the steps, rhetoric and practices employed by contemporary biocriminologists to explain, defend, and improve contemporary biocriminological theories, thus to ostensibly separate from or move beyond the marred historical approaches of biocriminology. This level of inquiry serves as a starting point to help better understand whether, and how, such knowledges contribute to societal-level comprehensions, performances, and reactions to VAB. Such an inquiry also hinges on questions related to the functioning, impacts, and/or likeness between the narrative(s) of scientific progress and narrative(s) of social progress. Can our current use of neuroscience avoid the pitfalls that plagued past employment of biomedical technologies and practices in VAB research, and/or can these technoscientific approaches enabled the emergence of *newer* and more nuanced reductionist ontologies (Pickersgill 2009)? In relation to violence, science, and race, what are the discursive methods through which scientific racism exists today within a post-Civil Rights racial era, and a discursively claimed non-deterministic and reductionist science era? Can we have racism without racists (Bonilla-Silva 2006)? Or, in this case, is there scientific racism without "true" racist intentions or racist scientists doing the work? If so, how does this look and operate?

My focus on the debates between nurture and nature are not meant to reiterate past debates or reinforce such theories as irreconcilable ideological stances, but to understand how such critiques of and debates about biocriminology have helped developed contemporary biocriminologists conceptualize newer theories and technologies to study VAB. That is, I am interested in the way critiques of biocriminology have function less as historical relics, but instead as *living artifacts*. Instead of ignoring such critiques, biocriminologists have, in their own ways, attempted to address and/or correct these areas of their work. This has been especially true, with contemporary biocriminology since the late 1980s. With the increase of technoscientific tools and practices, these researchers have continued to insist that they have, or are prepared to, addressed the critiques of the past. While at the same time, they have retained key ontological principles of the past, and some epistemological and methodological practices, in a continued effort to examine the most basic level of VAB, and to reinforce the perspective that the source of VAB is located *within* one's corporal makeup and/or biological functioning.

Essentially, contemporary biocriminology research forces science studies to better recognize and understand the ways it has attempted to correct, or improve from, the past. As noted by scholars today, it is difficult to simply label contemporary biocriminology as reductionist, especially since today's biocriminologists insist that VAB is the product of the interaction between both biological and social determinants (Pickersgill 2009; Rafter 2008; Rose 2007). However, how should we evaluate such claims by biocriminologists? What are the continuities that remain important to the infrastructure and practices of biocriminology? Using the aims of this dissertation as a starting point, the data collected for this dissertation allows me to address a few of these rebuttals at length, using contemporary neuroimaging practices as an exemplar. These points of contingency are used to frame the chapters of this dissertation.

Overview of Chapters

Chapter Two provides a historical examination of biomedical research on VAB. This chapter threads together specific continuities pertaining to epistemologies, methodologies, ideological debates and material consequences that underpin biological inquiries of VAB. It also outlines the historical arc of biocriminology and highlights specific ethical debates about its use over time. This chapter starts with an overview of the work of Caesare Lombroso, who was credited with starting criminology as an empirical study of crime (Rafter 2008; Wolfgang 1961). The historical analysis taken here focuses on: the contributions of Lombroso as a key figure in the development and popularity of biocriminology; key original works that help sparked the reemergence of biologically based explanations of VAB; and other major literature reviews, magazine and journal articles, and speeches that helped provide an overview of the development, uses, and critiques of biocriminology.

Lombroso had a very strong influence on criminology, and specifically the study of biology and VAB. This helped advance biological theories of crime and VAB, which were at their peak during the early twentieth century. However, these perspectives experienced a declined during the middle of the century due to the negative effects of and links to the eugenic movement and to racist propaganda campaigns during and after WWII (Rafter 2008). In this chapter, I also examine the role of biocriminology after WWII, or the resurgence of biocriminology in the 1960s, highlighting specific theories and figures that were key to its reemergence. The chapter ends with an overview of the historical relationship between race, science and VAB. Overall, I argue in this chapter that the history of biocriminology continues to inform contemporary practices both as a theoretical warrant of inquiry and as a methodological point of departure. Moreover, I use this chapter to help better situate and frame the practices, theories and technologies utilize by contemporary biocriminologists.

In Chapter Three, I utilize data from my qualitative content analysis of contemporary neuroimaging research on VAB. This chapter is framed around the critique of biocriminology that concerns how VAB is defined and understood within society. Specifically, critiques have argued VAB is result of a myriad number of factors, and how it is defined, conceptualized, and treated are products of social, cultural, and political practices and understandings. Critics contended that biological research on VAB does not adequately take into account the social nature of crime and VAB. While most biocriminologists state that *all* behavior is brain based, contemporary biocriminologists have also claimed that VAB is a psychopathology, thus a medically recognized psychological disorder.

Using the work of Geoffrey Bowker and Susan Leigh Star (1999), this chapter focuses on the operationalization of VAB, through quantification, classification, and scaling, into a psychopathology. I start the chapter with a description of the practices of and complexities in constructing VAB as a psychopathology. Then, this chapter highlights how contemporary researchers often use DSM defined classifications as a way to determine which behaviors and bodies are suitable for study, thus the two (types of bodies and types of DSM classifications), can often reinforce and legitimate each other. Using the DSM and other VAB classifications, biocriminology utilizes very specific conceptualizations of VAB to ostensibly justifying the use of technoscientific procedures to examine the neurological or genetic roots of VAB. Thus, the use of the DSM and other classification systems has allowed contemporary biocriminology to reply to their critics, and claim that the types of behaviors they focus on are more specific than in the past. Instead, their concern is only on behaviors that qualify as psychopathologies.

Chapter Four examines the types of tools, practices and procedures used to examine the brain in research on VAB. This chapter uses data from my content analysis along with interview data. Another important debate over the use of biocriminology has concerned the tools used for inquiry. This critique is shared between both contemporary critics and biocriminologists. Both seemingly agreed that certain ‘technologies’ such as *phrenology* (ascertaining one’s personality traits from the contours of the skull, Gall 1835), *craniometry* (measurement of skull size, Lombroso 1876), or *somatology* (focus on phenotypic characteristics and body shapes, Hooton 1939; Sheldon 1942) where flawed approaches to VAB, and can be described better as ‘pseudoscientific’ endeavors that often helped justify larger social inequalities (i.e. eugenics). However, contemporary biocriminologists also contend that, while the past approaches/technologies were inept and/or misused due to subjective personal preferences, newer biotechnologies and technoscientific practices (i.e. neuroimaging and genetics) has allowed contemporary researches to sidestep such issues.

To examine this claim, I utilize the concept of *biomedicalization* by Adele Clarke and colleagues (2003, 2010). I first outline the shift from the medicalization of VAB to the biomedicalization of VAB. I focus on what I have call the *technoscientization of VAB*, that is the increasingly dependence on: innovative bioscientific technologies, classifications, and practices; renewed funding opportunities that reinforced and stabilized the infrastructure of biocriminology; restored relationships with both the legal and medical fields; and future risk, bioprediction, and the therapeutic use biomarkers. This chapter also uses data from the content analysis to outline the specific use of structural and functional imaging in biocriminology. Finally, I highlight the growing importance of normal brains and populations in research on VAB. Such populations have been used to contrast to psychopathological brains, but I also argue that these practices work to substantiate prior claims that *all* behavior is rooted in the brain. This chapter notes that contemporary biocriminology has argued that these newer technologies have addressed the subjective practices of the past, and they provide greater, more complete, understandings of the role of biology on VAB. However, I find that while these technologies are certainly not the flawed pseudoscientific practices of the past, they still have not completely elucidated the complexities in understanding multifactorial processes like VAB, but instead have increased the focus on discovering the 'true' underling source of VAB *inside of the body*, and the biomedicalization of *all* behaviors.

Chapter Five of this dissertation was designed to address the lingering 'question of race.' Past science of VAB has often been used in a more reductionist way, leaving out or ignoring the impacts of social factors on VAB. In addition, such attempts to think about VAB in this way has also helped to reinforce racialized and gendered explanations of VAB, which have resulted in misleading associations between the hierarchal systems of social identity (race, class, and gender), and VAB. Contemporary accounts of VAB have contended that they recognize that both biological *and* social factors play a role in VAB. Moreover, contemporary biocriminologists acknowledge the past biocriminology exhibited both racists and sexist practices. However, they insist that such practices are just that, in the past. Today, any attempt to elucidate the biological correlates of VAB is said to be an attempt to not exclude or further marginalize racial groups, but to better help, and include such groups in biomedical research (Epstein 2007).

In this chapter, I use data from my interviews with neuroscientists to help describe understand how contemporary biocriminologists conceptualize and use race in their research. The chapter also asks how racism is understood, and how biocriminologists envision the future use of their work. I start with an overview of genetics research on VAB and the operation of race in such studies. Using *biosocial criminology* as an example, I note that this subgroup of criminologists have often been less successful than their *neuro*-criminologist counterparts in handling race, often times reinforcing racist connotations of VAB. I next look more specifically at neuroscientists who study VAB. Here, I examine their perceptions and complexities with race.

I find that these scientists are very cautious about how they address the 'question of race' in their research or in conversations among colleagues, what I call the *taboo of race*. However, I also note that in terms of racism, these scientists fully acknowledge the impacts that racial inequalities have on VAB, but insist that such factors are best understood as products of culture or class. The chapter ends with a short description of the *therapeutic promise of biocriminology*, which examines how these researchers see their work in the future. Overall, I conclude that complex social categories like race present methodological challenges and theoretical uncertainties for neuroimaging research on VAB. While neuroscientist have taken a much different stance on race than past biocriminologists, or even some of their contemporaries, they struggle with addressing race and have often used a *color-blind* or *no-race* approach to seemingly avoid controversy or backlash toward their research in terms of the 'question of race.'

Finally, this dissertation ends with a summary of the important theoretical and substantive implications of neuroimaging research on VAB. This chapter also includes a description of the future implications and applications of neuroimaging research on VAB and crime in relation to genetics research on VAB, the criminal justice system and crime prevention, and the 'question of progress.' I end the dissertation by detailing potential future areas of my work and next steps.

CHAPTER II
A SHORT HISTORY OF THE ENDURING SEARCH FOR THE 'CRIMINAL MAN'

> The fact that an idea has been misused does not mean it should be forgotten or that it was wrong. It is vitally important to realize that horrific though these atrocities were, they were *not* based on science. They were based on the prejudices and psychopathic policies of people in power who decided to misquote science to an uneducated public to fulfill their own immoral agendas…it was the **public's ignorance of the true facts that allowed such people to use these misrepresentations as weapons**. (Italics in original, bolding mine).
>
> Gail Anderson (2007:5)

CHAPTER II INTRODUCTION

The relationship between the history of a specific set of knowledges and its contemporary uses is at the heart of this examination of neurobiological VAB research. In this chapter, I provide a historical analysis of early twentieth century biological research on VAB. The aim is not to reproduce a complete history of all biocriminology[1], but instead is limited to an investigation of the nuanced knowledge making practices and negotiations of biological VAB knowledges of some key theorists and theories of biocriminology the early twentieth century. It focuses on better elucidating how the infrastructure and ontological assumptions underpinning these biologically based VAB knowledges have endured, specifically identifying the technologies, practices and discourses utilized to develop VAB theories, and how biocriminological theories conceptualized and operationalized violent, aggressive, criminal and/or deviant behaviors as biological constructs.

In the quote above, Anderson's (2007) reference to science refers to the biologically based research on VAB in the early twentieth century. Anderson's quote captured the prevailing sentiment of contemporary biocriminologists, who note that biocriminology continues to be hindered by its historical associations with misguided ideology, associations that are now presumably absent. However, Anderson's quote also points to some lingering questions concerning the impacts, and potential promises, of both previous and current biocriminology. What distinguishes a 'fact' from an 'ideology for biocriminology? Can we separate bioscientific ways of knowing VAB from cultural representations and interpretations of crime, violence and deviant behaviors? Does this 'science' play role or have a responsibility in shaping and/or enabling the applications or misapplications of the knowledges it produces? Moreover, how do we define 'misused' or even 'properly employed' biological VAB knowledges, and how are such VAB knowledges 'misused,' as opposed to them being properly employed? Throughout the chapter, I start to interrogate these questions, focusing on the history of biocriminology and its impacts on the structure and trajectory contemporary bioscience research of VAB—which has ostensibly shifted its stance, been repackaged and refocused, and ultimately endured its past to once again become a burgeoning influence on how to understand and treat criminal, aggressive and unhealthy behaviors and mental disorders. However, the question concerning knowledges of biocriminology may not be how to separate the truth from the ideological, but how 'regimes of truth' (Foucault 1979/1995) get translated, refashioned and become dependent upon throughout the history biocriminology. These discourses for knowing the truth are comprised of and embedded within infrastructure practices, epistemological techniques and technologies, and social interactions and negotiations that enable these knowledges and assumptions to be realized through biocriminology, and are materialized as true, real or objective ways of better understanding and/or treating violence or criminality within society.

Furthermore, this dissertation pays special attention to the use of, and engagements with the concept of race in biocriminology. Historically, research on VAB that focused on anatomy and psychological functioning has been discredited over time as deterministic and/or racist and sexist (Becker 2008; Duster 2006a, Rafter 2008, S. Rose 1995, N. Rose 2000; Spallone 1998). This chapter helps elucidates how particular sociocultural settings helped frame scientific and social understandings and uses of race, including describing how biocriminology incorporated and/or analyzed race, racial knowledges and related implications. However, this historical examination is more than an attempt to uncover racist practices of past eras; it attempts to thread together specific continuities pertaining to tracks of thought, modes of research, ideological debates and material consequences that underpin the history and current state of VAB science

Chapter II Overview

This chapter begins with an examination of the lasting impacts of Italian born physician Cesare Lombroso whose 'criminal anthropology' initiated the field known today as criminology. His influence in the late nineteenth century to early twentieth century spawned a flurry of theories related to biology and criminal behavior. His book *Criminal Man* (1876) transformed criminology into an empirical based scientific endeavor (Rafter 2008). It also fueled an already popular science of race—by synthesizing social Darwinist claims regarding race within his new theory of deviant behavior. As this chapter demonstrates, an understanding of Lombroso's contributions is imperative for understanding subsequent configurations of the bioscience of VAB.

Next, I move chronologically toward the mid-twentieth century with its quelling of biological theories of VAB (Rafter 2006). Here, I focus on the backlash against Lombrosian criminology spearheaded by the rise of sociological theories of VAB, and the specific steps taken to move away from eugenic and racist practices of science. I examine Germany's criminological practices during WWII to demonstrate the components of biocriminology that were rejected, as well as key ontological/epistemological assumptions that helped give rise to the reemergence of biocriminology after WWII. I conclude the section with an overview of the reemergence of biocriminology post-WWII. I focus the work of Hans Eysenck (1964), whose research on personality and VAB is credited as the first successful attempt to revive biocriminology after WWII (Rafter 2008).

The last section continues to historicize biocriminology, here using the 'question of race' as a lens through which I can better delineate social implications of the construction and use of biologized notions of VAB. I first provide brief discussion of the use of race in science research. I examine the construction and impacts of the two UNESCO statements on race following WWII, specifically I concentrate on the ways these panels constructed and justified the continued warrant for the examination of race through science. Finally, I utilize my assessment of these statements from the UNESCO to better evaluate the emergence of biocriminology post-WWII and its own lingering relationship with the politics of race and racism.

LEGACIES OF CESARE LOMBROSO

In 1876, Cesare Lombroso— deemed the 'father of modern criminology' (Wolfgang 1961:361)—published, *L'umo delinquent* (*Criminal Man*), one of the most important books to date on criminal behavior. The roots of this book date back to the 1860s, during the Italian Unification, when Lombroso, a physician by training, volunteered as medic in the Italian army. While stationed in southern Italy working in the midst of violence—and under the influence of the "southern question"— Lombroso began to formulate his theory of the "born criminal' (Gibson 2006; Lilly, Cullen and Ball 2002). The "southern question" was less of a question, and more of a characterization of southern Italy's social, economic, and cultural makeup. It was in turn used to justified a stereotype of people from southern Italy as lazy, criminal, and barbaric (Doyle 2002; Gramsci 1926/1995).

Through interactions with and observations of southern Italians, Lombroso started connecting physical appearances such as bodily markings (specifically tattoos) and mental deficiencies to innate criminality (Gibson 2006; Gould 1996; Lilly et al. 2002; Vold, Bernard, and Snipes 1998). Using a host of anthropometric methods including *craniometry*—skull measurements—along with data from graphs, statistics, visual technologies (such as mug shots), and anthropological observations, Lombroso would eventually develop a 'scientific' explanation of crime that located the causes of criminal behavior on and/or within the individual body.

According to Lombroso, it was on a gloomy December morning while he was examining the skull of the famous Italian brigand Giuseppe Villella, he stumbled across a revelation that would lead to the development of *Criminal Man*. Remarking on the resemblance between Villella's skull and those of lower animals, Lombroso stated:

> This was not merely an idea, but a flash of inspiration. At the sight of that skull, I seemed to see all of a sudden lighted up as a vast plain under a flaming sky, the problem of the nature of the criminal—an *atavistic* being who reproduces in his person the ferocious instincts of primitive humanity and the inferior of animals. Thus were explained anatomically the enormous jaws, high cheek bones, prominent superciliary arches, solitary lines in the palms, extreme size of the orbits, handle-shaped ears found in criminals, savages and apes, insensibility to pain, extremely acute sight, tattooing, excessive idleness, love of orgies, and the irresistible craving of evil for its own sake, the desire not only to extinguish life in the victim, but to mutilate corpse, tear its flesh and drink its blood. (Quoted in Lombroso-Ferrero, 1911, P. xv, emphasis mine)

Lombroso's "flash of inspiration" eventually led to his theory of *atavism*—a criminological model of behavior that proclaimed criminals are biologically abnormal, less evolutionary advanced, version of modern humans (Lombroso 2006; Gould 1996). This theory was at the heart of his new discipline, 'criminal anthropology,' which he asserted was scientific. Criminal anthropology synthesized principles of evolutionary biology, phrenology, scientific racism, anthropometry techniques of measurement, and statistical quantitative methodologies into a paradigm (Horn 2006; Lombroso 2006; Rafter 2008). This theory claimed that 1) criminals were born deviant, not socialized to act as such; 2) criminals represented a lower evolutionary species of humans, *atavism*; and 3) criminals could be differentiated from non-criminals by focusing on specific physical characteristics (such as handle-shaped ears, insensibility to pain, extremely acute sight, and tattoos). Criminal anthropology was not the first branch of knowledge to link innate biological characteristics to deviant behavior, but through Lombroso's relentless reliance on claims of scientific empiricism, criminal anthropology succeeded as the leading source of criminological thought throughout the early twentieth century (Sellin 1937; Becker and Wetzell 2006; Gibson 2006; Rafter 2008; Simon 2006). While, Lombroso's ability to popularize criminal anthropology using novel technoscientific practices afforded him scientific fame, it did not protect him from a criticism from both social scientists and other criminal anthropologists. As we shall see next, this criticism proved vital to the stability of criminal anthropology; it enhanced legitimation of the discipline and strengthened its development at the turn of the twentieth century (Gibson 2002; Rafter 2008; Simon 2006; Vold et al. 1998).

Backlash against Criminal Anthropology

The International Congress of Criminal Anthropology (ICCA)[2] became an incubator for criminology debates at the turn of the twentieth century. The ICCA was an annual conference held in Europe that played a vital role in developing criminal anthropology into an organized discipline. This included disseminating knowledge through publications, presentation of new techniques and technologies of data collection, and framing the boundaries of inclusion/exclusion of key producers and users of criminal knowledge (Kaluszynski 2006).

While criminal anthropology's biological deterministic tenets remained popular throughout ICCA, these conferences also demonstrated that the development of criminal anthropology was not unchallenged. Part of its success, and strength as a knowledge producer, was based on its willingness to engage divergent views of criminology.

Key here is that the ICCA demonstrated the overwhelming significance of positivist criminology, underpinning arguments on the significance of *both* social and biological factors of behavior (Gibson 2006; Simon 2006). Thus, ICCA played a significant infrastructural role in the development of criminology as a whole during this time. It provided the venues in which arguments about the roots of crime could be raised, and it demonstrated the tactics used by both sides of the biology/sociology debate to validate their claims. The ICCA's vividly demonstrated the reliance on knowledge networks as important sites of legitimation, vital to the processes of knowledge making and the development of scientific disciplines (Star 1989).

While Lombroso touted his affinity for 'facts,' and employment of the scientific method, these allegiances to empiricism were often overshadowed by his less than stellar execution of scientific procedures. His technological/methodological shortcomings and sometime blatant omissions were at the heart of critiques against him by his fellow colleagues in criminal anthropology (Gould 1996; Kaluszynski 2006; Rock 2007). English physician Charles Goring was very critical of Lombroso's lack of scientific prowess (Nassi and Abramowitz 1976). Goring was critical of what he described as Lombroso's misappropriation of scientific facts and far-reaching claims.[3] Goring described Lombroso's work as unscientific and biased, and essentially argued that criminal anthropology was an inaccurate theory of crime (Nassi and Abramowitz 1976; Rock 2007; Vold et al. 1998). In his book, *The English Convict* (1913), Goring used data collected on English prisoners to argue for his own biologically based theory, which distinguished criminals by their defective physical physique *and* inferior *mental capacity*.[4]

Lombroso was always cognizant of the critiques of his work; however, he never seemed deterred by the negative assessments. To address opponents, Lombroso would impetuously add other casual factors into his larger theory of atavism (Gould 1996; Rafter 2008). As if immune to critiques, he continued to defend his theory through publications and debates at the ICCA. Historian Nicole Rafter (2008) recently noted that while atavism was the central focus of his work, other factors said to underlie criminal behavior were added to subsequent editions of *Criminal Man*. These included race, epilepsy, gender, and even the weather (crime increases with the rise of temperature). While the incorporation of these new factors helped illuminate the inconsistencies of applying a deterministic biological grand theory of crime, they also demonstrated the malleability of criminal anthropology, and reinforced the discipline's durability and endurance as a legitimate producer of criminal knowledge. This was Lombroso's key contribution and most lasting effect on criminology—the *scientific legitimation criminology.*

Next, I elucidate how this legitimacy had lasting impacts on the discipline. I also describe two additional lasting impacts: positivism and the state political/penal system, and racial and gender discourses and criminology. These impacts are also important for understanding the development of biocriminology. They also frame significant points of contention and particular future trajectories of the discipline that echo loudly today.

Impacts of Lombroso's Criminal Anthropology

First, *constructing criminal anthropology into a recognized and legitimized field of scientific study* was one of Lombroso's most important impacts. Addressing the criticism of his theory, Lombroso (2006:99) sagely stated, "My data provided others with material for correcting and improving my own theories." According to his daughter Gina Lombroso-Ferrero, work such as Goring's (1913), exemplified the theory's scientific progression (Lombroso-Ferrero 1914). This is a challenge arguably still being taken up in modern neuroscientific and genetic studies of VAB to address ongoing uncertainties that arise within the research (Becker 2008; Moran 1980; Rose 2000). Many of these factors added to Lombroso's theories created important lineages of knowledge—producing and re-producing new biologically based inquiries into the study of VAB and crime. Moreover, these new knowledges helped criminologists defend and sustain their research in the latter half of the twentieth century (Hacking 2001; Rose 2000; Spallone 1998).

Through disagreements and the 'correction' of uncertainties, anomalies in Lombroso's work were used to create a more plastic, thus more durable, theory of criminal behavior, enabling this scientific theory to be utilized in multiple lines of work and applied to a host of actions and interactions (Star 1989: 17, 21). Thus, Lombroso's influence was not necessarily a direct product of what he said, or discovered, but instead was predicated on his *mode of discovery* and *its links to science* (Gibson 2006; Simon 2006; see also Star 1989). The methods/technologies used to excavate and translate knowledge in criminology also constructed the types of future knowledges possible (Clarke and Fujimura 1992; Star 1989). Despite negative criticisms, Lombroso compelled critics and followers alike to engage with his methodological tools. In this way, Lombroso transformed criminal anthropology into a legitimate scientific discipline; even his opponents had to acknowledge its existence and influence (Gould 1996; Rafter 2008).

Second, Lombroso's research also had impacts on *state and penal policies*. Stephen J. Gould (1996) noted that Lombroso and followers served as expert witnesses in many court cases throughout Italy, avowing that corporeal markers revealed evidence of guilt or innocence. Argentinian historian, Ricardo Salvatore (2006) noted that while Lombroso's theories were met with opposition in Argentina, the impact of positivist criminology nevertheless played a vital role in structuring Argentina's governing institutions in the early twentieth century (1890s-1930s). Engagements with Lombroso's research through scientific experiments, conferences and debates helped envisage new possibilities for the state that included reforms in health care, governance and social control. Ultimately, positivist criminology in Argentina "transformed into a grammar for governance, and as process of gradual annexation of sites of institutional power…it disseminated novel procedures for the handling of masses of populations throughout the landscape of the state, and thus established the foundations of a new regime of governance that was at once progressive and disciplinarian" (Salvatore 2006:278).

Lombroso's ability to build criminal anthropology into a discipline, and his reduction of criminality to be concerned solely with the constitution of 'criminal,' enhanced its capacity to define/diagnosis both *criminality* and *normality*. "Lombroso not only legitimated the medical model but also turned it into a metaphor capable of encompassing many forms of deviance…all deviations from what he and his followers defined as *normale* became signs of diseases, warning signs of potential criminality that called for interpretation and treatment by medical [personnel]" (Rafter 2008: 85). In a move similar to Goring's (1913) reformulation of Lombroso's theory into a criminal theory of mental/psychological functioning, Argentinian medical practitioners, particularly psychiatrists, gained a larger role in determining and diagnosing criminal behavior. In conjunction with and implemented through new state and institutional polices, social problems were rebranded as pathologies. Bodies were now evaluated in terms of inherent dangerousness; this trait/risk factor for criminality then became a way to reclassify criminals based on possible future behaviors. Lombroso contributed to naturalizing mental abilities as a legitimate cause of criminality, and assisted in the state's ability to police/ quarantine dangerous individuals for safety and health reasons (Salvatore 2006). The effects of this impact are realized throughout many forms of criminal/medical based research and treatment. Here social, corporeal, and mental factors are employed unquestionably to delineate, dichotomize and naturalize the sick/criminal/abnormal from the healthy/sane/normal (Canguilhem 1991; Foucault 1984; also see Gould 1996).

University of California, Berkeley law professor Jonathan Simon (2006) has similarly argued that Lombrosian knowledge was and remains influential in the construction and functioning of US penal policies. As was the case in Argentina, the malleability of positivist criminology made it useful for both conservative and liberal perspectives on criminal justice (Gibson 2006). While Europeans debated Lombroso's work, the US political/penal system embraced and utilized Lombroso's research as a template in assembling its carceral institutions (Rafter 2006). Simon (2006:2155) further asserts that during the early twentieth century the US embraced Lombroso's work specifically due to the racist underpinnings of his theory, such as Lombroso's suggestion that the "Negro's tendency to crime" might well be explained by "the fact that he is still practically in servitude." Simon's assessment helps explain, in part, how Lombroso's theory gained popularity during the early twentieth century—particular because of its reliance on and support of scientific racism. Today we can see the impact of Lombroso's research in US penal programs such as the death penalty debates; preventive detention; sexual violent predator civil commitment laws; renewed interest in rehabilitation; and more indeterminate sentencing patterns (Simon 2006). Such contemporary impacts underline Troy Duster's (2006a) assertion that we must examine the production of knowledge through grasping its socio-historical contexts and ontological/epistemological underpinnings in order to properly delineate potential impacts and implications of biomedical and technoscientific interventions within society.

Lastly, Lombroso's work also impacted *racial and gendered discourses on crime*. It is not surprising that Lombroso viewed race and gender as factors in his criminal formula. In *La donna delinquent* (*Criminal Woman*), Lombroso essentially constructed an argument that reduced women to two types. The first type was the good law-abiding women, and second type, criminal women. Both were characterized as biologically and intellectually inferior to *all* men, of course, and what we call today, sex workers were said to be the purest example of the 'born criminal' (Lombroso 2004).

On the issue of race, Nicole Rafter (2008) pointed out that the very root of his theory of crime, *atavism*, was derived from a little known un-translated book he published five years before *Criminal Man*. *L'uomo blanc e l'uomo di colore* (*The White Man and the Man of Color*) demonstrated Lombroso's scientific support for social Darwinism. Subsequently, in *Criminal Man* Lombroso made a similar argument to claim that criminals are *innately* inferior to others, and to suggest that criminals are more likely to be darker in skin tone.

In the United States, Lombroso's impact can be observed within eugenic based criminological theories of constitution and body-types. Although Lombroso did not write about eugenics in his work, it was clear that early twentieth century eugenic criminologist relied heavily on Lombroso's research to support their own claims (Becker and Wetzell 2006). In the US, eugenic research was exemplified by Harvard University anthropologist Earnest Hooton (1939) and psychologist William Sheldon (1942, 1949). Both argued that corporeal composition unveiled a significant understanding about mental capacity and criminal propensity (Vold et al. 1998). Specifically, Hooton (1939) stated that body build—i.e. slender, muscular, or heavy—

correlated to susceptibility to particular types of crimes. For example, first-degree murderers, in comparison to second-degree murderers, were described as taller, older and heavier (Rafter 2008). Both Hooton's and Sheldon's theories exemplified, propagated, and reinforced racist and sexist explanations for criminal behavior that reinforced well with popular narratives of racial/gender inferiority and institutionalized hierarchies of power/inequality.

While eugenic criminology highlighted the more obvious consequences of constructing a criminality theory that was intertwined with identity politics, it also demonstrated a much more subtle ontological dependency on the visual. As Foucault (1973) has pointed out, the importance of the *clinical gaze*—a specialized way to see identify and connect medically defined signs of sickness and disease to the anatomical body—transformed the practices of medicine. It generated a specific epistemic knowledge that privileged those trained in medicine to 'see' pathology in ways others could not. Similarly, Lombroso's criminal anthropology generated its own analytical gaze, to *see* criminal pathology visually. This *criminal gaze* explicitly linked visible anatomical, phenotypic, and/or emotional characters to societal defined deviant behavior. However, Lombroso's gaze was not limited to special modes of knowledge or technological expertise. Rather, he meant for this gaze to represent the highly visible and easily discerned marks of pathology/criminology that *all* persons could recognize. As noted by historian David Horn (2006:320), "knowledge of deviant bodies was not presumed to be exclusive to anthropologists. Artists, writers, the 'lower class,' and even children, according to Lombroso, were aware of and could reproduce in painting and poems the contours of criminal physiognomy." Essentially, Lombroso argued that anyone was capable of recognizing criminality or potential dangerousness. No special training was needed. His theory and empirical methods of measurement would confirm the presence of such a criminal gaze. The ability to 'see' criminality was embodied in social practices and everyday modes of life, and not limited to criminal or violent behaviors, criminal justice institutions, or expert knowledges. It was insidiously part of everyday practices and intertwined within the social hierarchies of race and gender. Therefore, *gaze* in this sense is characterized by its ability to normalize the visual marks of criminality for *all of society* to recognize and was therefore a more diffused and highly effective form of knowledge.

The impacts of Lombroso's work are important in considering relations between the progression of scientific thought and narratives of racial politics, vitality, and the discursive policies and practices of VAB and crime in the present era. In the conclusion of this chapter, I return to Lombroso and his impacts in discussing how post-WWII scientist tried to disentangle their work from Lombroso's legacy of scientific racism.

DECLINE OF VAB RESEARCH AFTER LOMBROSO

Early Influence of Sociological Thinking on Crime and Violence

Early sociologically based explanations for criminal and deviant behavior were formulated during the same era as those of Lombroso and his followers. For example, at the end of the 19th century, French social theorist Emil Durkheim (1895, 1897) constructed an explanation of criminal and deviant behavior that described such behaviors as 'social facts.' They were naturally occurring phenomena within a properly functioning society, and not—as described by Lombroso—and evolutionary anomaly. While arguments that focused more on sociological factors were beginning to be taken seriously, it would take nearly thirty years before a sociologically based criminological theory would be able to challenge the reign of biological explanations. By the late 1930s, an effort to change the direction of criminology was booming in the US, led by The Chicago School of Sociology (Lilly et al. 2002).

The main argument of the Chicago School was that the roots of criminal behavior are not found in innate characteristics of individuals, but in the organization and functioning of societal-level forces. The Chicago School emerged during a time of expansive urbanization and industrialization that led to rising economic hardships, unsettling living conditions, and increasing rates of criminal activities (Lilly et al. 2002). Instead of arguing that the causes of crime were based in an individual's biological inferiority, Chicago School theorists, such as Clifford Shaw and Henry McKay (1942) argued that the regulation of criminal and violent behavior is best understood by examining the nature and composition of neighborhoods, not the individuals who live there.[5] The Chicago School helped reshape public receptivity to fresh explanations of crime. These newer explanations took into account the blatant ongoing changes in society during the 1920s and 30s, such as increasing immigrant population, growing economic instabilities, and dire working and living conditions. The success of the Chicago School created lasting sociological influence on the direction of criminology. This influence would eventually displace biocriminology as the premier voice of criminology (Lilly et al. 2002; Vold et al. 1998). While a steady production of biological criminology continued through World War II, biocriminology was dealt a major setback due to its ties to Nazi criminology.

Rejecting Biocriminology at the End of World War II

Scholars have argued that the end of World War II signified a major shift away from biologically based criminological thinking (Rafter 2008). They argued that Nazi scientific experiments embodied the 'darkest hour' of biocriminology (Moran 1980; Rafter 2008), and that the effects of WWII and public trials of the Nazi regime led to a growing level of public and political backlash against eugenics and biocriminology (Lilly et al. 2002; Rafter 2008). An understanding of German biocriminology is necessary to elucidate infrastructural and epistemological aspects of biocriminology that were rejected during and after the Second War. It also helps define how these elements framed the 'conditions of possibility' (Foucault 1970) for, and perceived shifts in, biocriminology that led to new strategies in post-WWII biocriminology research.

In Germany, Lombroso's 'criminal man' thesis was reinforced by the growing presence of early heredity research on behavior, which affected on all criminology theory produced there (Becker and Wetzell 2006). The professional struggle to lead German criminology was essentially fought between two camps of German psychiatry: 1) the 'mental abnormalities' camp, and 2) the 'criminal psychology' camp. The differences between the two camps rested on Lombroso's 'born criminal" thesis (Wetzell 2006). The 'mental abnormalities' camp partly rejected Lombroso's 'criminal man' premise and re-appropriated the concept into psychological/moral terms (Rafter 2008). Like Lombroso before them, the 'mental abnormalities' camp helped normalize artificial dichotomies of normal/abnormal or health/sick behaviors in society (Canguilhem 1991). They did so by reducing sociocultural influences, interpretations, and lived experiences that framed mentality (personality) to biological risk factors. This mode of VAB knowledge production was a precursor of contemporary understandings of mental disorders exemplified by cognitive and affective neuroscience research.

In contrast, the 'criminal psychology' camp was important for at least three reasons: First, their research focused on *behaviors* defined as criminal/violent, rather than *individuals* labeled as such. Similar to some sociological accounts of criminology, they considered criminals biologically 'normal' thereby rejecting Lombroso's criminal man thesis (Wetzell 2006). Second, 'criminal psychology' became the dominant paradigm of criminology throughout the Weimar and Third Reich periods, and was closely tied to both the criminal justice and medical/health systems. Third, they explained criminal/violent behavior as a complex interaction between biological and social factors.

In Nazi Germany, an intertwined yet complex, relationship between state and science was forged. As WWII got underway and Hitler's Nazi party started their campaign, criminal psychology played a vital role in endorsing and disseminating the practice of biocriminology and the pathologization of criminals for the purpose of eugenics and the Nazi 'racial hygiene' project (Rafter 2008; Becker and Wetzell 2006). As noted by Wetzell (2006), part of this intricate relationship can be explained by examining psychiatrists' own sociopolitical and cultural perspectives. Some supported eugenic science, while opposing sterilization for criminals; others supported biosocial explanations of behavior, but favored biological factors over social factors.

The Nuremberg Trials

After WWII, the highly publicized Nuremberg Trials of 1946-7, particularly the *U.S.A. v. Karl Brandt et al.* (known as the 'Doctors Trial'), drew transnational attention to the role physicians, including many criminal psychiatrists, had played in the operation of eugenic and racist Nazi programs. German physicians were charged with war crimes and crimes against humanity (Harvard Law School Library 2013), stemming from their administration of unethical experiments—many resulting in death—of those deemed unfit, feebleminded, dangerous, or impure. The central issues during these trials were not the epistemological/ontological underpinnings of biocriminology, but the proper ethics of scientific research (Harkness 1996; Goodman, McElligott and Marks 2003).[6] The legal arena was much more concerned with the separation of 'good' and 'bad' scientific research. Essentially good science was described throughout the trial as the ability to guard against immoral uses of science, and thus being objective and able to keep at bay societal temptations and political agendas.

During the trial, the attorneys for the German physicians employed an interesting tactic. They contended that their research was no different from scientific studies conducted throughout the US, specifically pointing to Illinois's Stateville Prison Malaria study, headed by one of the prosecution's key witnesses, Andrew Ivy (Comfort 2009; Harkness 1996). Stateville's Malaria research was a military-sponsored drug trial, in which prisoners were injected with malaria to test the efficiency of new pharmaceutical malaria treatments (Comfort 2009).[7] The point the defense attorneys were trying to make highlighted the continued mistreatment and misuse of science in the US before, during, and after the period during which Nazi experiments took place. Another example is the multiple experiments on prisoners and the institutionalized mentally ill, or the well documented Tuskegee Experiment on African Americans (Comfort 2009; Epstein 2007; Gordon, McElligott, and Marks 2003; Lederer 1995; Roberts 2011).

The trial's conclusions led to a push for the development of a code of professional ethics for biomedical research. These new standards focused mostly on the notion of requiring informed consent to participate in research and the parameters of 'good science' (WMA 2008). Beyond the demonization of Nazi Germany, there was little focus on biocriminology agendas or the entangled relationships of science with state agendas and polices (Goodman, McElligott and Marks 2003; Lederer 1997). The discourse during and immediately after trial did not challenge the epistemological/ontological underpinnings of science per se.

Although the results of the Nuremberg trials eventually led to greater awareness of the ethical implications of science in regards to informed consent (Epstein 2007), many unethical practices within science and medicine, including problematic consent procedures, continue to operate today. It was not an anomaly that the principles of science were violated during the Nazi regime. The principles that define scientific work are continually negotiated, blurred, crossed and omitted during the production of scientific and medical knowledges (Bowker and Star 1999; Fleck 1935/1979, Knorr-Cetina 1981; Kuhn 1970; Latour 1987; Latour and Woolgar 1979/1987; Star 1989). Further, the question of race was not a direct focus of the trials, in part because of the United States' own intricate 'race problem,' and its own politically and socially sponsored de jure segregation and discrimination practices. The focus of race in science would later be deliberated in circles far beyond the trial, and eventually a host of writings, conversations and resolutions addressed science's proper use of race Post-WWII that also helped shaped the perceptions of race in biocriminology. However, the fallout after WWII also left biocriminology at an interesting impasse; connections between behavior and biology were shunned and sociological theories of crime become much more dominant.

THE REEMERGENCE OF BIOCRIMINOLOGY

Biocriminology Post-WWII

Crime and Personality, a book by Hans J. Eysenck, an internationally recognized psychologist at the University of London, was the first post-WWII biocriminological theory to challenge sociology's stronghold on criminology (Nyborg 1997; Rafter 2006, 2008). Although, Eysenck's primary research focused on the psychology of personality, his first and only book on criminality had deep and lasting effects on the direction of research on VAB. To be clear, biological theories of VAB did not completely disappear after WWII. However, because of huge support for sociological based criminology none of these biological theories made impacts as significant as their predecessors in the early twentieth century (Rafter 2008).

Crime and Personality (1964) focused on two points: First, personality, specifically learning and conditioning, was the basis of crime; and second, that personality was rooted in biology (Eysenck 1964, 1977; Rafter 2006). Eysenck relied on more traditional psychological research to make his argument that personality is related to crime. Eysenck stated that personality was the product of two intersecting dimensions, emotional state dimension (ranging from stable to unstable or liability), and a scale of extraversion-introversion. He would eventually change this statement in subsequent editions to reflect 1) an understanding of criminals who could be introverts and have low level emotions and 2) adding a third dimension to his theory, psychoticism.

These editions essential helped Eysenck's theory of personality move closer toward the quickly growing branch of psychological research on psychopathy (Rafter 2006). While not officially a DSM defined personality disorder, psychopaths are commonly understood today as exhibiting neurobiological dysfunction that underpins their lack of certain affect such as empathy (Blair 2003). Historian Nicole Rafter (2006:43) summed up Eysenck's additions to his first assumption by stating that, "with some fancy footwork, then, Eysenck has gone from his original concept of criminals as extraverts to identifying them with arch-villainous psychopaths." As I will describe more fully in the next chapter, the malleability of VAB definitions are important to their usefulness with biological knowledges and technologies and their durability over time.

The second part of his thesis—that personality is based on biology, thus crime is rooted in biology—was based off Ivan Pavlov's work on conditioning, and it was formalized in-part through new research in genetics and the brain sciences. Here, Eysenck relied on genetic research focused on twins, intelligence, and criminal behavior to make the argument that conditioning was tied to heredity. Eysenck also argued that criminals tended to have lower intelligence, and that intelligence, like personality, was hereditary (Nyborg 1997). He also briefly alluded to neuroscience, specifically neurophysiology, research that focused on brain structure. This literature was used to argue that the reticular formation (RF) area of the brain[8] acted as a gatekeeper allowing information to pass between the brain and rest of the body. Eysenck was trying to point out that RF was part of the automatic nervous system, and that this physiological system was active in the conditioning process and therefore responsible for controlling our emotions.

The principles that he put forth in the book helped foster in a upsurge in neurobiological, physiological, and genetic research on VAB that begin to help expand the biocriminology (Nyborg 1997; Raine 1993; Rafter 2006). However, Eysenck's (1964) research was not alone for long. Soon other studies aided in the renaissance of scientific interest in crime and VAB, and through their aide in the extension of medical authority and jurisdiction, post-WWII biocriminology also contributed to the larger growth of medicalization in the latter half of the twentieth century. These studies included work on twin siblings examining aggression and violent behavior;[9] heredity research on XYY chromosomal abnormalities and crime, especially in prison populations;[10] neurophysiological research using EEG to link irregular electrical activity in the brains of defined criminals and psychopaths;[11] and the controversial psychosurgery treatment of mental health patients and prisoners to 'treat' their uncontrollable violent or aggressive behavior.

Medicalization, VAB and the Therapeutic State

The post-WWII reemergence of biocriminology occurred in the midst of the shift from *badness to sickness*, and for biocriminology, the medicalization era help further legitimize the development and use of biologically based VAB research. The medicalization era also played an important role in cultivating both financial and political support for biologically based VAB research support (Coleman 1974; Nelkin and Swazey 1981; Moran 1992; also see Nelson 2011, chapter 5). The social and political implications of such research alarmed many critics of medicalization, who were skeptical of the promises made by such research, and the strengthening alliance between medical institutions and law enforcement. As noted by psychiatrist Lee Coleman (1974:675):

> In recent years, biomedical research funding has been drastically cut, while federal law enforcement monies have increased. With researchers in need of funding, and the government in need of 'solutions' to violence, an unholy alliance is growing. This partnership appeals to the survival instincts of the dominant social order. The stamp of medical expertise and benevolence simultaneously focuses attention on sick individuals while diverting attention from ailing social and political institutions.

These scientific developments raised important questions about the limits of scientific inquiry, the ethics of conducting such research at university campuses and state-funded hospitals, the social impacts of applying such treatments to control behavior, and the merits of funding such research though tax dollars (Nelkin and Swazey 1981).

Importantly, there were two other significant shifts in biocriminology during the medicalization era. First, biocriminology began to address the charges of strict biological determinism by more vigorously promoting a *biosocial* understanding of VAB. Moreover, to help justify their own biological research of deviant behaviors, biocriminologists leveraged biologist Edward O. Wilson's (1975) *sociobiology* thesis.[12] Secondly, biocriminology also shifted the focus of its research away from strictly searching for the *born criminal* per se (as in the case of Lombroso), toward addressing and potential control or treating crime through *therapeutic* solutions (Conrad and Schneider 1992; Moran 1992; Marsh and Katz 1985). During this time, newer developments and technologies—based off of recent biomedical advances from genetics, psychiatry, and the brain sciences[13]—were used to help elucidate unique biological markers of VAB to alleviate these maladies through biomedical techniques, and/or control such behaviors through both mental health and correctional solutions.

Deviance and Medicalization provided an analysis of the medicalization of VAB during this era, and devoted an entire chapter on the relationship between medicine and crime. Written by guest author sociologist Richard Moran, this chapter was an expanded version of Moran's 1978 article printed in *Contemporary Crises* on the search for the 'born criminal' and the medical control of criminality. Moran (1992) examined both historical and contemporary (as of late 1970s) uses of therapeutic biological theories of and technologies for crime control. He contended that medicalization of crime in the mid-twentieth century should be regarded as a continuance of the research conducted by Lombroso and others in the early part of the century (Moran 1992:239; also see Gould 1996; Nassi and Abramowitz 1976). Like others writing about criminal justice and psychiatric/medical interventions during this time (see Breggin 1975; Coleman 1974; Kittrie 1971; Szasz 1984), Moran's primary concern was on the role and expansion of the "therapeutic state." The term 'therapeutic state' was used to describe what many critics described as the expansion of medications, treatments, and mental health institutions, in order to further the state's means of social control. Moran (1992:222) stated that:

> With medical science and technology acting for the state in the *parens patriae* (parental) role, seeking not to discipline through punishment but to rehabilitate or remake through treatment, the individual offender can be handled more in harmony with the requirements of social defense…Just as the criminal law reflects clearly the values and interests of certain dominant groups in society, the emerging therapeutic state can be expected to protect the standards of 'appropriate' or 'normal' conduct and values of the same dominant group.

Moran and other critics of medicalization argued that the state's *parens patriae* role enabled and the expansion and use of medical explanations for social phenomena. Moreover, the state encouraged this research as an effective means of social control because it operated under the much less threatening banner of public safety and/or health (Kittrie 1971; Moran 1992; Szasz 1984). In the next section, I will continue to describe the impacts of biological VAB theories and technologies during the medicalization era, by describing both the development and use of theories of VAB, and the relationship between the medicalization of VAB and the question of race.

SCIENCE, VAB, AND RACE

In this section, I shift to think about the reemergence of VAB in relation to the 'question of race'. Sociologist W.E.B. DuBois (1903/1990:3) famously referred to the 'question of race,' as 'the problem of the twentieth century." Following Dubois, and countless other race scholars, I used the phrase 'question of race' here to denote the lingering sociocultural institutions, policies and classifications that help make and experience race, and the persistent debates, knowledges, and struggles concerning the practices, reinforcement, and durability of racism and inequality in our society. Specifically for this dissertation, the 'question of race' is less of a formal question and more of a theoretical and methodological tool to help better guide my examination of the legacies of race in relation to science and VAB. How is race constructed as area of inquiry (biological or social)? Under what terms and through what processes are these conceptualizations and realities of race made, experienced, reinforced, and how? In addition, who/what are the producers, users, and stakeholders of such knowledges, and how should we effectively evaluate these lingering debates concerning the significance, and/or futility, of race today? I start this section with a review of the treatment of race after WWII, focusing on declarations about race and science made from the United Nations Educational, Scientific and Cultural Organization (UNESCO). Secondly, I examine more closely how the 'question of race' and its relationship with scientific knowledges, has operated to help both construct meaning of VAB, and justify or reinforce racialized (and gendered/classed) inequalities in society based on biologized perceptions of the causes for crime and violence.

Science and the 'Question of Race' after WWII

Historically, the role of race in scientific research received serious consideration after WWII through a series of debates and publications on the 'race question' stimulated by UNESCO, which led to its resolutions on the use of race in science. Similar to the arguments made by historians of criminology—that society's perception of biology and crime shifted after WWII— many historians of race have also argued that a shift occurred regarding the use of race after WWII (Barkan 1992; Stepan 1984). However, as pointed out by contemporary scholars of race and science, questions surrounding scientific relevance and use of race in biomedical research remain far from settled (Bliss 2012; Duster 2003, 2006a, 2006d; Fullwiley 2008; Roberts 2011; Reardon 2005; Shim 2014; Obasogie 2014; Wailoo, Nelson and Lee 2012).

Jenny Reardon (2005), in her book *Race to the Finish*, demonstrated that the debate over the use of race in science did not lead to a rejection or race as a biological construct after WWII. Instead, "it led many to redefine race in the wake of scientific and political developments, [and] both physical anthropologist and geneticist would continue to believe that race served an important function in the study of human variation and evolution" (Reardon 2005:43). Reardon's argument reflected the subtle infrastructural elements that ground the continual interest, support and use of race in scientific work. It also reflected larger questions in science studies concerning the definition, production, and use of 'legitimate' or 'factual' knowledge, and the relationship between the construction of said knowledge and scientific *authority* and *expertise*. Such questions/debates also helped illuminate how to contextualize and understand the processes and discourses utilized in, and that underpinned, rhetorical responses and subsequent technical practices of scientists' in response to the critiques of their own work. Following Reardon (2005), below I summarize this infrastructural scaffolding work of science in two points: 1) *'ideology versus facts'* and 2) *scientific authority*.

A group that consisted mostly of sociologists wrote the first statement on race post-WWII. However, with each draft statement of the first resolution it became increasingly obvious that the group supported the perspective that race *could* be divided into two distinct categories: 1) 'biological' race defined as populations of *Home sapiens,* characterized by some concentrations and frequency of genes, and 2) race as a 'social myth' (UNESCO 1961). According to this first group, "race designates a group or population characterized by some concentrations, relative as to frequency and distribution, of hereditary particles (genes) or physical characters which appear, fluctuate and often disappear in the course of time by reason of geographic and/or cultural isolation" (UNESCO 1961:497). They go on to state that, "for all social purposes 'race' is not so much a biological phenomenon as a social myth, [and] the myth 'race' [sic] has created an enormous amount of human and social damage" (UNESCO 1961:499, emphasis in original). To be clear, this stance did not exclude or dismiss the possibility of race being 'real,' that is defined biologically and established through scientific facts. Their position was that the differences observed *between* biologically 'real' racial groups had no relevance to sociocultural or political organization, morality, or interactions between people (UNESCO 1961:501). Such an explanation of race not only delineated a perception of a "true meaning of race," but also by default, characterized 'unreal' notions of race, or 'myth race.'

'Myth science,' defined in this way, designated ideological illusions, and such conceptualizations suggested that racial inequality was a simply a product of false realities about the ‘true’ nature of race. This definition generated a crude *misunderstanding* of the social construction of race (Duster 2006d). Such practices render social constructs of race as damaging misconceptions *within* society, thereby minimizing how the state, intentional behaviors and powerful discourses influence the meanings and organization of races and racisms in society. This conceptualization also depoliticized race by diminishing the social consequences of race and reframing the concept in terms of ethnicity. As noted in the UNESCO (1961:497) first statement:

> National, religious, geographic, linguistic and cultural groups do not necessarily coincide with racial groups; and the cultural traits of such groups have no demonstrated genetic connexion with racial traits. Because serious errors of this kind are habitually committed when the term ‘race’ is used in popular parlance, it would be better when speaking of human races to drop the term ‘race’ altogether and speak of *ethnic groups* (emphasis in original).

Ethnicity is often defined through a sociocultural frameworks and/or nation-state frameworks that can in some cases overlook the collective power and socially hierarchal meanings that are imbued through the category of race (Bonila-Silva 1997). As noted by Robbie Shilliam (2013:2) “This myth had to be dispensed with; hence ethnicity – as a social/cultural classifier – was proposed as a preferable classificatory regime to that of race. Ethnicity, after all, had not been tainted with supremacist hierarchy and could signify instead non-hierarchical diversity.” Essentially, refashioning race as ethnicity allowed researchers to reframe difference among groups as the consequence of cultural difference, and not systematized inequity in societal institutions and practices (Bonilla-Silva 2006; Feagin 2000; Omi and Winant 1994; Whitmarsh and Jones 2010).

A subsequent panel of physical anthropologists and geneticists composed a second UNESCO statement on race. The second panel was uncomfortable with what they perceived as limitations placed on scientists' ability to define race, more specifically the parameters that limited science's ability to seek and manage racial differences (Reardon 2005). On the other hand, they also felt that the first statement did not clearly distinguish biological race from social race, meaning, it did not differentiate well enough, racial *facts from ideology*.

The second panel disagreed with the first panel's inclusion of language that explicitly stated that there was no scientific proof of innate mental (including intelligence) and/or emotional (including temperament) differences between racial/ethnic groups, and that scientific evidence supported universal human equality (UNESCO 1961:498-500). The second panel argued that questions concerning distribution and variation of mental and emotional characteristics between racial groups were *not yet settled by science*. As argued by A.E. Mourant (1961)—then Director at the Lister Institute in London and member of the UNESCO second panel—even the smallest differences *within* racial groups may have profound significance for society. Mourant (1961:339-340) contended:

> It is unlikely that there are any racial differences in mentality, which make an absolute distinction between all members of one population an all members of any other. [However], it is probable that there are some mental characters showing continuous variation which make significant racial differences between some pairs of populations…the differences between the averages may be very small compared with the range for either distribution, [but] even when this is so, there may be a marked differences between the relative frequencies of populations of individuals having extreme values of the measurement. This may be of importance in the case of some mental characters.

This argument—that small difference may unlock important within group differences—continues to be important in current debates over the use of race in genomic research. Moreover, the subsequent move to then utilize *within* group differences to generate *between* group comparisons has been very important in conversation over the appropriate use of genetics in criminology, medicine and ancestry testing (Duster 2004; also see Duster 2006a; Wailoo, Nelson and Lee 2012).

The second panel also accused the first group of ineffectively differentiating between biological and social race. Remember that while the first group endorsed biological race as the true 'factual' interpretation of race, they also stated that 1) race—especially its use within society—was still best understood through a cultural lens as ethnicity, and 2) neither biological or social race had any relevance on social life. Scientists on the second panel took exception to this statement as a misunderstanding of biological race. For them, biological race was the only 'real' understanding of race because it was political, cultural and socially *neutral*, especially in comparison to the harmful effects created by social 'myth' race.

Overall, the UNESCO race and science statements responded to the political and social debates about race that emerged as a result of the Second World War. As Reardon (2005) argued, the impact of these mid-twentieth century debates on race did not result in science abandoning the concept of race, but instead created greater efforts to define race in biological terms and embrace its use in scientific research. However, reexamining the debates between the first and second UNESCO groups also helps elucidate the discursive work that made particular types of questions, methodologies, and research framings of race possible—those defined in terms of *facts vs. ideologies* of race, and utilizing the *authority of science* to define the terms of race. Thus, these debates were much more than attempts to educate the public on race. They also *reinforced scientific authority on matters of race*, and by default, weakened and demeaned other 'non-factual' understandings of race. From the point of view of the scientists on these panels, by establishing the legitimacy of scientific facts over sociocultural ideology, they could then warrant the continued search for explanations of racial differences *without* reinforcing discriminatory racial policies or actions. Thus, they seemingly absolved science from any responsibility with respect to the reproduction or maintenance of racism within society, while at the same time, reinforced the authority of science to address the 'question of race.' Although not directly cited, the UNESCO racial statements did have an impact on how the reemerging biocriminology would deal with the question of race in its research.

The 'Question of Race' in Biocriminology

The 'question of race' has been taken up by nearly every criminological perspective at some point (Gabbidon 2007), yielding both conflicting and concerning findings, as well as refreshingly newer perspectives concerning the relationships between identity, marginalization and violent deviant behaviors. Yet, how did race become such an ubiquitous factor to study in VAB research, and relatedly how has the construction and performance of identity for some racial groups become defined by and synonymous with specific violent or criminal characterizations? Part of the answer to such questions is embedded within the larger operation and maintenance of identity politics and continued struggles for civil rights struggles within the United States. In particular, the practices of race are continually reconstituted through, *an incessant reliance on individualizing and biologizing racial identity*, and more contemporarily, *rendering systemic racism and/or racialized injustices as isolated, corrected or even solved* (Bonilla-Silva 2006; Brown et al. 2005; Goldberg 2009; Wacquant 2009).

On the other hand, race has also been imperative to the production, interpretations, and uses of criminological research. During the time that biocriminologists like Cesare Lombroso, and later eugenicist such as Ernest Hooton, were developing theories of biocriminology that placed race (and gender) as a key determinant of crime and VAB, social scientists were also using scientific and positivist methodologies to buttress their own theories of race and crime, what historian Khalil Muhammad (2010:35) has termed 'writing crime into race.' Thus, the formulation and practices of violence/aggression, penal law, and criminal justice are continually intertwined in and framed by the 'question of race' (Alexander 2010; Wacquant 2009).

For example, writing at the end of the nineteenth century statistician Fredrick Hoffman (1896) published, *Race Traits and Tendencies of the American Negro*. Based on crime statistics, this book argued that newly 'freed' African Americans possessed innate criminal and violent tendencies. Hoffman's interpretations were influenced by biological research that supported African American inferiority (Wolff 2006). However, Hoffman's claim that African Americans were *natural* criminals went even further, as he also claimed to trace the emergence of black criminality to: 1) the rise of black mortality in that era, and 2) the loss of an effective social control mechanism because of the emancipation from enslavement (Hawkins 1995; Muhammad 2010). In contrast, the conclusions Hoffman reached concerning the etiology of white crime during that same era tended to focus more on lack of economic opportunities, than innate criminal traits.[14]

In 1899, sociologist W.E.B. DuBois countered Hoffman's claims and other deterministic racial theories of crime through his ethnographic study of African American life in Philadelphia, *The Philadelphia Negro*. DuBois did not dispute that African Americans had higher crime rates, but as he was quite aware of the racist lens through which previous statistical data was compiled and analyzed (Hawkins 1995). Using the same statistics that Hoffman analyzed, DuBois argued that the causes of crime in African American neighborhoods was much less the result of natural or biological based predispositions, and instead were the consequence of continued racialized social and economic practices in housing, policing, and employment. Thus, the construction and interpretations of criminal statistics are far from neutral or objective facts. As noted by historian Khalil Muhammad (2010:277 emphasis mine):

> By illuminating the idea of black criminality in the making of modern urban American, it becomes clear that there are options in how we choose to use and interpret crime statistics…For good or for bad, the numbers do not speak for themselves, they never have. They have always been interpreted, and *made* meaningful, in a broader political, economic, and social context in which race [and other socialized/hierarchized inequities] mattered.

As Muhammad (2010) argued, the tools of empirical inquiry, used in either social science or biological research, do not speak for themselves; they are not objective facts. This was made clear in the review of Lombroso's work earlier in this chapter, which highlighted the inherent racialized and gendered biases that were made meaningful through his pseudoscientific inquiries and techniques, and through the subsequent dissemination and use of Lombrosian knowledges of VAB throughout society (Salvatore 2006; Simon 2006)

Following WWII, the question of race in biocriminology was manifest in three forms, all of which are important to contemporary science: 1) no mention of race (race-neutral); 2) addressing race through a mental functioning lens; and 3) addressing race/crime through biosocial lens. Although the connection between biology and VAB in studies before WWII had made explicit attempts to map such behavior on to both race and gender, much of the immediate post-WWII VAB research lacked any conversation about race or racial implications. This could be interpreted as a good thing, that because of WWII events, the sciences were now more cautious about impacts on marginalized communities. However, it is more likely that the absence of the mention of race tells us more about attempts of post-WWII VAB science to appear divorced from its past. In fact, this strategy of omission was also used by an array of eugenics organizations post WWII when they changed their names to eliminate the word 'eugenics'; the old eugenics organizations and journals continued under new labels—old wine in new bottles

(Allen 1991). The absence of race also does not absolve this science from its impacts on reinforcing and reproducing existing modes of inequality, marginalization, and discrimination.

Connecting crime to IQ was not new to biocriminology. As mentioned, throughout the twentieth century many theories connected moral and mental abilities with criminal research (Gould 1996; Rafter 2008). Eysenck's 1964 book did not explicitly link race to crime, nor did he mention any racial implications of his research. However, Eysenck was neither anti-racist nor neutral on the issue of race and personality, and while his early work was seen as innovative, his career quickly took a downturn when he started support science that linked race to IQ. Eysenck's view of crime helped reinforced the idea that role of race and biology was still an important and open question. Specifically, he soon aligned with the portions of the UNESCO statement that argued for the continued duty of scientific expertise to uncover and explain the relationships between racial differences in mental and emotional characters.

In 1971, Eysenck published *Race, Intelligence and Education* (1971) to defend the work of his former postdoctoral student Arthur Jensen (Jensen 1997), who was faced with considerable criticism of his work suggesting that differences in intelligence between racial groups were rooted in genetics.[15] Moreover, by the 1970s, Eysenck's efforts to reestablish biocriminology were joined by a host of new studies, and biotechnologies were being proposed to conceptually reduce the causes of crime to even smaller levels—the brain, gene, and hormonal-levels. Through these methodologies (particularly genetics and neurological studies), VAB and crime were framed through a more *biosocial* lens. This move served as a way to both guard against claims of determinism from critics of the science and, while 'recognizing' social factors, continuing to favor biological factors as root causes of deviant and criminal behavior.

By far the most controversial mental health approach to VAB was with psychosurgery. Psychosurgery is defined as “a destruction of some region of the brain in order to alleviate severe and otherwise intractable, psychotic disorders” (Valenstein 1980: 12). In relation to VAB, psychosurgery used newer brain knowledges and technologies to argue that VAB could be localized in specific areas of the brain (most commonly the amygdala, the so-called emotional centers of the brain (Chorover 1980). Psychosurgery treatments of VAB were popularized by Harvard neurosurgeon Vernon Mark and psychiatrist Frank Ervin (1970), but its relation to race was mentioned only once, in a *Journal of the American Medical Association* (JAMA) publication by them and their colleague William Sweet (1967). In their editorial titled, “Role of Brain Disease in Riots and Urban Violence” they argued that one possible factor that needed to be explored was whether violence in particular socioeconomic areas could be better explained as a result of an underlying brain dysfunction, and not in reaction to the racial, economic and cultural strife that significantly structured the living conditions in these areas. They noted:

> That poverty, unemployment, slum housing and inadequate education underlie the nation’s urban riots is well known, but the obviousness of these causes may have blinded us to the more subtle roe of other possible factors, including brain dysfunction….[Moreover], it is an unjustified distortion to conclude that the urban rioter has a monopoly on violence. It pervades every social ethnic and racial stratum of our society. The real lesson of the urban rioting is that, besides the need to study the social fabric that creates the riot atmosphere, we need intensive research and clinical studies of the *individuals* committing the violence. The goal…would be to pinpoint, diagnose and treat those people with low violence thresholds before they contribute to further tragedies. (Mark et al. 1967:895).

Eerily reminiscent of Samuel Cartwright’s (1851) pseudo-disease *drapetomania*[16], Mark, Ervin and Sweet thesis seemed to suggest that the causes of urban violence and riots in the late 1960s was less the result of repressive and/or racist social practices and living conditions, but instead the result of an underlying brain disease that caused such individuals to act violently. Their statements were critiqued from within the brain sciences by other scientists and neurosurgeons, and from outside by social scientists and African American social justice groups such as the Black Panther Party (Moran 1992; Nelson 2011).

In response, Mark and colleagues (1968) backtracked some from their original stance. The group insisted that their claims was taken out of context, and that they intended for the publication to be, "an appeal to suspend judgment [of the cause of urban rioting] until enough facts could be collected by intensive research and clinical studies of the *individuals* committing the violence to warrant an answer" (Mark, Ervin and Sweet 1968:368 emphasis in original). However, such a reply did not address why an organic brain disease explanation was deemed suitable for explaining rioting in the midst of the turmoil of the 1960s, nor did it explain why such accounts were *not* extended to explicate the causes of the extreme violent behaviors by law enforcement or political officials against marginalized groups during this same era.

Later, Mark (1973) attempted once again to clarify the group's remarks on race, the brain and crime. Mark (1973:247) argued that 1) while there are political implications of the theory, such implications do not suggest, as the psychological literature on race and IQ does, that brain-based violence is an inherent character of African Americans; and 2) the manner in which violence manifests may be a product of social conditions, but the root cause of these acts are brain-based. That is, race does not inherently denote violence, but "environmental cues to personal violence may very well cluster around racially differentiated areas" (Mark 1973:248). Thus, similar to the UNESCO statements on race, Mark's approach to seemed to suggest that the 'question of race,' its use and worth, was best left to scientists to figure out. Not only did Mark's (1973) response fail to recognize the social nature of race, but it also overlooked how social factors underpin the practices and recognition of VAB—a highly racialized/gendered social behavior. Moreover, Mark's rebuttal also employed an argument vis-à-vis race that is also part of the repertoire of contemporary scientists. He noted that suppressing biocriminological research might in fact further marginalize racialized communities. However, he fails to provide any details as to how such biomedical research *would* be beneficial to marginalized communities, how such research can address disproportionately high rates of crime in such marginalized communities, and/or the deep inequalities within criminal justice and healthcare systems that can help engender such disparities.

As sociologist Alondra Nelson (2011) reminded us of in her examination of Black Panther Party's influence on the UCLA Center for the study of Reduction of Crime, the historical and contemporary effects of biomedical knowledges/technologies and VAB tell a different story, not one of amelioration or social justice for the African American community, but a perpetual narrative of misuse, control, and distrust of biomedicine and the criminal justice system. A segment of UCLA's center was originally planned to be devoted to studying the biological basis of crime. Specifically, Frank Ervin, a major advocate of psychosurgery, was set to lead a project, "Violence and the Brain" (Moran 1980; Nelson 2011). The Panthers helped spearhead efforts to obstruct the construction of UCLA's center that succeeded. In her analysis, Nelson (2011:155) argued that:

> The Panthers' defended a social health perspective on violence that identified biomedical rationales as antithetical to the larger cause of black well-being…[Moreover,] racial, gendered, and institutional facets of [VAB] biologization suggested that it would be carried out in such a fashion as to make already marginalized population more vulnerable to medicine as an instrument of social control. That is given the specific historical and institutional context in which this biologization would take place, the population that would be subject to it, it would be very unlikely that medicalization would lead to reduced culpability or greater social understanding of violence. Rather, this medicalization would effect the further criminalization of social groups—black males, the incarcerated—and in turn justify calls for increased surveillance and social control.

In sum, by reducing these violent behaviors to biological pathology, biocriminologists ignored the sociopolitical institutions and state-level policies that helped produce such actions, and reinforced racialized hierarchies and discourses that depend on such behaviors/actions in order to stay viable. In essence, these programs would help further racialized and criminalized already marginalized segments of society (Hawkins 2003; Muhammad 2010; Nelson 2011).

CHAPTER II CONCLUSION

What then does the history of biocriminology help us learn about contemporary biocriminology? This chapter provides an understanding of the stakes of science beyond its ability to adhere to scientific methods and empiricism. It demonstrates that the practices of scientific work are not without sociocultural influences and discourses. To conclude, I outline three important patterns in the history of biocriminology and race that continue to inform the research today.

Lombrosian criminology as a 'measuring gauge' for future studies

The first point to highlight here considers the question of calculating the potential and real implications of current neurobiological VAB research. Should Lombroso's contributions, or related criminological discourses of earlier eras, be used as a gauge to determine whether or not contemporary research is discriminatory, deterministic and/or reductionist? Critics have pointed to the Lombroso era to show the perils of biological based theories and the dangerous ways these knowledges reinforced racialized/sexist ideologies.

On the other hand, proponents often use Lombrosian criminology as a point of departure to demonstrate both an awareness of the horrid past, and as a metric to demonstrate biocriminology's progression away from racist and eugenic research. They blamed earlier transgressions on the overall lack of technological prowess, explained as an unfortunate historical artifact, and the inability of some scientist to separate their sociopolitical perspectives from their scientific research. However, what was not questioned was the legitimacy, usefulness, or implications of locating the roots of VAB in biology. As stated by forensic entomologist Anderson (2007:5) in the quote at the start of this chapter, “it was the public’s ignorance of the true facts that allowed [scientist of the early twentieth century] to use these misrepresentations [of fact’s] as weapons. Anderson’s (2007) comments referred to science’s role in educating people about ‘true facts,’ an explanation that resembles Leslie Dunn’s (1961) statement’s concerning UNESCO and the relevance of race in scientific research (see Chapter 1). Moreover, she asserts that when performed properly and without bias, science generates a truth that is separate from ideology.

As demonstrated in this chapter, I argue that Lombroso’s work is much more than a point of divergence. Instead, these schools of thought, was fundamental to fuelling the discourses and practices of biocriminology in the twentieth century, and its continued relevance demonstrates the ontological continuities between his research and current trends on biocriminology. Therefore, his work should not just be viewed as a historical misfortune. A more useful approach would be as a tool for analyzing the infrastructural and discursive processes that underpin biocriminology’s endurance and justification as a mode of knowledge, in particular the ways in which the continued relevance of the relationship between biology and criminal behavior are realized, reconstituted and made more legitimate through contemporary technoscience. As sociologist E. Doyle McCarthy (1996:23) reminded us, “knowledge is a historical construct…and cannot be divorced from the historically specific forms of social intercourse, communication and organization.” In this chapter, and throughout this dissertation, I argue that there is little doubt that contemporary biocriminology has been transformed through the growing use of emergent biotechnologies, which have certainly help revitalize the 'conditions of possibilities' for its production and use today. However, its history remains with us as a living artifact, through the infrastructures that shape the organization of biocriminology; the ontological underpinnings guiding the types of questions asked and bodies used; and the epistemological practices and discourses that allow it to be translated and incorporated into other social domains and institutions. These are the real historical legacies of biocriminology that have endured and been reworked, reproduced and extended through contemporary VAB biological research.

The role of the visual

It is important to understanding that much of the work in biocriminology, then and now, did not subscribed to a crude biological determinism, a point that is critical to understand in order to evaluate current implications of the science. Instead, Lombroso and his followers' deterministic view of VAB and criminal behavior reflected active influences of physical and social environments on crime/VAB. However, they tended to reduce these social/environmental variables into simple representations of, or precursors to, biological traits (Becker 2006). This is important because first, this made the theories more durable and malleable for future applications. Also second, it helped normalize visual factors of criminality, and situated and bound them within specific socio-historical framings. As Ann Stoler (1995:206) remarked, "Race/[or race/gender] is located in invisible ties and hidden truths, unspoken assumptions about morality and character. Invoked as common sense knowledge, these hidden truths are rarely identifiable; but because they are hidden they can be explicitly enumerated by those with expert medical psychological and pedagogic knowledge." Race/gender in the criminal gaze are at once biologized, rendered abnormal, and mapped upon a socio-historical context in which their worthiness reflects an already active hierarchal system of value.

Writing on the impact of Lombroso's work on the US, Simon (2006:2155) noted, "Few, if any, contemporary criminologists share Lombroso's views on the biology of race, but Lombroso's focus on the lives of African Americans as a key ingredient in understanding American homicide is thoroughly contemporary." Therefore, this criminological gaze was a vital part of the complicated normalization schema of societal level racial/gendered hierarchies. As race continued to become naturalized (pathologized/criminalized) as a biological property, race/gender also became more intertwined within the politics of criminality/violence and certain raced/gendered bodies became visual markers of dangerousness. Moreover, as Foucault (1970, 1979/1995, 1980) has taught us, through discursive knowledge/power people are disciplined to regulate themselves, and to constitute and reconstitute themselves in and through particular discourses. Through such processes, racial/gendered beings learn how to behave toward themselves and others. Further, when our raced/gendered bodies oppose particular discourses, self-disciplining technologies are supplemented by state-level and other institutional-level powers to protect the general public from such threats, through laws, policies and overt violent actions (Fanon 1967; Foucault 1979/1995, 1980; Spade 2011). As a result, these discursive normalization processes, race/gender bodies become synonymous with abnormal/deviant bodies.

Race/gendered thinking should not be framed as 'irrational' thought or ideology

As much as Lombroso was attacked for his methodological flaws, his thinking on race/gender did not endure the same vehement level of scrutiny. In fact, his work, along with that of many others, helped guide the development and employment of eugenics in Europe, the US, and South and Central America. Lombroso's views on race and gender demonstrate the pervasiveness of racial/gendered discourses, and simultaneously the politics constituted by the nature of the search for objective knowledge on criminal behavior. Asserting biological underpinnings of socially defined criminality defined a new direction as scientific research. Moreover, these scientific foundations do not simply represent a discourse on acts of criminal behavior; they are simultaneously a discourse on raced and gendered bodies and their social worth. The science of Lombroso's era visualized (literally through craniometry) that criminal knowledge *is* racial knowledge. As elucidated in the work of Muhammad (2010), empirical statistical scientific data has been misused to forge "blackness" as a mark of criminality. Moreover, the legacies of these historical foundations are still influential today, where by the characteristics of being young, male and black can be unquestionably interpreted denoting a criminal/violent person (Hawkins 2003).

Moreover, after WWII, the links between race and science did not dissipate. Instead, science found new discursive ways in which to analyze the race question. In addition, even when social understandings of race are acknowledged, scientists should be still cautious regarding the unintentional effects such discourse can have on already marginalized, medicalized and criminalized groups. As Stephen Gould (1996:135) noted, "'inferior' groups are interchangeable in the general theory of biological determinism. They are continually juxtaposed, and one is made to serve as a surrogate for all—for the general proposition is that society follows nature and that social rank reflects innate worth."

My argument is that the from the outset, the construction of scientific inquiry on VAB has been a quest for innate biological explanations for socio-culturally defined deviant behavior that was simultaneously committed to uncovering natural, immutable differences between races and genders, in an effort to both understand and legitimatize social order and inequality. Thus, I argue the origins of biocriminology can be seen as a 'racial project' (Omi and Winant 1994:56). Specifically, these knowledges and technologies operate in conjunction with specific discourses within society to racialize everyday experiences and to socially determine processes, explicitly linking signification with social structures. In this way, biocriminology as a racial project is reminiscent of the *co-construction* process (Clarke and Fujimura 1992). That is, how the world is represented and understood (through science) and how it is experienced through everyday actions and interactions cannot be separated or distinguished. Contemporary VAB science has the challenge of both rejecting its origins, while preserving the ability to locate biological determinants of VAB. Scientists involved in these endeavors should be aware of how their historical foundations are re-engendered through their current practices and how racialized meanings are already built into the understandings of VAB that they explore in research.

In the next chapter, I will more explicitly take up the question of defining VAB in biological research. This chapter utilizes data from my content analysis on contemporary neuroimaging research on VAB. Following, Conrad and Schneider (1992), this chapter describes how understandings of VAB has been repurposed to better classify violence and aggression as medical phenomena. However, this chapter goes further, focusing on the infrastructural practices and classificatory systems used to operationalize VAB, it contends that contemporary neurobiological VAB research is more than just an extension of medical jurisdiction; it also represents the epistemic shift from medicalization to biomedicalization (Clarke et al. 2003, 2010) in which highly technoscientific practices work to transform and reconstitute VAB at the level of the brain chemistry, neuronal processes, and cortical structures.

CHAPTER III
FINDING THE 'FIT': DEFINING VIOLENCE AS PSYCHOPATHOLOGY

> Not only is it almost impossible to conclusively demonstrate that crime is a psychopathology, but it is equally difficult to demonstrate that it is *not* a psychopathology. The reason for this paradox is simple: Experts in psychiatry and psychology have found it exceedingly difficult to outline an acceptable definition of psychopathology…Although no single definition clearly delineates psychopathology, the many definitions, when taken together, create a general 'gestalt' or picture of what constitutes a psychopathology…The key question is whether these definitions provide any degree of "fit" to criminal behavior.
>
> Adrian Raine (1993:3, emphasis in original)

CHAPTER III INTRODUCTION

Defining violent, aggressive, or criminal behaviors in our society has primarily been a task left to the criminal justice system. Society depends upon this system to control such behaviors through policies and laws, which articulate specific knowledges about how to label, classify and make meanings of such behaviors. In practice, however, recognizing and understanding what "counts" as violent or aggressive behavior is much more ambiguous, and defining these behaviors often produces more uncertainty than consensus. Instead of clarity, people tend to rely on the 'eye test,' the 'I know it when I see it'[1] perspective, to complement laws and policies regarding what counts as violent behavior and who counts as violent or criminal. Such complexities in defining VAB lead to many questions. How should we describe the meanings of violence and/or aggression? What types of behaviors qualify as aggressive, violent, or criminal, and what are the differences, advantages, problems, and/or complexities in using such adjectives to describe behaviors? Furthermore, and crucial to this project, are these uncertainties in defining VAB an issue where scientific knowledge can provide more clarity?

In this chapter, I will explore how biocriminologists have responded to critiques related to the approaches to and definitions of VAB in biocriminology. Specifically, this chapter examines the variability in defining and understanding VAB, and it helps clarifying how such understandings are used and advanced in biocriminology. As noted above in the quote by Raine (1993), the ability to medicalize VAB or make such behaviors suitable for scientific and medical study have been a key point of interest for contemporary biocriminologists. I argue in this chapter that such approaches have also worked to better legitimate associations between biological substrates to VAB, and to defend contemporary biocriminology from criticism.

In chapter two, I examined early biocriminologists such as Lombroso who concentrated less on what defines crime per se, and more on bodies he believed were innately marked as criminal. He argued that the obviousness of criminal behaviors was so evident that no definition was needed, and that anyone, even children, could recognize a criminal when they saw one (Horn 2006). Thus, early biocriminology tended to rely more on behaviors that were already defined as criminal through the law, and were more interested in elucidating corporal characters that embodied the *Criminal Man* (Lombroso 1876). Over a century later, University of Pennsylvania neurocriminologist Adrian Raine (1993:3), in an attempt to fully revive biocriminology through psychology/psychiatry and novel genetic and neuroscientific biotechnologies asked, “Is crime a psychopathology?”

This was not the first attempt to medicalize criminal and/or violent behavior (Conrad and Schneider 1992; Moran 1992). However, Raine (1993) contextualized his question in an interesting way, as a ‘paradox,’ specifically to be settled by psychology/psychiatry. He was not interested in using criminal justice classifications, and the corporeal markers of VAB he was interested in were located *within* the body, not *on* the body. Raine (1993:122-124) was also cognizant of the backlash against psychiatric treatment, in particular the contentious history of psychosurgery, and was not then concerned with outlining a cure for VAB. Instead, his purpose was somewhat simpler—to revisited longstanding questions concerning which behaviors are suitable for biological study.

The link to biology here is mediate through psychology/psychiatry. Raine attempted to provide evidence that specific types of criminal behavior could fit within the criteria for a psychopathology, as captured in the title of his book, *The Psychopathology of Crime: Clinical Behavior as a Clinical Disorder*. If VAB could be defined as a psychopathology, then such behaviors could be treated like other psychopathologies, and the determinants of such behaviors would be suitable to be explored through genetic and neurobiological means. Therefore, Raine's purpose was slightly different than earlier biocriminologists. Moreover, understanding the impacts of such a discursive move requires a more nuanced critique, one that goes beyond the critique of 'therapeutic tyranny' (Coleman 1974; Moran 1992) that was used to argue against biocriminology during the medicalization era.

To accomplish this task Raine (1993) first had to define criminal behavior within the context of mental health. Finding the answer to this question, Raine argued, rested on two issues: 1) the definitions and criteria for psychopathology as outlined by psychiatry/psychology, and 2) the 'fit' of criminal and/or violent behaviors within these criteria for psychopathology. Raine later contended, as captured in the quote above, that even without definitional or classificatory clarity of what constitutes a psychopathology, it was still possible to use such criteria to evaluate criminal behaviors as clinical disorders. As he contended, "it is the overall 'fit' of a condition to the totality of criteria which may provide the best assessment for what constitutes a psychopathology" (Raine 1993:4). Raine's perspective exemplifies the views of contemporary biocriminologists on VAB, who assent that VAB is a psychological/psychiatric issue. However, Raine's understanding of the 'paradox of VAB,' also raises questions concerning the technical tools and discursive processes and practices needed to construct definitions and classifications of VAB for use in contemporary neurobiological research. As I argue in this chapter, finding the 'fit' for VAB takes 'infrastructural work' (Bowker and Star 1999).

This chapter examines the ontological and epistemological underpinnings framing VAB through discursive processes and practices in order to produce 'fit' as a psychological/psychiatric disorder. What are the tools and knowledges needed to find fit? How are these utilized in neuroimaging VAB research? What uncertainties and complexities arise through the use of such tools and knowledges, and how are they addressed? To approach these issues, I utilize the work of Geoffrey Bowker and S. Leigh Star (1999; Star 1989, 1999; Star and Ruhleder 1996; Star and Strauss 1999) on classifications, standards, technologies, and technical practices produced through infrastructures and the 'invisible work' requisite for such systems to operate. This chapter also utilizes the recent of Martyn Pickersgill (2009, 2011, 2012a, 2014), who offers an understanding of scientific uncertainties created through the production of categories like antisocial behavior personality disorder and psychopathy, and the elaborate relationships between classification systems, such as the Diagnostic and Statistical Manual of Mental Disorders (DSM) and the development and expansion of neuroscientific research technologies. These interdependences themselves become infrastructure.

Chapter III Overview

This chapter draws on my content analysis of neuroimaging research on VAB from 1990-2012. Using themes and codes generated from analyzing both review and empirical articles on neurobiological VAB research,[2] I first examine the processes utilized to construct VAB as a psychopathology. In chapter 1, I provided an outline of the definitions used to describe VAB and the classification systems employed in neurobiological research to label individuals as violent, aggressive or antisocial. Here I extend the discussion on the definitions of VAB by concentrating on four interworking frames of knowledge that psychology/psychiatry have identified as important for describing VAB as an illness including: 1) the movement away from criminological definitions of VAB toward DSM classifications; 2) reframing aggression as a continuum of behaviors which can be further subtyped and better traced to underlying behavioral and biological factors; 3) recognizing VAB psychopathology through observation of 'repeated patterns' of certain behaviors; and 4) demonstrating VAB as psychopathology through the use of quantification.

I then discuss the operation of neuroscientific/neuropsychiatric VAB definitions in contemporary neuroimaging research. Here I focus on the use of *proxy definitions* for VAB and the types of populations used for research. Using codes generated from my content analysis of empirical neuroimaging VAB research, I outline three groupings of research participants used in this research: incarcerated populations, populations defined through DSM classifications, and healthy volunteers. The employment of certain groups, their symbolism, and the particular VAB risk factors they embody intrinsically reinforce psychological/psychiatric knowledges of and causes for VAB. Overall, this chapter provides an analysis of: 1) how these VAB understandings have been reworked, appropriated, and utilized as tools within informational systems like the DSM; 2) how DSM classifications, and other interacting VAB informational systems, have been mapped to specific brain regions and functions to better substantiate claims of biological, as well as biosocial, VAB etiology.

CONSTRUCTION OF PATHOLOGY

Historically, the DSM was created in part as a result of psychiatry's own concern about the lack of diagnostic standardization, and the manual's subsequent revisions reflected the desire for even greater reliability for clinical use (Hyman 2010; Farah and Gillihan 2012; Rose and Abi-Rached 2013). In a similar fashion, the move to DSM classifications for VAB reflected an attempt to better standardize VAB knowledges amongst its researchers by using reliable criteria. Proponents argued that DSM classifications were replacing socially constructed criminal justice labels, such as murderer and /or rapist, in favor of more reliable and measureable behavioral phenotypes (Fishbein 2000). Contemporary biocriminological knowledges are products of sophisticated clinical and research methodologies that are dependent on interacting information systems such as the DSM, the International Classification of Diseases (ICD), and a host of scales and sub-scales that provide assessment criteria for VAB related personality traits (e.g. impulsiveness). These classifications systems frame violent and aggressive behavior as symptoms of complex mental disorders (psychopathologies). In the DSM, these psychopathologies fall under the heading of personality disorders (see Chapter 1). This classification system also points to possibilities for uncertainty during the diagnosis and associated research on VAB related disorders (Pickersgill 2011). What effects do these ambiguities in classification have on study results, especially when research findings confidently delineate specific brain functioning and structure as biological markers for unique DSM classifications.

In contemporary neuroimaging VAB research, I found that the term aggression was more common, but a formal definition for the term was not common in research articles. Instead, understandings of VAB were more frequently ascertained through the use of DSM defined categories or risk factors (see Chapter 1). The use of DSM as a classification tool in contemporary neurobiological VAB research has allowed researchers to contextualize these behaviors for their own use, serving as a "boundary object" (Star and Griesemer 1989), and thus operating to better legitimate the study of VAB as pathology. "Boundary objects" are defined by Susan L. Star and James R. Griesemer (1989:393) as "objects both plastic enough to adapt to local needs and the constraints of the several parties employing them, yet robust enough to maintain a common identity across sites…they may be abstract or concrete." Here, I argued that biocriminologists, have been able to utilized the DSM defined classifications as a boundary objects to help make and justify their claims that certain VAB can be identified, studied, and potentially treated using technoscientific and biomedical practices and tools.

Criminologist Diana Fishbein (1990) noted that contemporary biological theories of VAB have focused less on defining violent and aggressive behaviors as criminal or not criminal, and instead are more concerned with understanding these behaviors as maladaptive or antisocial. However, the specific criteria and tools used to define VAB, the risk factors and behavioral characteristics of such behaviors, and the diagnostic value of the knowledges produced on VAB continue to spark debates concerning their applications for clinical and research purposes (Glenn, Johnson and Raine 2013; Pickersgill 2011, 2012a; Raine 1993). I next look more closely at what it means to see crime as a *psycho*-pathology.

Reframing Aggression for Neurobiological Research

Qualifying adjectives for aggression have been utilized throughout the history of neurobiological VAB studies to denote distinctive subtypes of aggression that capture specific risk factors for DSM personality disorders. Using work from social psychologist Leonard Berkowitz (1993), contemporary neurobiological research uses two distinct sub-types of aggression, impulsive and instrumental aggression. Impulsive aggression is also referred to as reactive, affective and hostile aggression. This form of aggression is triggered by emotional provocations such as frustration, anxiety, fear, as well as lack of impulse control (Blair 2010b, Gollan et al. 2005). On the other hand, instrumental aggression is defined as goal-orientated. This form of aggression is also called premeditated, proactive, purposeful, planned, or predatory aggression. Instrumental aggression is characterized by premeditated thoughts, and such behavior is described as goal-orientated for the gain of the aggressor (de Aguirre 2006; Blair 2010a, 2010b; Glen and Raine 2009; Gollan et al. 2005). Furthermore, the risk for such instrumental aggression is increased in populations of youth and adults who have psychopathic traits (de Aguirre 2006; Blair 2010a, 2010b; Glen and Raine 2009).

Neurobiological research has linked impulsive and instrumental aggression to specific populations based on the DSM, which in turn has helped validate the use of DSM classifications in VAB research. For example, impulsive aggression is associated with DSM classifications like IED (Blair 2010a; Coccaro 2011) and ASPD (Dolan 2010). In order to support their association with the risk for VAB, neurobiological research often test the correlations between neuropsychological tasks that measure impulsivity and specific regions of the brain that are said to control behavior or decisions making, such as the prefrontal cortex and orbitofrontal cortex. On the other hand, psychopathy—defined as a lack of guilt and empathy and poor impulse control—has also been linked to instrumental aggression. As neurologist Marie Ines de Aguirre (2006:228) noted, psychopathic individuals are especially susceptible to demonstrating this goal-directed type of aggression due to impairments in the affect system, especially in relation to moral thoughts and behaviors. Instrumental aggression, and psychopathic traits, has been linked to areas of the brain that control emotions, most commonly the amygdala. These qualifying behavioral characteristics operate as additional classificatory risk factors that researchers can use to help make more reliably diagnoses, but are also used help researchers recruit and formulate specific research populations for study. However, even with addition of these two characteristics for aggression, there are still difficulties pertaining to their use, and their associations to DSM disorders are not as straightforward. As NIH neuropsychologist and expert on psychopathy James Blair (2010a) recently stated, psychopaths are now understood to exhibit *both* instrumental *and* impulsive forms of aggression. Therefore, the associations made between these forms of aggression and specific disorders, at least psychopathy, are complicated.

In his review of the neurobiology of aggression and violence, psychiatrist Larry Siever (2008) echoed similar concerns in calling for greater attention to and better detailing of aggression for neurobiological research. He noted:

> When a threat is dangerous and imminent, this unpremeditated aggression might be considered defensive aggression and thus part of the *normal* repertoire of human behavior. Therefore, the line between pathological and impulsive aggression and more normal forms of aggression is not hard and fast, and individuals with pathological aggression may experience or rationalize their violence or aggression as being within the boundaries of normal protective or defensive aggression (Siever 2008:429).

Siever's assessment further complicates the use of these terms by adding another factor, that some aggressive behaviors can be seen as *normal* or *healthy* forms of behavior. How does the research distinguish between normal and pathological aggression? Are these the only categories of aggression that should be used, or are there other ways to think about aggression sub-types? One way to make such distinctions requires further pathologizing of behaviors such that they can be separated from normal forms of aggression. Psychological/psychiatric literature, specifically the DSM, has attempted to accomplish this by establishing that pathological disorders are characterized by recurrent behavioral patterns, and not signal abnormal events.

Repeatability as Pathology

The practice of defining VAB behavior is linked to establishing that such behaviors are displayed in a *recurrent pattern*. According to the DSM-IV-TR, individuals diagnosed with a personality disorder are said to exhibit *recurring patterns* of behavior that are abnormal, dangerous, or unhealthy. Repeatability is actually stressed throughout the DSM as a key diagnostic quality of personality disorders, and the recognition of a behavior as *recurrent* and *pervasive* is regarded as an important sign of pathology. Neuropsychiatrists and biocriminologists also use language pertaining to repeatability to describe behaviors of interests. In their review on the neurobiology of aggression, neurologist Pamela Blake and cognitive neuroscientist Jordon Grafman (2004:12) stated that neurobiological VAB research is interested in those "violent and aggressive individuals [that] are repeat offenders." In a similar vein, an observable pattern of behavior is also a criterion outlined in the PCL-R to determine psychopathy. Blair and colleagues (2006:262, emphases mine) argued:

> The classification of psychopathy identifies a relatively homogeneous pathology (at least when compared with the diagnoses of conduct disorder [CD] and antisocial personality disorder [APD]). [And], unlike CD and APD, psychopathy involves a *pervasive pattern* of both emotional (considerably reduced empathy and guilt) and behavioral (criminal activity and, frequently violence) symptoms.

The phrase *pervasive pattern* is also used throughout the DSM in relation to personality disorders. Like the term *repeatability* it denotes a display of behaviors that has replaced 'normal' behavior. Such pervasive or recurrent patterns of behavior are regarded as universally recognized 'abnormal' behavior, relied upon to distinguish pathologized populations from normal populations. Therefore, these descriptors can be better understood as part of the discursive clinical practices that underpin a psychiatric/psychological 'gaze' (Foucault 1973).

The term gaze reflects the epistemological underpinnings of psychiatric/psychological practice, and captures how knowledges, discourses and practices together assemble etiological meanings to reconstruct particular behavioral characteristics as clinically useful and treatable (Foucault 1973). The use of terms like "repeatable and/or pervasive behavioral patterns" in neurobiological VAB research help to redefine VAB, and such a discursive move may also segregate the meanings of these behavioral characteristics from the macro- and meso-level social and cultural factors that help engender and make meanings of their use. In this way, these behavioral characteristics are seen as markers of dysfunctional mental/brain processing and are understood as evidence of an individual's inability to adapt to social norms and/or to control their bodies. Thus, through the gaze of neuropsychiatry, these characteristics make behaviors and bodies appropriate for neuroscientific inquiry and biomedical treatment.

Quantification and VAB Knowledge Production

Through content analysis, I identified 26 different neuropsychological scales used to capture important behavioral measures employed in VAB research (Appendix D).[3] Building on the work of Bowker and Star (1999) as well as the recent work of Martyn Pickersgill (2009, 2011), I argue that psychiatric VAB scales designed to measure and quantify behaviors and traits also play a vital role in structuring VAB knowledge production, and reinforcing VAB classifications as pathologies. This highlights the often overlooked 'invisible work' (Bowker and Star 1999) generated by the use of neuropsychological scales and subscales of VAB. Specifically, the use of these measures to *quantify* behaviors and behavioral traits for neuroscientific VAB research are vital to measuring statistical correlations between DSM categories or VAB-risk factors and the structure and function of the brain.

In general, quantification is imperative to neuroimaging research design, which relies on sophisticated computerization and statistical analysis to give voice to the iconic visual images said to exemplify study's results by showing the brain 'in action' (Alac 2008; Beaulieu 2002;

Burri and Dumit 2008; Dumit 1999, 2004; Joyce 2008). In her ethnographic examination of brain mapping and fMRI technologies, Anne Beaulieu (2002) pointed out the significance of quantification for the production of visual knowledge and images in neuroscience. Beaulieu (2002:62 emphasis mine) noted:

> Functional imagers argue for a quantitative definition of their representations. Representations, when understood as part of an imagistic register, are only accepted as markers of moments of discovery. Otherwise, a discussion in visual terms of the representations used by imagers is considered [to demonstrate] a lack of understanding of the approach and phenomena these researchers are investigating…For brain mappers, the proper understanding of functional imaging is to see it as an experimental strategy that measures and explores the brain quantitatively, *not* one that visualizes it.

Beaulieu's (2002) work demonstrated how neuroscientists' utilize quantification in their work to buttress the significance and reliability of their results and visual representations (see also, Burri and Dumit 2008; Lynch 1991). Quantitative interpretations are thought to better capture scientific reason, validity and objectivity, thus quantified factors of the studied phenomena are the only factors rendered important for the study (Burri and Dumit 2008). As noted by Regula Valerie Burri and Joseph Dumit (2008:301) the 'mathematization' of specific measures becomes a necessary assumption, which can effectively erase and silence the unmeasured. Therefore, while visual representations serve as vital artifacts of patients'/participants' brains, it is the quantitative relevance of these illustrations that make them "speak," and thus become scientifically useful. However, before any 'neuroaesthetics' (Aguirre 2013)[4] are performed to produce useful pictures of the brain, calculations must first be made to understand the statistical significance between observed brain activity and the targeted VAB or VAB risk factors. It is at this point that quantified measurements of violence or aggressiveness and/or VAB risk factors are most useful for my assessment here of neuroimaging VAB research.

Neuropsychological measures are sophisticated rubrics used to better diagnosis and evaluate personality disorders. Some of these measures are embedded within larger more general interview surveys or screening tools. These tools, like the Structured Clinical Interview for DSM-IV (SCID I and SCID II) or the Child Behavior Checklist (CBCL), are diagnostic tools used to assess adults and children for DSM mental disorders. They are understood as universal instruments that standardized the subjective practices of diagnosis into more accurate, objective, and reliable procedures (APPI 2014). Others, like the aforementioned Psychopathy Checklist revised version (PCL-R), are commonly used alongside the SCID II and other intake interviews to help make better diagnostic classifications and to assists researchers in allocating study participants to proper study cohorts (i.e. healthy vs. pathological groups).

The PCL-R is a twenty-point scale that quantifies behavioral traits related to psychopathy. Each item on the checklist can be scored on a three-point scale (0, 1, or 2) with a total psychopathy score for an individual ranging from 0-40 (Hare 1998). Even though the checklist has been widely utilized, it is recommended that only individuals with specific qualifications and training use it (Hare 1998), there are questions remain about the consistency of its results across studies (Anderson and Kiehl 2012). The average psychopathy cut-off score for neuroimaging VAB studies determined through my content analysis was 23. Individuals with scores of 23 and above were designated as psychopathic; to be in the study's control group, individuals needed scores below 23. Although, there were studies that used different cut-off points, Ly and colleagues (2012) have taken a more cautions of approach in categorizing psychopathy. They used a PCL-R score of 30 to define psychopaths, and a PCL-R score of below 20 as the cut-off for their control population. Such precautions help prevent misclassification and ensure that the right groups are utilized for neuroimaging studies. However, inconsistencies in the use of psychopathy cut off scores in studies remain unaddressed. Nor does this provide clarity in distinguishing the qualitative differences between a 0, 1, or 2 score for PCL-R. These difficulties illuminate the variability in classification, the uncertainties in constructing authentic groups for study (Pickersgill 2009, 2011), and problems in comparing results across neuroimaging studies (Anderson and Kiehl 2012).

While the PCL-R provides diagnostic classifications, other VAB scales like the Barratt Impulsivity Scale (BIS), Buss-Durkee Hostility Inventory (BPAQ) or the Lifetime History of Aggression Scale (LHA) (Appendix D), are used to measure behavioral traits (like impulsiveness or hostility). These scales are designed to measure behavioral characteristics of aggression (instrumental and impulsive) and other the risk factors associated with these types of aggression. VAB scales like the PCL-R or BIS also help make statistical correlations between specific sets of data, such as the correlations between age and PCL-R score, or IQ and LHA scores. However, the primary use these scales, is to find statistical correlations between VAB classifications and/or neuropsychological measures and brain function and structure. Therefore, the use of these scales and neuroimaging technologies can help corroborate DSM classifications such as psychopathy or ASPD. I will return to this point more in the next chapter, which examines more explicitly the findings from neuroimaging VAB research. However, next I want to examine more thoroughly how VAB definitions and classifications bolster technoscientific procedures and neurobiological knowledges that frame VAB as a psychopathology. Using data from my content analysis of contemporary (1990-2012) neuroimaging VAB research, I explore the ‘infrastructural work’ accomplished by taxonomic practices in neuroimaging studies.

THE OPERATION OF VAB NEUROIMAGING RESEARCH

Understanding how violence and aggression are defined in contemporary VAB neuroscience requires examining the operation of these classifications, and elucidating the kinds of 'work' they accomplish for VAB neuroscience. In Table 3.1, I present data on the most common ways VAB was defined and operationalized through contemporary VAB neuroimaging studies. In this section, I argue that while the studies reviewed did not always provide a formal definition of violence or aggression, the use of study classifications worked as elaborate *proxy definitions* of VAB in these studies. Specifically, I identified at least three approaches utilized in neuroimaging VAB work to define and operationalize understandings of VAB: 1) using violent/aggressive incarcerated populations, 2) using classifications in the DSM, and 3) using healthy or normal participants. I concentrated on the particular groups of participants recruited for the studies to demonstrate the fluid interactions between informational systems that provide classification criteria for disorders (DSM) and define VAB and neuropsychological risk for such behaviors (VAB scales and subscales), and the types of bodies used for research.

Ironically, the data in Table 3.1 represents my own classification system for these studies. However, I do not intend for the categories here to represent the only way to understand the use of VAB in neuroimaging. Instead, this charting of VAB meanings and uses is to help better understand the diverse manner in which meanings about VAB are made and substantiated through the research, and to provide a useful approach to think through the progression of this research. This discussion of VAB categorization also helps better capture the *taxonomic* and *diagnostic* uncertainties, to use Susan Leigh Star's (1989, also see Pickersgill 2011) concepts, and the ways in which the DSM, NIH and other infrastructural entities have helped structured and support the rise and growth of neurobiological VAB research.

Table 3.1 Defining VAB in Neuroimaging Studies Sample, 1990-2012
*Number in parentheses represents the number of studies for each imaging technology

Imaging Technology	VAB populations	DSM categories	Healthy volunteers
PET (15)	5	6	4
SPECT (5)	2	3	0
MRI (29)	0	26	3
fMRI (36)	1	23	12
DTI (4)	0	4	0
Total (89)	8	62	19

Using VAB Populations

In Table 3.1, the column titled 'VAB populations,' shows that 8/89 contemporary neuroimaging VAB articles demonstrated the meaning of VAB by using populations defined as violent or aggressive through the criminal justice or mental health system. Participants in these studies were recruited based on their previous pattern of violent, aggressive and/or criminal behaviors. These studies were considered unique because they did not rely on DSM classifications to defined and recruit their participants. Instead, recruitment was based primarily on participants' past history of violence as ascertained through official criminal records. While criminal records were also used in other studies, particularly in conjunction with DSM classifications, the eight studies here are distinct because they did not refer to their populations through DSM classifications.

Seven of the eight studies in this column used populations previously defined as violent offenders. These participants were recruited directly through the criminal justice system, and were required to undergo forensic psychiatric assessment in order to stand trial, or as part of post-trial sentencing. For the one remaining study, participants were recruited through criminal probation services. This study's focus was on a very specific social group and behavior: men who abused their wives and were arrested for it. Using populations already defined violent through the criminal justice system was an important step in the progression and growth of neuroscience of VAB research. This method of targeted recruitment allowed researchers to focus on specific behaviors without having to qualify such individuals using the DSM. The results of early neuroimaging VAB research helped generate the ‘conditions of possibility’ for neuroimaging psychiatric research to expand beyond psychiatric populations. In essence, these studies provide the data needed as ‘validation’ and/or ‘justification’ for future research on the brain and VAB (Rose and Abi-Rached 2013). This move also allowed neurobiological VAB research to be applied to a larger group of study populations and to expand and reinforce the definitional boundaries of what constitutes mental disorders.

For example, using PET imaging techniques Raine and colleagues (1994) found that the population of murderers in their study was characterized by deficits localized in particular areas of the brain (also see Raine, Buchsbaum and LaCasse 1997). Raine and colleagues (1994:372) noted that, “this specific population is of importance in the contexts of law, psychiatry and society, [and] these initial findings provide a basis on which future brain-imaging studies of violence may build.” In a follow up study that also found abnormal brain function within an expanded group of murderers, Raine, Buchsbaum and LaCasse (1997:505) clarified the importance of framing VAB through a psychiatric lens: two of their reported study limitations were 1) the absence of standardized diagnostic and neuropsychological assessments for the study population, and 2) the absence of a ‘psychiatric control group,’ to control for the presence of mental disorders within the population of murders. Such strategic wording, was in part to defend the science from charges of determinism, this also helped expand neuroimaging VAB research. However, as noted by Rose and Abi-Rached (2013), while acknowledging that their findings should be interpreted cautiously and that biological factors are not the sole reason for VAB, Raine and colleagues (1997) were less cautious about the implications that could be inferred through their studies' titles or abstracts, one such title was, "Brain abnormalities in murderers indicated by positron emission tomography."

Despite concerns among neuroscientists and psychiatrist about the usefulness of neuroimaging VAB research during its developmental phase (late 1980s-early 1990s), neuroimaging VAB research dramatically expanded by the late 1990s-early 2000s (Rafter 2008; Rose and Abi-Rached 2013). Nikolas Rose and Joelle Abi-Rached (2013:177) noted:

> Biological criminology was no longer, it seemed, linked inseparably with the pseudoscience of criminal anthropology…the gaze of the neurocriminologist could now plunge into the interior of the living criminal brain and discover therein the roots of violence and failures of impulse control in the dangerous individuals.

The use of novel biotechnologies with greater scientific power enabled defense of the science against long-standing criticisms of determinism. But even with these new techniques, questions remained around the potential ethical and social implications of rehashing the biology of violence (Duster 2006b; Spallone 1998; Touchett 1993).

The use of violent offender groups in neuroimaging VAB research was imperative for its growth. Such conclusions assisted in the expansion of this vision of VAB beyond mentally-ill populations into the prisons, courts, schools and the everyday lives of individuals. While this research would later argue against the use criminal designations (e.g., murderer or rapist) for biologically-based VAB research (Fishbein 2000), they still relied on criminal or mentally ill populations to conduct the bulk of their research on VAB. These early developments of a neuro-view of VAB demonstrated that they did not move away from criminal justice labels, but instead *reframed* these populations as 'psychiatric groups' for research purposes. The violent offences committed by these groups were now repacked as pathologies defined through the use of DSM and other neuropsychiatric VAB measures.

Classification systems used in neurobiological VAB research are more than mere descriptions of persons who behave in deviant or violent matters. Through their continual use in research and clinical settings, and expanding practices in legal and educational spheres, these knowledges operate as tools, proving a malleable infrastructure for VAB science, which both creates and routinely reinforces the validity and reliability of definitions used to describe and treat VAB. While, the use of criminal designations by name may have decreased, but such connotations lived on as artifacts embodied within the very populations chosen for research. Thus, the use of violent offenders in early neuroimaging VAB research helped expand the medicalization (Conrad and Schneider 1992) and biomedicalization (Clarke et al. 2003, 2010) of psychiatry/VAB.

Using DSM Categories

Table 1's column labeled "DSM categories" shows that the majority of reviewed neuroimaging studies (62/89) used DSM defined classifications to refer to the behaviors of interests in the study. Using such psychopathological DSM defined descriptions—such as antisocial behavior or psychopathy— was said to capture a more dynamic understanding of VAB, including behaviors that may a not be defined as illegal and/or those that go undetected by the criminal justice system. According to Fishbein (2000:12):

> Due to the nature of the phenomenon of antisocial behavior, research to understand the origins and the underlying mechanisms in criminal behavior must focus on the measurable dimensions (phenotypes) of antisocial behavior that may increase the risk for criminal activity. A focus on crime, per se, is misguided from a measurement standpoint since crime is an abstract legal and social construct, not a measureable behavioral construct. Criminal acts that are committed only once or rarely by an individual may be more a result of a situation than an ongoing predisposition. But a longstanding or

> recurrent pattern of antisocial behavior is more likely due to the cumulative, developmental influence of interacting biological and environmental factors.

Therefore, these proxy definitions of VAB represented more than just a way to define behavior. They symbolized: the recruitment practices for the study's sample populations; the classification methods used by researchers to allocate their sample populations into control and study groups; and the types of behaviors and behavioral traits, or risk factors, examined in neuroimaging VAB research. However, the question remains: How do researchers recruit and make these populations? How do they know they have the right 'kinds' (Hacking 2001) of people in their studies?

Even in ideal situations, psychiatric/psychological diagnoses are based solely on behavioral observations, not measurable biological criteria (Farah and Gillihan 2012). Forming research groups for neuroimaging research based on DSM criteria, and the decisions researchers have to make to determine which individuals represent the 'ASPD group' versus the 'psychopathy group' or the 'normal group,' for example, is a social experience/practice. Although the groupings are based on DSM diagnostic criteria, the use of such knowledge for diagnosis/grouping is much more of a social practice than a biological 'fact.'(Hacking 2001). As Ian Hacking (2001) described in his analysis of genetic research on VAB, diagnostic criteria are in constant flux, and researchers' diagnostic/grouping decisions rely more on their common social understandings of terms like 'impulsive' and 'aggressiveness' than on any chemical, genetic, or 'natural' differences observed between groups. Yet, neuroimaging VAB research is said to demonstrate the biological underpinnings of these socially determined DSM criteria.

Part of the allure to the DSM, and subsequently neuroimaging, is discipline based. The majority of researchers who do neuroimaging VAB research come from the fields of psychology and/or psychiatry, and their use of neuroscientific and genetic biotechnologies to help bolster psychological/psychiatric knowledges has fueled the recent upsurge of biologically based research to better understand the psyche via the brain (Singh and Rose 2009). The underlying assumption in neurobiological VAB research is that pathological VAB signifies an underlying personality disorder, and *all* violent or maladaptive behaviors originate in the brain. Therefore, if a researcher can establish that a person's violent or aggressive behaviors can be labeled by the DSM—that the person can be classified as having a personality disorder—the next logical step researchers' argued, is to look for causal brain dysfunction(s) of particular personality disorders. However, as demonstrated in this chapter, biocriminologists still have difficulties with the first step of this process—agreeing on the best way to characterize behaviors as violent or aggressive. Furthermore, applying these VAB understandings, measures and observations to DSM criteria in order to construct research populations and clinical diagnoses are also full of uncertainties (Pickersgill 2009, 2011). Interestingly, to address these concerns researchers have worked less on ironing out the uncertainties of defining violence or aggression for psychiatric use, in favor of better establishing the relationship between DSM criteria and the brain (or genes).

University of Pennsylvania cognitive psychologists, Martha Farah and Seth Gillihan (2012:1) have pointed out that "the established view in psychiatry is that brain imaging has no role to play in routine clinical care. Aside from its use to rule out potential medical causes of a patient's condition, such as a brain tumor, neuroimaging is not used in the process of psychiatric diagnosis." However as they admit later in the article, the diagnostic utility of neuroimaging (and genetic) technologies is underpinned by its future 'promise' for clinical use and treatment. As noted by sociologists Ilina Singh and Nikolas Rose (2009), the use of biomarkers, especially neurological and genetic markers, in psychiatry are held as promising in part because of the potential for these knowledges to provide a more precise means of diagnosis. Singh and Rose

(2009) also stated that these influences might also effect the future organization and development of the DSM and other diagnostic manuals. Indeed these debates around the use of genetic markers, brain functioning and structure, as well as the desire for more accurate, objective, and dependable diagnosis criteria and behavioral definitions, are at the heart of the debates around the latest edition of the DSM.

Recent statements by current National Institute of Mental Health (NIMH) Director Thomas Insel underscore the debates on and requests for better classification, as well as the underlying assumption that the *neuromolecularization* and *geneticization* of mental health will lead to greater health outcomes. Insel (2013), in a blog post titled, “Transforming Diagnosis” released on April 29, 2013 on NIMH’s ‘Director’s Blog’ webpage, argued that the newest edition of the DSM, DSM-5, published in the spring of 2013 is unfit to be the model diagnostic reference for the future. He declared that NIMH (and NIMH funded research) will not be using the DSM-5 categories going forward. Instead NIMH has launched the *Research Domain Criteria* (RDoC).

The future vision of NIMH, according to Insel, is for the RDoC to replace the DSM as the primary source of the guidelines for classifying mental health disorders. Insel was unsatisfied with what he described as DSM-5’s inability to address and incorporate genetic and neuroscientific evidence of mental illness. The weakness of the DSM, according to Insel (2013), is that its content, while reliable, lacks validity because its knowledge relies too much on behavioral symptomology. Insel also noted that the DSM-5 does not accurately reflect the growing need for more objective laboratory research on biological correlates of mental health. Therefore, the DSM’s replacement, the RDoC, will serve as a ‘research framework’ and no longer a clinical tool like its predecessor (Insel 2013).

The focus of the RDoC will reflect the dramatic growth of research on genetic and neurobiological correlates of mental disorders. In his blog release, Insel (2013) described the assumptions behind NIMH's shift in four points: First, "a diagnostic approach based on the biology as well as the symptoms must not be constrained by the current DSM categories." Second, "mental disorders are biological disorders involving brain circuits that implicate specific domains of cognition, emotion, or behavior." Third, "each level of analysis needs to be understood across a dimension of function." Last, "mapping the cognitive, circuit, and genetic aspects of mental disorders will yield new and better targets for treatment." However, a few weeks after the release of this post, Insel retracted these statements in a joint press release with American Psychiatric Association President, Jeffery Lieberman (Insel and Lieberman 2013). In an apparent attempt to quell doubts and public concerns around the continued use of the DSM for clinical purposes following Insel harsh criticism, Insel and Lieberman (2013) argued that the two manuals are 'complementary' frameworks. They concluded their joint statement by reiterating:

> All medical disciplines advance through research progress in characterizing diseases and disorders. DSM-5 and RDoC represent complementary, not competing, frameworks for this goal. DSM-5, which will be released May 18, [2013] reflects the scientific progress seen since the manual's last edition was published in 1994. RDoC is a new, comprehensive effort to *redefine the research agenda* for mental illness. As research findings begin to emerge from the RDoC effort, *these findings may be incorporated into future DSM revisions and clinical practice guidelines*. But this is a long-term undertaking. It will take years to fulfill the promise that this research effort represents for transforming the diagnosis and treatment of mental disorders (Insel and Lieberman 2013, emphasis mine).

Thus the latest interpretation of the conflict over classification has now framed the DSM-5 as the primary *clinical* classification system, and the RDoC as the primary *research* classification system. According to Insel and Lieberman (2013), the two systems would operate as a collaboratively. However, the relationship between the two information systems outlined in the press release seemed to suggest more of a unidirectional relationship. The RDoC's promises to find neurobiological and genetic correlates of mental illness will be used to help inform, and be incorporated into, future DSM revisions. The reverse, the DSM advising the RDoC's future revisions, was not mentioned. This only underscores the contemporary biomedical position that the best diagnosis and treatments for health are derived from research on basic biological factors (Duster 2006b; Rose and Singh 2009). Therefore, even given Insel's reversal on DSM use, it is clear that the future vision of NIMH, and of psychological research funding, will be to increase the production of neurobiological and genetic based research.

Switching to a classification system that seems to be explicitly constructed to better advance neurobiological and genetic research on mental health can produce a 'bootstrapping effect,' in which the RDoC and neurobiological and genetic psychiatric research will mutually reinforce purpose and reliability. Here, the RDoC will help erase epistemological uncertainties and quell debates around diagnostic classifications used for neurobiological and genetic research. Seemingly, these categories will be based on more reliable biological criteria, and not behavioral characteristics like the DSM. On the other hand, neurobiological and genetic research and technologies will help substantiate the RDoC's epistemology and ease questions concerning its efficiency and reliability. The RDoC's findings will eventually be used to change clinical diagnostic criteria in the DSM. Therefore, while these shifts at the NIMH do not ease the *uncertainty* imbued in defining behaviors, it refocuses diagnostic decisions used to determine pathology, it will further advance the reliance on the *neuromolecularization* and *geneticization* of psych-knowledge, and thus further legitimize these knowledges as more productive interpretations of psychiatric etiology. Furthermore, based on prior research examining the DSM's influence on shaping mental health knowledge and research, we should not expect that the RDoC will be any better equipped to resolve debates around reliability or classification uncertainty (Pickersgill 2011, 2014, also see Bowker and Star 1999).

Using Healthy Volunteers

In the final column in Table 3.1, I coded 19 articles under the theme ‘healthy volunteers.’ However, here I am not simply capturing the recruitment of healthy volunteers to serve as research participants. In fact, the use of healthy volunteers for control groups was very common across all reviewed empirical studies. Instead, I use the code ‘healthy volunteers’ to capture important infrastructure elements of neurobiological VAB research. These elements help thread together key arguments in this chapter, and provide an understanding of the relationships between VAB knowledges and the construction and use of healthy/normal research participants in neuroimaging VAB research.

Investigations of ‘healthy brains’ signified a move to better understand the relationship between VAB and ‘normal’ neurobiological processes and brain structure. This move takes up the challenge noted by above by Larry Siever (2008:429) who called for VAB researchers to better differentiate pathological aggression from the ‘normal repertoire of human behavior.’ However, I argue that studies labeled under the heading “healthy volunteers’ also reveal another discursive route used to expand scientific expertise. The knowledge produced from research on healthy populations creates great “promissory value” (Thompson 2005), particularly related to how such knowledge informs prior VAB research and how it can lead to the development of better VAB biomarkers for future research. “Promissory value” is intended to capture the future values and use of biomedical knowledges and technoscientific practices to predict, discipline, and/or ‘treat’ VAB. This concept is employed here similarly to Charis Thompson’s (2005:258-259) term “promissory capitalism,” which she used to describe the economic characteristics of biomedical mode(s) of reproduction. Following Thompson (2005), I argue here that the worth of biomedical knowledges and technologies of VAB is best described as “promissory.” Thus, the productive value or capital of said knowledges of VAB are not only a product of the rise of or greater dependency on biomedical modes of thought, but also on the potential abilities to address, extended or transform life (Clarke et al. 2003, 2010; Rose 2007).

For example, in one of the larger MRI studies on VAB— a joint funding and research effort between NIH and Canadian Institutes of Health Research (CIHR)— Ducharme and colleagues (2011) looked at neuroanatomical correlates (brain structure) of impulsive aggression in healthy children. [5] They summed up the significance of neurobiological VAB research on healthy volunteers in the following passage:

> *Studying brain-behavior relations among healthy children exhibiting normal variation may provide critical insight on the neural substrate of human behavior and psychopathology*…Most neurobiological studies have focused on pathological aggression/violence (i.e., criminals, personality disorders, conduct disorder, etc.), [but] few studies have looked at correlates of aggressiveness in healthy children (Ducharme et al. 2011:283-284, emphasis mine).

While directed, Ducharme and colleagues (2011) statement contains important nuances. First, there is an assumption made concerning the term healthy. In neuroimaging VAB research, the meanings and measurements of ‘healthy’ can change from study to study. But in the studies reviewed for my content analysis, the tools used to determine ‘healthy’ participants were consistently the diagnostic criteria in the DSM and VAB scales that measured VAB risk factors. Using such criteria, these healthy individuals were determined to have no ongoing or prior mental disorders.

There is also an assumption in Ducharme and colleagues (2011) statement that all behaviors, healthy or pathological, are products of brain dysfunction/function. Interestingly, the relationship between VAB and the brain is not mediated through medicalized personality disorders:

> [W]e assessed magnetic resonance imaging (MRI) neuroanatomical correlates of [The Aggressive Behavior scale (AGG)] scores in developmentally healthy children…We hypothesize that, *even in nonpathological subjects, there are anatomical variations in cortical thickness of the [anterior cingulate cortex] the [orbitofrontal cortex], and basal ganglia volume* associated with [Child Behavior Checklist's (CBCL) Aggressive Behavior scale (AGG)] scores.

Essentially, Ducharme and colleagues (2011) argued that there was a correlation between the scores on the AGG and gray matter brain volume, suggesting that youth with higher aggression scores had less gray matter volume in the ACC (a region of the brain associated with decision making and empathy). The key here is the assumption that VAB can be measured in a linear fashion, and as the risk for such behaviors increase (higher scores on aggression scale), observed brain volumes were correspondingly lower. Thus, neurobiological studies do not have to rely on pathological groups, but can used normal populations who are 'at-risk' of violent behavior based on such numerical measurements of VAB. In addition, by expanding the focus of neuroimaging VAB research beyond pathological populations, researchers are able to create new neuro-knowledge that can be linked to and mapped upon neuropsychiatric understandings of 'normal' expressions of aggression.

These discursive methodological moves toward understanding the 'normal' serve to rationalize prior neurobiological knowledge of the pathological (Canguilhem 1991). The goal is to isolate 'healthy' brain structures or neural pathways to help improve understandings of neurobiological abnormalities that underpin VAB in all populations. As stated in King and colleagues (2005) study, "Doing the Right Thing: A Common Neural Circuit for Appropriate

Violence or Compassionate Behavior," the usefulness of studies on healthy populations lies in its ability to support, or build upon, previous research on pathological VAB:

> Our results suggest that the expression of context-appropriate behavior in healthy participants is guided by a common neural system including the amygdala and ventromedial prefrontal cortex. *These data support suggestions that dysfunction in this system underlies the presentation of inappropriate social behavior in some individuals, [and] provides a way to begin to investigate the neural bases of socially appropriate behavior*, how they fail in conditions such as psychopathy, and how this system is affected by manipulation of the contexts encountered. King and colleagues (2005:1075, emphasis mine)

King and colleagues' (2005) results also suggest that *all* behaviors (healthy and pathological) are the results of complex neural system, and that VAB is a dysfunction of a normally healthy functioning brain. This type of research on normal/healthy brain processes of VAB validates the usefulness and reliability of diagnostic and biological characteristics of pathology that are outlined in manuals like the DSM or ICD. It further biologizes psychopathologies and obscures definitional and classificatory uncertainties produced through prior VAB research (Star 1986, 1989). Therefore, neurobiological VAB research focused on healthy populations further reinforces the idea that the most useful understandings of the cause for pathological VAB is through the examination of its biological correlates (Duster 2006a).

Second, the articles coded as 'healthy volunteers' also captured how biomarkers and/or behavioral traits play a large role in shaping and producing the types of neuro-knowledges and neuro-understandings created through neuroimaging VAB research. As stated by Singh and Rose (2009:203), the use of biomarkers, has resulted in a "methodological shift away from searching for the causes of a condition towards estimating the probability that the condition is present or will develop." Thus, there has been a refocusing of the practices of biomedicine toward *potentialities.* The importance of genetic biomarkers can be demonstrated by the increasing methodological shift toward hybridity in neuroimaging research, in which the knoweldges produced through neuroimaging technologies have been said to have the greatest potential when combined, or coproduced, with genetic technologies (Caspi and Moffitt 2006; Raine 2008). This shift has resulted in an increasing demand and use of both genetic and neurobiological knowledges in VAB imaging studies.

The use of imaging in genetic research on VAB most often concentrates on the distastefully titled ‘warrior’ gene, (Gibbons 2004; Lea and Chambers 2007) known also as monoamine oxidase A (MAOA).[6] The use of MAOA in biological research on VAB has significantly accelerated biological VAB research in the last two decades. The link between MAOA and VAB was first suggested in a paper published by Brunner and colleagues (1993), in which they asserted that impulsive aggression may be linked to serotonin, a neurotransmitter regulated by MAOA. Before this work, genetic research on VAB was limited to twin and heredity research. Using genetic mapping techniques in combination with heredity research, Brunner and colleagues (1993) innovatively traced a relationship between MAOA deficiency and violence over several generations in one Dutch family. Although Brunner himself later noted that the findings from the article were misinterpreted, the press coverage from the publication changed the direction of genetic VAB science (Rafter 2008; Rose and Abi-Rached 2013). From this point on, MAOA research had a significant effect on VAB research, particularly research that focuses on the relationship between maltreatment or childhood adversity, VAB, and MAOA (Caspi et al. 2002; Kim-Cohen et al. 2006). More recent VAB research concentrates on two variants of MAOA, MAOA-H (high variant) and the MAOA-L (low variant). MAOA-L has been associated with greater risk of VAB in both structural and functional MRI research (Alia-Klein et al. 2009; Buckholtz and Meyer-Lindenberg 2008; Passamonti et al. 2008a).

Research on MAOA polymorphisms and VAB is said to only account for a small portion of the variance in behavior (Buckholtz and Meyer-Lindenberg 2008), and research findings over the last 20 years have been inconsistent (Beckwith 2013; Buckholtz and Meyer-Lindenberg 2008; Prichard et al. 2008). Harvard University neuropsychologist Joshua Buckholtz and University of Hidelberg neuropsychiatrist Andreas Meyer-Lindenberg (2008:127) have pointed out these inconsistences in MAOA research, but also noted the importance of genetics for neuroimaging VAB research:

> The main utility of the intermediate phenotype approach is less in the claim to have isolated a genetic risk factor that by itself deterministically predicts psychopathology, than using such variants as tools to discover neural systems linked to impulsive violence. The combination of genetic and neuroimaging methodologies to study pathological aggression improves our ability to gather useful data, furthering our biological understanding of this complex and relevant phenomenon.

Adrian Raine (2008) summed up this epistemological merger in the title of his review article, "From Genes to Brain to Antisocial Behavior." Raine (2008) argued that genetic markers that code for neurotransmitters affect brain function, and brain functioning underpins *all* behavior. Yet, as it has become common practice, Raine also acknowledged that environmental factors could potentially impact causal pathways to VAB by altering gene expression. However, even with these caveats, the article concluded by (over)stating that it is an individual's genetic makeup that predisposes them to VAB, and therefore genetic expression is the etiological center of VAB. Accordingly, contemporary biocriminologists are excited about the possibilities neurogenetic and imaging genetics have for the study of VAB, and they contend that the logical progression is to incorporate more genetically informed research into neurobiological VAB research (Caspi and Moffitt 2006; Plodowski et al. 2009; Raine 2008). Thus, another way to think about this is the reduction of VAB to the brain and then to the gene.

Neuroimaging research also uses these genetic knowledges in a similar fashion as DSM classifications and other VAB behavioral measures, as a way to target recruitment. Using genetic technologies to type individuals for MAOA-L and MAOA-H variants, researchers are no longer limited to research on personality disordered, incarcerated, or violent offender populations. Instead, healthy populations can be genotyped for MAOA polymorphism during the project's recruitment for study participants. Meyer-Lindenberg and colleagues (2006) used a sample of healthy volunteers genotyped for MAOA low and high expressed variants and found that MAOA-L was associated with an increased risk for violent behavior. Meyer-Lindenberg's group (2006:6269, emphasis mine) summed up the significance of using healthy populations in neurogenetic imaging research in the follow passage:

> Because our sample was nonviolent, we are not studying the relationship of MAOA and violence per se, but rather the effects of one specific genetic factor on relevant aspects of brain circuitry *without contamination* by other interacting genetic and epidemiological risk factors that may be implicated in the emergence of this complex behavior and that could obscure or exaggerate the genetic effect (e.g., drug or alcohol use or maltreatment).

Meyer-Lindenberg and colleagues' (2006) comments demonstrate the pervasive reliance on risk factors and biomarkers (Singh and Rose 2009), and the persistent reminders provided by contemporary biological VAB research to rebut claims of determinism. The use of healthy populations ostensibly assumes that these samples are free of all other confounding factors for VAB, thus a 'contaminant-free' sample. However, questions still remain concerning these ideas of 'contaminant-free' science. These questions are also addressed in Chapters 4 and 5, but it is important to draw out some of them out here. The most concerning problem is that VAB is never contaminant-free, so is it useful for a science of VAB to pursues such a methodological stance? What epidemiological factors actually count as factors for VAB in this science, and how do you identify and define such factors? Do gendered, racial, and class factors that may structure decisions and behaviors matter? If so, how does neurobiological VAB science incorporate such factors?

Using a study group of healthy men divided into two groups based on MAOA genotype (MAOA-L and MAOA-H), Nelly Alia-Klein and colleagues (2009) investigated how MAOA influences brain functioning during an fMRI task designed to test an individual's anger control.[7] Their findings stated that MAOA-L genotyped group demonstrated unique patterns of brain function during the anger task. This finding supported previous research suggesting that MAOA-L carriers have a greater vulnerability to aggression. However, the study's conclusion also demonstrated how researchers perceive the importance and future significance of imaging genetic research, including how research on healthy populations translates back to future research on pathological VAB groups. Alia-Klein and colleagues (2009:) stated:

> In general, it is becoming clear that multilayered gene-brain-behavior models will help predict aberrant aggression in specific populations and under specific conditions. Therefore, it remains to translate these endophenotypic models from basic human studies to populations of individuals with chronic anger and episodes of violent behavior as observed, for example, in social-relational situations that involve domestic abuse.

Both the comments from Alia-Klein's group and Meyer-Lindenberg's group demonstrated the significance of healthy populations, and the promises that such populations provide for future biological research. These results also indicate that imaging technologies are used to provide an understanding of individuals who are more 'at-risk' for VAB. These at-risk populations undergo imaging research to uncover specific brain dysfunction and/or abnormal structure that can link MAOA to brain function, and ultimately tie these risk factors to personality disordered and violent offender populations. However, such conclusions are based on a much larger knowledge framework and prior assumptions initially generated through research on criminal groups.

In sum, research on healthy populations performs at least two interrelated tasks for neurobiological VAB research. First, by using healthy populations this research reinforces the notion that *all* behaviors have a brain, thus biological, basis. This means *any* behavior can be study using these techniques, not just VAB. Second, this research helps substantiate prior claims about VAB. The claims that linked neurobiological pathways and biomarkers to VAB were original generated from research on VAB populations. Examining the same neurobiological pathways or biomarkers in 'healthy' populations serves as proof to corroborate prior VAB biological knowledges. Even if VAB is not a characteristic of these healthy groups, as noted by Meyer-Lindenberg and colleagues (2006), a *risk* for such behaviors can be ascertained through the use of VAB scales. However, the association between biology and risk for VAB are not as clear as assumed in neurobiological research. For those interested in the social, ethical, and legal implications of neurobiology VAB research, it may be more useful to think about the complexities that arise when researchers try to apply these risk factors to the actual display of VAB. How are we defining risk? What actually places one at risk? Can complex social risk factors be reduced to linear numerical values? Are these factors any better or worse than the risk factors already used to predict and label VAB or criminality, or to diagnosis VAB personality disorders?

CHAPTER III CONCLUSION

This chapter provides an understanding of important infrastructure elements for neuroimaging VAB research. This includes the knowledge production processes and practices that underpin how VAB is defined, and the elaborate information systems that classify and sort meanings and bodies for neuroscience research. I began with a description of the knowledge-making processes that buttressed the relationships between definitions and understandings VAB and the processes of ‘fit’ needed to reframe VAB as a psychopathology. I argued that before any understanding of violent, aggressive, or criminal behavior can be used in neurobiological research, these behaviors must first be reframed as a medical disorder or psychopathology. In order to reframe or “fit” VAB within the larger knowledge systems that construct psychopathology, it takes ‘infrastructural work.’ Such work is needed to approach or frame the question of violence and the brain, and includes the historically and culturally situated practices and discourses needed to produce a system of criteria (classifications or standards) that can be used to create fit. In the case of neurobiological VAB research, many of these practices are embodied within manuals like the DSM. These manuals provide extensive guidelines and standards to fit behaviors within a framework of pathology.

The infrastructural work needed to frame VAB also includes professional training and education to interpret these criteria and their importance to the epistemological and ontological goals of the profession. In order to validate the use of the DSM and other VAB scales and subscales, psychiatrists/psychologists studying VAB have rejected the use of criminal justice labels in favor of their own VAB classifications. Thus, one way modern biocriminologists have addressed, or perhaps bypassed, the debates concerning uncertainty of VAB definitions was by shifting the conversation away from behavioral definitions used by the criminal justice system (e.g. murderer, rapist, etc.) to behavioral classifications outlined in the DSM as pathological personality disorders (Hacking 2001). In doing so, I argue that these professionals have attempted to draw a disciplinary boundary around the behaviors that they are interested in, which are defined by the profession as behaviors characterized by repeated and pervasive behavioral patterns, underpinned by instrumental and/or impulsive aggressive behaviors, and capable of being reduced to quantitative values so that they can be better operationalized in genetic and neuroimaging research (Gieryn 1983, 1999; Star and Griesemer1989)

Finally, it takes a unique network of professional members to utilize these criteria, and other taken-for-granted tools and expertise knowledges, to ultimately construct fit. That is, through practices, uses of biotechnologies, and the production of 'new' knowledges on VAB, neurobiological research is able to justify the framing of VAB as a psychopathology. I have demonstrated that VAB neuroimaging research has used different populations to both build upon and help create VAB knowledges. The use of these populations has expanded the influence of biologized notions of VAB into other social arenas. For example, using healthy volunteers and/or violent offenders from court mandated forensic evaluations has permitted biocriminology to generate expert neuro-knowledges about populations that are not always under psychiatric care. This also helps biocriminology substantiate previous neurobiological knowledges that delineated specific brain structures and functioning as underlying factors for VAB.

Ultimately, I argue that the work, practices, and professional negotiations, along with classificatory tools used in research that help construct biologically-based VAB knowledge frameworks and standards (DSM, VAB scales and subscales) operate together to systematically incorporate new knowledges, factors, and kinds of behaviors into the rubric of biocriminology. This infrastructural work helps facilitate the supplanting and/or forgetting of divergent streams of knowledge (Bower and Star 1999; Hacking 2001; Star 1989), and helps create and maintain particular ontological and epistemological visions of VAB that ultimately locate the source of such behaviors within the body (brains and genes) (Becker 2008; Duster 2006a; Rose and Abi-Rached 2013; Spallone 1998). Moreover, the knowledges produced through neuroimaging VAB research substantiate prior knowledge claims and epistemological assumptions concerning VAB etiology. Like Martyn Pickersgill (2009, 2011), I also contend that such moves continue to operate seemingly smoothly and productively, without fully dealing with the uncertainties and ambiguities in both the definition of VAB and the application of DSM classifications.

Overall, through describing the practices classifying and defining VAB, this chapter highlights the pervasive uncertainty that underlines the production of scientific knowledge on VAB (Star 1985, 1989). While defining VAB may rest in the contested arena of uncertainty, the production of scientific and psychiatric/psychological knowledges on VAB are nevertheless universally relied upon classification systems. Incomplete and contested as they are, these knowledge systems still help quell, and/or render invisible, classificatory and definitional paradoxes during the production of knowledge, and thus are valuable infrastructural components for the science (Pickersgill 2011; Roth 2005; Star 1985, 1989).

As stated by Pickersgill (2011:71), "for neuroscientists studying the contested conditions ASPD and psychopathy, psychiatric and psychological classifications and concepts are used to substantiate one another. This co-produces epistemological and ontological un/certainties, without wholly resolving philosophical and methodological questions regarding what mental disorders are, and how they can be recognized." Indeed, as stated by Raine (1993:3), "although no single definition clearly delineates psychopathology, the many definitions, when taken together, create a general 'gestalt' or picture of what constitutes a psychopathology." Raine's statement implies that researchers and clinicians are aware of the discrepancies and difficulties inherent in the VAB definitions and DSM classification even while employing such informational systems as methodological tools in neurobiological VAB research.

In addition, through medicalization of VAB as a psychopathology, biocriminology is seemingly placed in a much better position to defend itself from critiques concerning the ambiguities and socially constructed quality of definitions and interpretations of violence and aggression. Moreover, through the use of novel biotechnologies, these discrepancies are seemingly erased or rendered negligible in neurobiological VAB research, and the enduring search for *criminal man* continues.

In the next chapter, I explore in more detail the associations established by neuroimaging research between brain function and structure and VAB. Specifically, that chapter will examine how knowledges on brain localization, or specialized brain structure and functioning (Star 1989), have been mapped to the definitions and classifications of VAB outlined in this chapter. Moreover, that chapter will also pay special attention to the shifts in biocriminology knowledges and practices that I describe as the transformation from the medicalization of VAB to the biomedicalization of VAB (Clarke et al. 2003, 2010; Conrad and Schneider 1992; Conrad 2005; Moran 1992).

CHAPTER IV
DISEASED BRAIN AND DYSFUNCTIONAL AMYGDALA: THE TECHNOSCIENTIZATION OF VIOLENCE AND AGGRESSION

> The “new Lombrosians” believe that many criminals are biologically predisposed to crime and violence and that modern scientific technology can provide the means for their identification. This “sign” of criminality contrary to Lombrosian theory, is not engraved on their countenances, but rather is outlined in their fingerprints, footprints, and palm prints, or in the temporal lobe region of their brains, or in the constitution of their sex chromosomes. Science can thus tell the good people from the bad, but more sophisticated instruments than the naked eye are required.
>
> Richard Moran (1992:227)

CHAPTER IV INTRODUCTION

What is the relationship between the causes of VAB and the technoscientific practices and biotechnological tools used to produce knowledges on the structure and function of the brain? Further, how do assumptions about and functions of these neuro-knowledges shape the ways both science and society conceptualized the management of criminal bodies, ascribe who or what identities are at risk for violent behavior, or determine which behaviors and thoughts count as aggressive? To approach these questions, this chapter describes how knowledges of VAB are produce through neuroimaging technologies. In particular, I focus on the discourses through which new biomedical potentialities for VAB are made material through neuroscientific knowledges and images that help realize the biological underpinnings of VAB, who is violent, and where violence is in the brain (see Figure 4.1).

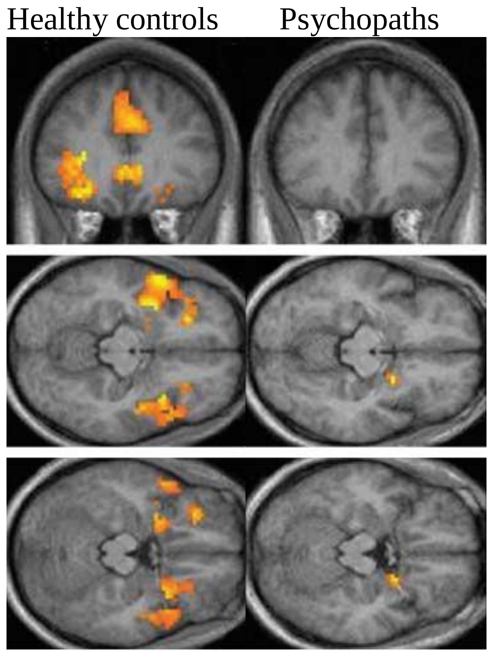

Figure 4.1 - Contrasting images are commonly employed to demonstrate the visual differences between healthy (normal) brains and violent/aggressive brains. In this image, a functional MRI scans is used to demonstrate the activation patterns in areas of the brain associated with affect in healthy controls and psychopaths. Healthy volunteers here showed greater activation (highlighted in orange) in these areas compared to psychopaths during a task to test fear conditioning. The authors concluded that the study helps explain psychopath's lack of emotions and inability to anticipate aversive events. Source: Birbaumer et al. 2005, Archives of General Psychiatry 62:799-805.

This chapter especially takes up the rebuttals of contemporary biocriminologists who have stated that contemporary VAB has allowed for a more objective, sophisticated examination of VAB at the molecular level, thus allowing them to make more correct and compelling arguments than possible for past researchers. These biocriminologists have noted that while on the right track, past attempts at understanding the roots of VAB were limited due to the lack of cutting-edge scientific tools of inquiry and more advanced biomedical knowledges of the body's molecular make-up and function. Similarly to sociologist Richard Moran (in the quote above), I argue that the use of neuroimaging technologies is more than using sophisticated tools to see the brain. Instead, these technologies are expanding the influence of biocriminology, by reinvigorating the continued search for the roots of crime and VAB through neurons and genes. Moreover, following Clarke and colleagues (2003, 2010), I also argue in this chapter that the dependency on these *technoscientific* innovations has done more than expand the jurisdiction of biomedicine; its increasing authority has transformed the possibilities of understanding VAB, health and life-itself. How should we evaluate the claims made by this 'new' biocriminology? How are these contemporary tools employed? How do these technoscientific tools and practices shield contemporary biocriminology of criticism, and the incongruities, prejudices, and challenges that exemplified prior attempts at the production and translation of biocriminological knowledges to the broader society? What new potentials are made possible through these technoscientific practices?

Chapter IV Overview

I first provide a brief review of biomedicalization theory, specifically how contemporary theories of medicalization have been utilized to better understand the current neuroscience and psychology practices and knowledges. I argue that by establishing the relevance and impacts of biomedicalization on neuroscience and psychology, I can further make the case that biomedicalization theory can also be a useful rubric to outline the social implications contemporary biocriminology. I then trace the shift from the medicalization of VAB to the biomedicalization of VAB. I note that this transformation is highlighted by the shift *from biotechnologies used for therapeutic control (medicalization)* to *more innovative technoscientific practices and techniques used to better elucidate molecular factors and processes in hope of advancing future therapies, treatments, and policies for VAB (biomedicalization)*. I argue that contemporary neuroimaging of VAB research is best understood as the *technoscientization of VAB*. The technoscientization of VAB is a product of larger biomedicalization processes.

Anchored by the biomedical promises afforded through neuroimaging technologies, the technoscientization of VAB comprises a hybrid amalgamation of social and biological practices that have reconstituted, extended, and legitimated the continued biomedical search for the 'criminal man.'

Using data from my content analysis of neuroimaging research on VAB, I divide the remainder of the chapter into two broad areas: structural imaging research on VAB and functional imaging research on VAB. Specifically, the section on structural imaging looks at VAB studies that have used MRI technologies to explore brain morphologies that may underlie VAB. Here, I note that MRI technologies, in conjunction with updated psychometric scales of VAB, have extended a notion of VAB that relies on the idea that 'smaller brains equal damaged brains.' Far from the only tools used in neuroscientific studies, I argue that the realities of the technoscientization of VAB are best realized through elucidating the abilities and promises of these imaging technologies, and in particular by charting the standard practices of combining these technologies with an array of neuropsychology tools, classifications, and standards in research on VAB. These sections further elaborate the conversations from chapter three regarding the definitions of VAB by exploring specific brain structures and networks that are mapped upon biomedical understandings of VAB.

In the last section, I highlight the assumptions and uncertainties embedded within imaging practices of VAB. The potentials of brain research on VAB have been dramatically transformed with the use of functional imaging technologies, and especially fMRI technologies. For VAB research, the combination of greater access to functional imaging technologies, more user-friendly computational software, and sophisticated neuropsychological tasks have led to an increased focus on the brain and VAB, ostensibly empowering researchers to make more exact correlations between brain dysfunction (reduced or increased brain activity in comparison to normal controls) and VAB at more precise and infinitesimal levels than ever before possible in biocriminology. In addition, this section also attends to the ways biomedicalization of VAB has transformed biocriminology beyond the inclusion of behaviors socially constructed as criminal, violent or aggressive. The technoscientization of VAB has steadily allowed biocriminologists to consider how VAB is located within the roots of everyday normal cognitions and behaviors. Thus, these developments have led to a much greater focus in contemporary biocriminology on the neuro-determinates of *all* behaviors now made discoverable through the images of normal brains.

Throughout this chapter, I stress that the technoscientization of VAB is highly malleable, and made possible in part through the ability of its practices and biotechnologies to simultaneously be utilized to reinforce the theoretical warrant for specific VAB questions (Duster 2006a). Therefore, increasing use of these biotechnologies in VAB research helps expand new possibilities between biology and behavior. In combination with other biotechnologies and technoscientific practices of VAB, neuroimaging research helps reconstitute older and delineate newer biomarkers of VAB. As a result, the knowledges produced can be applied to and *co-produced* through specific institutional domains (Jasanoff 2005), as well as specific bodies, identities and biomedical practices (Burri and Dumit 2007; Clarke et al. 2003, 2010; Rose 2007). In all, by focusing on how contemporary VAB neurobiological research has correlated brain processes, networks, and structures with VAB, I can better delineate how the technoscientization of VAB operates as a product of discursive *social* practices, knowledges and negotiations

FROM MEDICALIZATION TO BIOMEDICALIZATION OF VAB

The processes of (bio)medicalization have been taken up in contemporary scholarship on the current applications of psychiatry and neuroscience. In particular, and similar to Clarke and co-authors (2003, 2010), recent examinations of psychiatry and neuroscience have pointed to the intricately embedded social character of medicalization theory and the shifting ‘conditions of possibility’ actively being made and realized in biomedicine and society through a growing dependence of genetic and neuroscientific biotechnologies.[1] For example, sociologist Martyn Pickersgill (2012b:329) noted that psychiatry is best understood as a “complex socio-technical praxis,” in which processes that structure our understandings and engagements with ideas of personality and behavior operate in an ever more multidirectional manner, increasingly co-produced through biomedical technologies, practices, and the production of new forms of sociality (see also Rabinow 1992). Pickersgill (2012b:336) was concerned here with evaluating the appropriateness of using medicalization as a rubric to understand psychiatry today.

> Medicalization does not take place along a singular, linear trajectory. Rather, it might be better understood as a set of processes enabled by and co-produced through the interactions between a heterogeneous assemblage of standards, clinical practice, scientific research and patient activism. Debate about how appropriate it is to consider a phenomena or entity as part of a medical rubric thus necessarily entails asking questions about the relationships between medicine, science and society.

Similarly, others have utilized (bio)medicalization to better evaluate the relationships forged between the brain, psyche, and social behavior through the growing merger between neuroscience and psychology. In an article on biomedicalization and neuroscience, Simon Williams and his colleagues (2012:238 emphases in original) expressed concern how neuroscientific knowledges have increasingly challenged and made possible new ways of understanding the pathological *and* the normal:

> [The neurosciences] both reflect and reinforce the shift towards more *biological* understandings of mental life and social behavior in general and mental illness,

> abnormality or pathology in particularly…[moreover,] normal brains as they are becoming collectively categorized and more elaborately imaged, are assumed to represent normal minds and persons, as increasingly more human attributes become folded into neurocognitive spaces. To the extent that these developments in neuroscience constitute a significant part of contemporary transformations in bioscience and biomedical power lends further support to the foregoing arguments regarding the historical transition from medicalization to *bio*medicalization.

These reflections highlight the social character of biomedicalization, and identify these practices and negotiations as key paths through which biomedical innovations make possible new ways to think about, categorize, and transform notions of well-being via the management of healthy brains (see also Rose and Abi-Rached 2013).

At the intersection of the biomedicalization of neuroscience and psychology lies neuroimaging. Which serves as the 'visual imaginary' (Rose and Abi-Rached 2013:12), the key producer of neuroscientific knowledges and champion of the biomedical promise afforded to the brain-sciences. Through making visual knowledges, such as images demonstrating neuronal function or grey matter integrity, neuroimaging and the knowledges produced through it operate as symbolic emblems of the power, allure and possibilities of the brain (Joyce 2008). As I will demonstrate through the rest of this chapter, neuroimaging research has also had dramatic effects on the rise of biological based criminology in the last 20 years. However, in order to better situate the factors of biomedicalization of neuroscience on psychology in general, and specifically to their impacts on study of crime and VAB, I next outline the merger between neuroscience and psychology, i.e. *neuropsychology*, which directly impacted the rise of neuroimaging in the mid-1980s.

Neuropsychology and the Emergence of Imaging Technologies of the Brain

The term neuropsychology—also commonly referred to as cognitive neuroscience and cognitive neuropsychology—was coined by psychologists Michael Gazzaniga and George Miller

(Gazzaniga 2010). While, the birth of neuropsychology in the mid-1980s owes much of its development to imaging biotechnologies, the current popularity and allure of brain imaging is a result of the continued alliance between the neurosciences and psychology. This merger led to much increased use of neuroscientific technologies by psychologist to explore a growing number social phenomena, problems and behaviors (Dalgleish et al. 2009; Farah 2013; Feinberg and Farah 2003; Gazzaniga 2010; Kosslyn and Shin 1992; Raichle 1998, 2003). Recently, Gazzaniga (2010:3, emphases mine) commented on this fusion:

> As the two fields of neuroscience and cognitive science were coming together, a major event occurred. *Human brain imaging suddenly appeared on the scene, and with it, the ability to study the human brain in-action*. *Everything from basic issues in perception to higher order mental activities, were fair game for study*. It wasn't only a question of observing brain areas activated under specific cognitive conditions. It was revealing which systems are involved in particular mental activities, such as mental imagery. Years of debate ensued on whether visual images in the mind relying on the actual brain systems known to be essential for vision could now be studied and resolved.

Gazzaniga's statements on the merger of neuroscience and psychology underlined hopes to resolve the mysteries of the mind via the brain. For Gazzaniga and other psychologists, these technologies held the promise to do more than just reveal the brain 'at work,' they would provide a conduit to demonstrate 'visually,' and hence with greater certainty, the biological underpinnings of the psyche. Therefore, these statements also embodied the excitement surrounding these new tools for brain mapping—the process of visually investigating and the relationships between the structure and function of the brain—and also reflected the myriad 'conditions of possibility' that arose with in the psych-sciences as "everything from basic issues in perception to higher order mental activities [became] fair game for study" (Gazzaniga 2010:3). Overall, these developments in the psych-sciences align well with the early shifts from medicalization to biomedicalization eras in medicine (Clarke et al. 2003, 2010), in particular neuroimaging technologies became a means through which new forms of health, illness and disease, as well as the possibilities of, could be made real.

Neuroscientific research benefited immensely from increased *computerization* and *mathematization*[2] in the latter half of the twentieth century (Beaulieu 2002, Prasad 2005). Such techniques have enhanced the statistical analysis power of the correlations between, and sophisticated techniques to better outline and identify smaller and more specific brain regions of study (see Figure 4.2). The technoscientization of psych-sciences is best illustrated by the advent of fMRI technologies have powered the expansive application of neuropsychological approaches to social problems and biomedical phenomena through functional imaging of the *brain in-action* (Dumit 2004; Joyce 2012; Rose and Abi-Rached 2013). As captured by University of Pennsylvania neurologist Geoffrey Aguirre (2014:S16-S17):

> The marked variability of research quality in neuroimaging may be attributed to the manner in which neuroimaging techniques have spread within and between academic disciplines. Before the advent of fMRI, PET scanning was the primary means of obtaining images of brain activity. PET scanners are specialized medical devices, requiring a cyclotron and the injection of radioisotopes, which greatly limited the availability of the technology. The development of fMRI, however, radically altered this situation. MRI scanners are nearly ubiquitous in modern hospitals, and while some equipment upgrades improve the quality of the data, even a standard, clinical MRI machine may be used for neuroimaging studies. This produced a rapid and revolutionary democratization of neuroimaging research….As it happens, the ubiquity of MRI scanners intersected with the availability of free, open-source software capable of performing these analyses…This software placed complicated data analysis and statistical methods behind an easy to use graphical interface…Consequently, little more than research access to a hospital and an internet connection was needed to perform neuroimaging experiments and produce pictures of the brain in operation.

Aguirre's description provides and even greater understanding of the biomedicalization practices that underpinned the emergence of neuropsychology. As important as the development of imaging biotechnologies were for the discipline's authority to address new domains of questions concerning the mind and behavior, access to such developments was only possible through the 'democratization of neuroimaging.' This process helped materialize the discipline's theoretical desires and practice needs through two key technoscientific components: *access to imaging technologies*, both new and modified imaging modalities, especially at academic institutions with hospitals in which imaging technologies were readily available; and through the *availability of more user-friendly computational software* for analysis allowing more sophisticated technology to better delineate the structure of the brain and better calculate correlations between observed brain structure or function and mental traits.

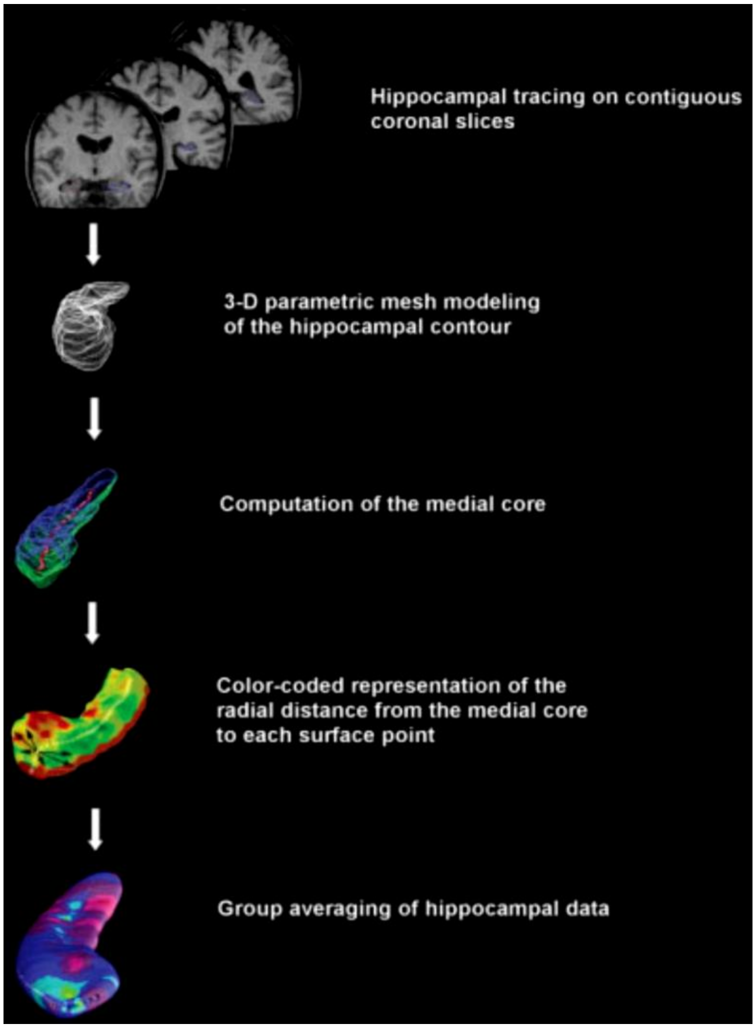

Figure 4.2 - Example of imaging processing procedures utilized to better map and highlight brain differences visually, but also to better represent statistical differences and significance between groups. Source: Boccardi et al. 2010. *Human Brain Mapping* 31:438-447.

These technoscientific opportunities enabled new biomedical promises which neuropsychologists, and soon after biocriminologist, eagerly navigated towards as a means to revisit and hopefully put to rest, longstanding theoretical questions concerning the relationship between biology, behavior and the mind. However, what neuropsychology viewed with excitement, others saw as problematic. This merger between neurosciences and psych-sciences refueled longstanding ontological questions about operationalization of the 'mind/brain problem' and localization theory (e.g., Star 1989), and enduring concerns about biologically-based research on behaviors and their linage to pseudoscientific endeavors like phrenology. Moreover, it also initiated fresh concerns about discursive bioscientific practices and accompanying technologies used for inquiry or the 'right tools for the job' (Clark and Fujimura 1992), and more recent questions about the discursive developments of new *neuro*-endeavors, such as neuro-economics, neuro-marketing and of course neuro-law (Dumit 2004; Pickersgill and van Keulen 2012; Rose and Abi-Rached 2013; Vrecko 2010b).

Charting the Biomedicalization of VAB research

By the mid-1980s the translational possibilities for neuroimaging technologies in psychiatry underpinned the biomedicalization of VAB. The 1970s and early 1980s were characterized by ethical debates concerning the use of psychosurgeries advocated by neurologist and psychiatrists as safe therapeutic methods to control and/or modify the behavior of mentally ill violent patients and criminal offenders (Moran 1992; Nelkin and Swazey 1981; Valenstein 1980). However, by the late 1980s and early 1990s, researchers concerned with the relationship between VAB and the brain gradually begin to shift their focus away from psychosurgeries, and the emphasis on behavioral modifying biomedicine was tabled as emergent imaging technologies opened up new alternatives for biocriminology.

While practices of medicalization still exist and are continually practiced and reinforced in neuroscientific and psychology VAB research (Pickersgill 2012b), these processes are embedded within the larger transformation of biomedicine that is dependent upon newer biotechnologies which, since the mid-1980s, have continued to altered the nature and possibilities of behavioral research. Therefore the shift from medicalization of VAB to the biomedicalization of VAB was dependent on: 1) the broader trend of increasing biomedicalization of mental health and behaviors; 2) the rise of neuropsychology as a discipline; and 3) technoscientific developments that where marketed as non-invasive tools that could be used for the excavation of the brain's workings and structure. All of these components were vital to the shift to biomedicalization, and all have helped created the conditions of possibility for what I call the *technoscientization of VAB.*

In this chapter, I utilize Clarke and colleagues' (2003, 2010) central processes of *technoscientization* as a template to help describe the shift from medicalization to biomedicalization of VAB biocriminology. This transformation is manifest most distinctly in the shifts away from *technologies for therapeutic control and modification* (e.g. psychosurgeries to exert "control over" mental processes) toward the *technoscientization of VAB* through neuroimaging and genetic research modalities that focus more heavily on elucidating localized neural risks for VAB. While the technoscientization of VAB does not completely eliminate ambitions for behavioral therapy, instead it holds on to the promise that the knowledges produced through this era will serve as key components *in the future creation* of behavioral therapies and pharmaceutical treatments for VAB (Pickersgill 2009; Rose 2007; Rose and Abi-Rached 2013), in the "transformation of" the problem itself. Therefore, contemporary biocriminology—specifically neurobiological criminology—has not dismissed the possibilities of treating and/or curing biological causes of VAB. But since the late 1980s, it has reconsidered the use of biotechnologies, and placed more emphasis on utilizing these technoscientific innovations to elucidate the neurobiological determinates of VAB, rather than as therapeutic solutions for VAB.

In biocriminology, technoscientific innovations in combination with other neuropsychological processes and biomedical practices, help bind knowledges of the brain to both theoretical and social understandings of violence and mental illness, creating new subjectivities and transforming criminal and violent identities by mapping neurologic differences and psychological inabilities onto specific deviant bodies and groups. However, the technoscientization of VAB, as a hybrid production of the larger biomedicalization of neuroscience *and* psychology, is much more than the study of dysfunctional brains. As Williams and colleagues (2012:238) noted in the above passage, "normal brains as they are becoming collectively categorized and more elaborately imaged, are assumed to represent normal minds and persons, as increasingly more human attributes become folded into neurocognitive spaces."

These transformations of normal brains through neuroimaging are also key processes of biomedicalization, helping to both legitimate and grow the use neuroimaging research. These possibilities speak to what Clarke and co-authors (2010:81; 2003) termed the shift from *normalization to customization.* As mentioned in chapter three, the use of neuroimaging combined with more sophisticated neuropsychological testing and genetic technologies (i.e., risk factors), has led to the formalization and use of normal populations in studies of VAB. This growing reliance on understanding the pathological through the normal underscores the shift away from medicalization and therapeutic treatments for VAB, toward technoscientific remaking and regulation of VAB knowledges, identities, and bodies most often through the language of *risk*.

Below, I more fully describe this concept of the technoscientization of VAB. Overall, I am arguing that the shift from the medicalization of VAB to the *technoscientization of VAB* is realized as a an assemblage of: enduring ontological and epistemological knowledge claims about the relationship between biology and violence; contemporary biomedical practices and psychological testing, including the ongoing merger with genetics technologies; classification and standards that shape and reinforce biomedical identities of crime and mental-illness; and the epistemic flows, and translational potentialities, of VAB knowledges produced through these techniques, which includes the malleability of their use in, and especially the transformation of, other social discourses, practices and knowledges.

TECHNOSCIENTIZATION OF VAB: BRAIN STRUCTURE AND FUNCTION

Neuroimaging as One Tool in the Neuroscience Toolbox"

Anthropologist Joseph Dumit (2004:177 emphasis mine), has noted that "PET researchers have often pointed to phrenology as a key historical period *when the right questions were being asked, with the wrong technologies*." Speaking on the relationship between science and the construction of the 'right' technologies for inquiry, sociologists Adele Clarke and Joan Fujimura (1992) have argued that science is both structured and enabled by what they termed "*the right tools for the job*," which must be specifically calibrated for "goodness of fit." Following the scholarship of these researchers, I ask: how do we assess the social impacts of the relationship between neuroimaging and VAB? In what ways, and for what jobs, is neuroimaging 'right' for VAB research? How are neuroimaging technologies used to help articulate and realize specific questions about VAB? And in turn, how do enduring biological knowledges and approaches to VAB help influence and construct the development and specific uses of these modern technoscientific tools?

References to the 'right technologies' are commonly espoused in biocriminology to underscore the symbolic promises of current biotechnologies. Contemporary biocriminologists have noted that the biotechnological advancements in genetics and neuroscience are vital tools that can be used 1) to correct past misunderstandings of the relationship between biology and VAB, and 2) to exceed the barriers of previous biotechnological limits to understand the biological underpinnings of VAB. The promise of advanced biocriminological technologies reflected by neuro-criminologist Adrian Raine (1997) in a speech honoring the work of Hans Eysenck. Raine suggested that Eysenck would have further advanced his theory,[3] and benefited biocriminology even more if he was privileged to use the technoscientific tools that are now available for research. Raine (1997:137-8) stated:

> Eysenck was decades ahead of his time in suggesting a biosocial approach to crime, for it is only now that this approach is beginning to be embraced by a wider scientific community… If Eysenck was starting his career again in 1997, what would his blueprint be for tackling the growing problem of crime and violence in society?...One suspects there may be both a theoretical and methodological shift in his approach. In terms of methodology, he might argue for a molecular genetic approach to furthering our understanding of the basic biological, temperamental, and personality predispositions to crime…[Moreover], the recent technical advances brought about by brain imaging would certainly result in suggestions about using functional magnetic resonance imaging (fMRI) to assess arousal and conditionability more directly. The increase in our knowledge of brain functioning might have led Eysenck to speculate more on dysfunction to specific brain mechanisms which may underlie deficits in arousal, conditioning, and emotion regulation, and the neural networks that subserve antisocial and aggressive behavior.

Raine's comments suggest a "natural" progression of Eysenck's research on crime, as well as biocriminology, one that seemingly would have *certainly* benefited from and embraced the genetic and neuroimaging technologies of the 1990s. Do all technological developments, and uses "naturally" produce greater understandings of the phenomena at question? The potential of the biotechnologies of VAB is seen by biocriminologists as: a way to advance the research by elucidating a more direct, clearer and complete understanding of VAB, thus increasing the research possibilities for biomedical and pharmaceutical VAB treatments and therapies in the future; and as a way to provide proof, or rationalize, the continued study of biological underpinnings of VAB by demonstrating the inevitable progress of biological research on VAB.

Other biocriminologists have also echoed similar aspirations about the technological advances in contemporary neuroscientific tools and their use for VAB research. However, while agreeing that such advancements hold the greatest promise for the best understanding and most effective treatments for VAB, they have also expressed concerns about placing too much emphasis on neuroimaging technologies. As sociologist Martyn Pickersgill (2012b:339) explained, “the interaction of biological and other styles of thought has long been apparent within psychiatry: neurologic conceptions of psychopathology are thus perhaps more likely to sit side-by-side with other interpretative frameworks than they are to fully supplant them.” The neuroscientists I talked with echoed this statement, stressing that the neuroscientific technologies represent an array of techniques and practices, and are *much* more than just neuroimaging.

Dr. Holmes (10/04/13), a neuroscientist I interviewed, cautioned me after I read the purpose of the dissertation project to him, that “one thing I want to emphasize at the get-go is that *neuroimaging is just one tool in the toolbox of neuroscience, and still quite a young and crude tool*, so I wouldn't put too much emphasis on [it].” Similarly, the claim that neuroimaging is just one of many “tools in the neuroscience toolbox” was also made by Dr. Lewis (11/07/12), another researcher who uses MRI technologies to study psychopathy. Dr. Lewis elaborated even further the complex relationship between the power of using a collaborative set of neuroimaging technologies and the promises and allure they hold in relation to future treatments for VAB. He stated:

> All behavior comes from the brain. And what we understand, then, is the brain scanners can take pictures and help indicate how individuals who have that trait are different from individuals who don't have that trait. [Whether the trait] shows up as, you know, as a difference in the self-report scale, or differences in the neuropsychological test, or differences in the brain image, *I think they're all about the same. The only question is if the brain image gives us a slightly more intuitive kind of understanding of where, when and how, you know, [an individual] might have developed that abnormality*. And it's

> based on that information that we can try to develop better treatments for individuals with those impulsive problems. [Dr. Holmes, 11-07-2012]

These statements are important because they provide a clearer picture of the practices of neuroscience, and how neuroimaging and other techniques become fashioned into the 'right tools' for VAB research. Moreover, the power of the neuroimaging from the view of the neuroscientists who study VAB seems to be downplayed here, that is while imaging is held as a way to 'see' or 'take' pictures of the brain, its true interpretive or promissory value is best achieved when it is utilized with other biotechnologies (such as genetic testing) and/or with psychological theories, test, standards and classifications. Therefore, to assess the true impacts of neuroimaging VAB research we must pay close attention to how other biotechnologies and practices are articulated with neuroimaging in the construction and production of VAB knowledges. This point will be clearer as I describe the overall arc of neuroimaging research on VAB in the section below.

As vital components of the technoscientization of VAB, imaging technologies in neuropsychiatry research on VAB are structured and utilized to produce more 'appropriate' ways of seeing and understanding the brain as the basis of *all* behavior. Through these imaginaries, violent, aggressive and criminal thoughts and actions are understood to be *products of the brain*, and such behaviors are deemed to be *regulated* by the brain. As products of the brain, neuro-knowledges of VAB are reconstituted as functional neuro-biomarkers, representing correlations between neuronal function and/or brain anatomy identified VAB risk factors. On the other hand, the brain is also seen as the most important site of understanding VAB because it is considered the gatekeeper for *all* behavior. As such, the technoscientization of VAB helps to construct the use and value specific neuro-knowledges as more complete, and appropriate means for elucidating the causes of VAB, and helps to reinforce the view of VAB as a product of an individual's (in)ability to self-regulate or control their body within society. For the remainder of this chapter I will focus on two broad areas1) structural imaging modalities, in which I concentrate on MRI technologies used in VAB research, and 2) functional imaging techniques in which I focus mainly on fMRI technologies used in VAB studies. Each section first offers a general description of the overall use of the specific imaging approach to VAB and then focuses on key findings from the content analysis data.

Technoscientization of VAB via Structural Imaging

Structural imaging can be accomplished using a few different imaging techniques including: CT, MRI and DTI technologies.[4] From the content analysis findings, 33 of the 89 or 37% of studies reviewed used structural imaging,[5] and most structural imaging research on VAB used MRI technologies (29/33 or 88% of studies). MRI techniques have been utilized in neuropsychiatric research since the 1990s, most often as a secondary imaging technology for PET studies. In VAB research, this early function of MRIs was limited to helping better determine and outline regions of interest (ROI) to enhance analysis of functional data from PET, and/or to detect any brain lesions—abnormal or damaged brain areas—for inclusionary purposes for participant populations (e.g. Seidenwurm et al.1997).

By the early 2000s, MRI technologies began to be more widely used in VAB research, and today MRIs are the most frequently used structural imaging technique in neuropsychological research on violence/aggression. The purpose of using structural imaging in VAB research is to help identify 'abnormal' brain volume or morphology in targeted populations defined as violent, criminal, or mentally-ill. For example, imaging studies of psychopaths have focused especially on the brain's amygdalae located in the limbic system because it is thought to a play role in regulating emotions (Blair 2003, 2007). Similarly, studies on ASPD populations have been most often focused on abnormalities in the prefrontal cortex (PFC) and temporal lobe regions, because they have been suggested as important for decision-making and impulse control, as well as having a regulatory role in emotional responses (Brower and Price 2001; Patrick and Verona 2007; Yang, Glenn, and Raine 2008).

Specifically, the use of MRI scans in VAB research has concentrated on better elucidating differences in targeted populations, commonly characterized by structural *abnormalities* in key areas of the brain. These identified ROIs have been designated as important for VAB because they have been linked to 1) the executive cognitive control over one's bodily functions and decision-making (i.e., impulse control); and/or 2) affect regulation and control over one's emotions (or lack thereof) in relation to behavior (such as empathy or fear). Both are thought to contribute to increasing the likelihood of an individual engaging in risky, aggressive and/or violent behaviors, and/or to represent key traits for VAB related personality disorders (Dolan 2010; Plodowski et al. 2009; Yang et al. 2005; Yang, Glenn, and Raine 2008).

All imaging research on VAB relies on technologies to help delineate *a priori* selected areas of the brain, or ROIs, to better localize and correlate the brain with VAB. ROIs are chosen based on previous literature from neuropsychology and/or previous neuroimaging VAB research, which has identified and/or correlated these areas to specific cognitive functions. For example the amygdala is often preselected as a ROI in studies that are concerned with the regulation of emotions, and most commonly used in VAB studies that concentrate on the relationship between the brain and psychopathy (in adults) or callous-unemotional traits (in youth populations) (Blair 2003, 2007; Jones et al. 2009; Marsh et al. 2008). The amygdala holds promise for psychopathy research because the condition is commonly characterized by emotional detachment, lack of empathy, and callousness (Anderson and Kiehl 2012; Blair 2003, 2009). The size, shape and volume of the amygdala is often the focus of MRI studies of VAB. Abnormalities of the amygdala are said to characterize certain groups, such as adults with psychopathy and children with callous-unemotional traits (Blair 2007, 2009; Huebner et al. 2008), and/or indicate increased risk for VAB (Antonucci et al. 2006; Matthies et al. 2012)

Using results from my content analysis, I categorized MRI research on VAB into two main strands.[6] I will first discuss historical underpinnings that ground much of the research on neuroscience and cognition and continue to contribute to assumptions about the brain, VAB, and cognition generated today. This discussion will lead into a description of the general findings from MRI research on VAB, which often focused on specific structural brain differences between groups. Second, I will describe MRI studies that have also integrated psychometric scores into the analysis of their imaging data. In these MRI studies, specific psychometric behavioral scales and sub-scales were used throughout the imaging procedures, especially during analysis as collaborative technoscientific tools that together could better correlate volumetric brain abnormalities with VAB.

Adrian Raine and colleagues (2000) did one of the earliest MRI studies of VAB to assess whether men diagnosed with antisocial personality disorder (ASPD) had structural brain deficits that could help explain their disorder. They found that such men had a lower percentage of grey matter in the PFC area of the brain compared to normal controls. Similar findings of volumetric reductions in key ROIs of VAB groups versus control groups have been found in other MRI studies. To fully understand the technoscientific significance of these findings however, I must first trace the discursive development that enabled connections to be made between structural brain abnormalities and VAB. Ultimately, these connections suggest that abnormalities in the brain can be utilized as biomarkers for VAB. But how? How have abnormal brains come to be understood as damaged brains? Moreover, how are damaged brains then correlated with deviant behaviors? To answer these questions, and to better understanding the significance of structural MRI research on VAB, we must start with a brief synopsis of the story of Phineas Gage.

The narratives of Phineas Gage and contemporary imaging research on VAB

Phineas Gage was a railroad worker in the mid-nineteenth century. In the fall of 1848, Gage was working to clear land in Cavendish, Vermont to lay railroad tracks when he was unexpectedly injured by a tamping rod that was sent through the left side of his head and lodged in his skull as a result of a detonation accident. Unknowingly at the time, Gage's work related accident and the ensuing narratives of his life after the event would shape the direction of the brain sciences. The impacts of this narrative included its use as: a justification for the practices of phrenology at the time; to challenge, interestingly, localization theory; and as an exemplar of the biological underpinnings of personality (Becker 2008, 2010; Macmillan 2000; Damasio et al. 1994). Gage survived the accident and "remained as abled-bodied and appeared to be as intelligent as before the accident; he had no impairment of movement or speech; new learning was intact, and neither memory nor intelligence in the conventional sense was affected" (Damasio et al. 1994:1102). However, while there seems to be agreement that Gage lived the rest of his life without any cognitive deficits, there has been considerable debate regarding the narratives of Gage's behavior and personality after the accident (Becker 2008, Kean 2014; Macmillan 2000).

The impact of Gage's life on neuroscience research starts with the stories assembled from his impaired skull, both during his life and particularly after his death when his physician John Harlow exhumed Gage's skull and placed it on display five years after his death.[7] However, it should be noted that Harlow only had direct contact with Gage during the initial examination of following Gage's accident, and there was no autopsy conducted on Gage and his actual brain was never examined after death (Becker 2008; Macmillan 2000). Still, it was Harlow's (1868) published secondhand accounts of Gage—twenty years after the incident—that popularized a new vision of Gage that placed a heavy emphasis on changes in his personality and behavior. According to Harlow (1868:277):

> [Gage's] contractors, who regarded him as the most efficient and capable foreman in their employ previous to his injury, considered the change in his mind so marked that they could not give him his place again. The equilibrium or balance so to speak, between his intellectual faculties and animal propensities, seems to have been destroyed. He is fitful, irreverent, indulging at time in the grossest profanity (which was not previous his custom), manifesting but little deference for his fellows, impatient of restraint or advice when it conflicts with his desires, at time pertinaciously obstante, yet capricious and vacillating, devising many plans of future operation, which are no sooner arranged than they are abandoned in turn for others appearing more feasible. A child in his intellectual capacity and manifestations, he has the animal passions of a strong man…his mind was so radically changed, so decidedly that his friends and acquaintances said he was 'no longer Gage'.

This narrative contributed to a new understanding of the associations between brain lesions and personality changes, and today it is commonly cited in psychological and neuroscience literature when referring to relations among the brain, mental processing, and behavioral proclivities (Becker 2008, Macmillan 2000). Contemporary neuroscience and psychology teachings and undergraduate textbooks offer a similar story of Gage's life, also describing him as a very well-mannered man who, after his unfortunate incident with a tampering rod, was unable to make well-informed decisions and began to exhibit characteristics of impulsive and/or abnormal behavior (Damasio et al. 1994; Fishbein 2000; Kiehl 2014; Kilhlstrom 2010; Raine 2013; Wagard and Thagard 2004). Ultimately, this narrative operates as a *neuro-biographical artifact*. I use this term to represent the way the Gage narrative has been co-produced through both scientific and popular discourses on the brain and behavior; sustained as a social practice, reassembling and reconstituting a view of Gage's behavior and mind through ever more technoscientific biomedical lens that seemingly erases the ambiguities of this story and stabilizes it for use; and relied on as a foundation of scientific knowledge, the basis through which a malleable neuropsychological platform can enable continued examination and growth of research on the brain as the origin of all behavior.

Recently, biomedical interpretations of Gage's personality changes after the incident have been contested by contemporary historians and social scientists who have noted that the evidence of Gage exhibiting impulsive behavior, childlike intelligence and/or aggressive traits is very limited (Becker 2008, 2010; Kean 2014; Macmillan 2000). In fact, this scholarship has argued that there is actually very little known or recorded about Gage's behavior after the incident, even though there are records of him living abroad in Chile and working as a sideshow exhibition for P.T. Barnum's museum in New York—holding the tamping iron that pierced his skull and even reenacting the trajectory of the rod with an extra skull (see Figure 4.3) (Becker 2008; Macmillan 2000). Instead, the reliable evidence that his damaged brain played a role in altering his behavior has been his exhumed skull and the rehashed accounts of his behavior that started with physician John Harlow.

Figure 4.3 – A daguerreotype of Phineas Gage holding the tamping rod that pierced his skull.[8]

Harlow's (1868) narrative of Gage has survived in neuroscience as a vital *neuro-biographical artifact* partly because its utility has been less about the story of Gage, and more about its utility in the brain-sciences (Becker 2008), legitimatizing the continuation of neuroscientific inquiry into the relationship among the brain, psyche and behavior, and justifying discourses of the brain as the basis of all behaviors. As stated by historian Peter Becker (2008:277, emphases mine):

> Narratives about Gage…are about a specific vision of the brain and the ways in which it defined the parameters for individual behavior. The case of Phineas Gage features in them only as a passing point of reference – a reference which is sufficiently well known to be enlisted as support. Reducing complex stories to a naked grid of references, which can easily circulate and be allied with other references to build new stories – this is the *narrative strategy of neuroscientific arguments*. It is the obvious consequence of the redefinition of the subject into a neurochemical self. By simply reducing social and cultural factors to the environment of the brain, neurophysiological processes of

> neuroanatomical features can be singled out and linked to behavioral patterns without paying any more attention to the wider context.

The ability to reduce Gage's narrative to brains, behavior, and mental abilities is a key feature of this neuro-biographical artifact that allows it to be malleable over time, yet still play a key in buttressing cognitive neuropsychological research on the behavior. While some neuroscientists have acknowledged the questions raised regarding the complexities surrounding the Gage story, their concerns differ from those of historians and social scientists, and instead are concentrated on debates concerning the positioning of the tamping rod in Gage's brain (e.g., Damasio et al. 1994; Ratiu et al. 2004; Van Horn et al. 2012; Wagard and Thagard 2004). Few neuroscientists have questioned the more discursive impacts of this neuro-biographical artifact on knowledges or technoscientific practices of contemporary neuroscience or neuropsychology.

Gage's story has played a key role in cognitive neuroscience. In fact, there is even a neuro-computational computer model, aptly named GAGE— in honor of Phineas Gage and his importance to neuroscience and psychology. This model is designed to help calculate how the brain produces cognitive-affective processing in the prefrontal cortex, the same areas where Gage's injuries are said to have occurred (Wagard and Thagard 2004). Moreover, contemporary neuroimaging technologies have been used to help digitally reconstruct a visual representation of Gage's brain damage (Figure 4.4).

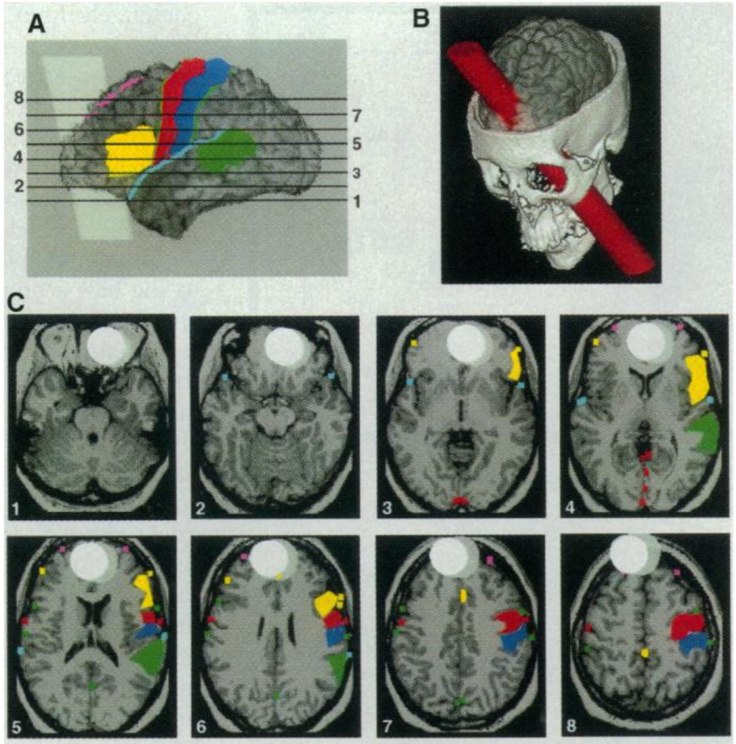

Figure 4.4 - The reconstruction of Phineas Gage's Brain using neuroimaging tools. B. shows a computerized simulation of the likely path of the tamping iron in Gage's skull. C shows axial MRI images of the reconstructed brain of Gage. Source: Damasio et al. 1994 *Science* 264(5162): 1102-1105.

In 1994, a team of neuroscientists led by Hanna Damasio and her husband Antonio Damasio, used Gage's skull and modern neuroimaging and computer techniques to construct an ideal model of Gage's brain. They argued that Gage's injuries resembled modern day lesions of the prefrontal cortex. They further asserted that the observed 'neuroanatomical pattern' could be responsible for Gage's behavioral changes because these same brain regions were correlated with abnormal decision-making and behavior in contemporary patients. On the other hand, at least two other research groups have also attempted to reconstruct Gage's accident, and have disputed the findings from Damasio's group. These two studies, one by Peter Ratiu and colleagues (2004) and the other by Jack Van Horn and co-authors (2012), used more sophisticated computerization techniques in conjunction with CT imaging and DTI imaging technology respectively. While neither group disputed the possibility that the sustained lesions could lead to the behavioral changes said to be exhibited by Gage, both argued that the reconstructed positioning of the rod in Gage's brain reported by the Damasio group was not accurate. These studies helped reinforce and make useful a new vision of Gage's story that was functional for both neuroscience and psychology. Through these technoscientific practices they attempted to resurrect a viable example of the corporal realties and possibilities of the mind via the brain. The technoscientific transformation of Gage's narrative as a neuro-biographical artifact temporally stitched together a discursive view of the past and present and, through computerization, it made material a new neurobiological image and interpretation of Gage's damaged brain. Therefore, one key element of the technoscientization process is its ability to bind together social-cultural and scientific infrastructures, and simultaneously work upon past discourses, present materialities, and future biomedical promises.[9]

Structural MRI imaging: 'smaller' brains as damaged brains

This brings us back to the question of MRI technologies today. What is the impact of Gage's narrative on the direction of neuroimaging research, and in particular neuroimaging VAB research? This question can be approached in two parts, both of which emphasize the importance of the technoscientization of biomedical and VAB research. First, Gage's narrative actively reinforces the epistemological foundations of contemporary neurobiological research of VAB (Becker 2008, 2011), particularly that VAB is caused by a damaged brain. In his recent book *The Psychopath Whisperer*, neuroscientist Kent Kiehl (2014:170 emphasis in original) described the importance of Gage's accident on the neuroscience of VAB in this way:

> Gage was transformed by [his] accident from a responsible railroad manager and husband to an impulsive, irresponsible, promiscuous apathetic individual. Many of Gage's symptoms are consistent with those classically associated with

> psychopathy…Neurologists originally named the condition Gage suffered from *pseudopsychopathy*, but it was subsequently called *acquired sociopathic personality*. In other words, if you damage a part of the paralimbic system you can acquire a psychopathy personality.[10]

Here, instead of retelling the narrative of Gage through technoscientific visualization, we see a translation of Harlow's (1868) descriptions of Gage's behavior into a more contemporary and useful rhetoric that ultimately created greater possibilities, and strengthen support for, research on the brain and VAB through neuroimaging technologies. The description of Phineas Gage's behavior post-accident given by Harlow, as impulsive, irrational, childlike, even animalistic, was reinterpreted here through criminology. Biocriminological interpretations filtered Gage's supposed behavioral descriptions through the lens of the DSM and psychopathy. The new narrative of Gage understood his impulsive behavior as a risk factor for psychopathy, and further reframed his underlying brain damage as a biomarker for psychopathic behavior. Therefore, this description of Gage as a normal law-abiding citizen turned psychopath via a brain lesion, became a useful discourse in support of neuroimaging VAB research (Becker 2008, 2010).

Secondly, the Gage story also played a role in transforming contemporary research on brain lesions and behavior. In early neurobiological VAB research, such as the CT research presented during the Hinckley trial, the search for lesions in the brain involved a qualitative comparison of brain regions between targeted and control groups. In these early imaging techniques, trained specialist had to first manually delineate specific ROIs by hand, and then carefully check the morphology of these suspected areas for abnormalities by eye to 'find' differences between study groups, a process that contemporary neuroscientist have described as both subjective and error-prone (Kempf and Meyers-Lindenberg 2006). As mentioned in chapter one, VAB research using CT scans often yielded ambiguous findings, although this was attributed more to the technologies lack of prowess than mistakes from trained researchers.

Nevertheless, CT scans were replaced by PET scans during the 1990s, leading to an exponential increased in VAB research using the newer imaging technology (Raine 1993). However, the primary function of PET scans is to measure functional activity; therefore, while PET research certainly expanded the focus on neuroscience of VAB, the shift left open many question concerning the structural makeup of the brain and its relation to VAB. This was until 2000, when Raine's group used MR structural imaging techniques for the first time to examine structural brain abnormalities in VAB defined groups.

There was a key difference between the early structural imaging studies and those that were being produced through MRIs. These differences included the ability of computational analysis software to discretely discern more precise and smaller ROIs, and the ability of MRI technologies to better detect very minute difference or abnormalities in the brain's volume and shape that were nearly impossible to do by the naked eye alone (Kempf and Meyers-Lindenberg 2006). Based on the contemporary lesion studies and narratives of Gage, Raine and colleagues (2000) postulated that antisocial behavioral groups who do not have any discernable brain trauma may still exhibit *subtle* brain differences that may help explain their violent, antisocial, or criminal behaviors. Therefore, while brain trauma like Gage's was certainly still seen as a possible risk factor for VAB, they noted that subtle deficits in grey matter volumes of their study population "may underlie the low arousal, poor fear conditioning, lack of conscience, and decision-making" (Raine et al. 2000:119). All of these descriptors are common characteristics in the DSM of ASPD and/or psychopathy. In their conclusion, Raine and colleagues (2000:125 emphases added) provided the following description of the significance of this research:

> To our knowledge, this study establishes for the first time *the existence of a subtle structural deficit in the prefrontal cortex* of un-institutionalized antisocial, violent persons with psychopathic-like behavior who live in community settings, and represents the first MRI findings on ASPD. It also extends previous neurological research that has

> observed pseudopsychopathic behavior in patients with neurological disorders with observable lesions affecting both gray and white matter by *showing that a much less observable volume reduction specific to prefrontal gray matter is associated with APD* in this community sample. The APD group had an 11.0% reduction in prefrontal gray matter compared with the control group, a 13.9% reduction compared with the substance-dependent group, and a 14.0% reduction compared with the psychiatric control group… *while these effect sizes are thought to be large, this deficit is visually imperceptible at a clinical radiological level*.

In this case, we see the technoscientization of VAB accomplished through MRI technologies. By using MRI technologies, which boast greater resolution power than previous structural imaging methods (i.e. CT scans). Raine's group was able to both extend and transform neurobiological knowledges of the relationships between brain deficits and VAB.

The *neuro-biographical artifact* capturing the life of Phineas Gage now lives on through a new molecularized version. We are reminded of this artifact here in relation to the question of brain damage. What constitutes brain damage, and how severe does such damage need to be to cause VAB? In this case, this *artifact* has enabled neuroscientific knowledges on the relationship between abnormal behavior and lesions to be operationalized through MRIs and utilized as a way to explain VAB in groups that do not present evident structural brain abnormalities or damage. Through a focus on greater molecularization, MRI research on VAB has enabled researchers to transform knowledge-making practices and procedures, seemingly enabling them to discern and measure brain differences between VAB target groups and control populations at microscopic levels. At this reductionist level, the materiality of VAB as a product of biology becomes even more realized and less mysterious (Rose and Abi-Rached 2013:9-11). VAB is now understood through smaller units of analysis, its corporal realities are mapped upon contemporary scales, measures, and definitions of VAB, and ultimately the biological nature of VAB itself is transformed, ostensibly made real, discoverable, and significant through this technoscientific exercise.

These differences in grey matter volume between VAB groups and normal controls have been repeated in other studies. Through these technoscientific practices biocriminologists have equated structurally abnormal ROIs—as represented in terms of 'grey matter volume reductions' or 'cortical thinning'—with damaged cortices of the brain, thus elucidating these areas as key characteristics of targeted populations and useful biomarkers of VAB. Some studies have gone further and attempted to better delineate biological differences between VAB groups (i.e. psychopaths and ASPD groups). For example, a recent MRI study by Gregory and colleagues (2012) set out to identify structural grey matter differences between three groups: violent offenders with ASPD and psychopathy; violent offenders with ASPD only; and health non-offenders. Their study argued that there are grey matter differences between the three groups, and that the group of violent offenders with ASPD and psychopathy displayed significantly reduced grey matter volumes in key ROIs responsible for affective processing. As the noted, the significance of this work is that it supports the notion that there are unique biomarkers for the defined VAB groups used in biocriminological studies. However, some imaging studies have also failed to replicate significant brain abnormalities in VAB groups.

Take the case of Dolan and colleagues (2002b), who did not observed significant reductions in the PFC even though neuropsychological testing on the group at the time of the scan did find evidence of impairments in executive function for the VAB group. In a study by De Brito and colleagues (2009b) on young boys diagnosed with callous-unemotional traits (commonly seen as a precursor to psychopathy and ASPD in adulthood), they found *increased* volumes of grey matter ROIs compared to control groups. This is in contrast to studies on adult populations, which have consistently found *decreased* grey matter volumes in these areas of the brain. Findings like those from Dolan's group and De Brito and co-authors exemplify some of the difficulties of imaging VAB research. Such incongruent results have also been the basis of questions raised from within the neuroscience and psychology communities. These questions include: how to neurobiological research addresses behavioral and biological changes over time, what neurobiological processes and brain structures best explain VAB, and the overall difficulties in comparing results across imaging VAB studies (Anderson and Kiehl 2012; Loeber and Pardini 2008). In the case of De Brito's study on youth populations, such results have left biocriminologists both puzzled and intrigued about: the potential changes in brain structure that may occur during the transition between adolescent and adulthood and the difficulties of labeling, and mislabeling, youth with VAB designations. On the other hand, social scientists have pointed to such studies like De Brito and colleagues (2009b)— as well as recent Supreme court ruling in *Roper v. Simmons* (543 U.S. 551 [2005])[11]—to question the biologization of socially constructed notions like maturity and adulthood through imaging research, and call attention to the slippages and assumptions that occur when equating dynamic notions like maturity to risky or aggressive behaviors (Dumit 2013).[12]

Structural VAB imaging: VAB and psychometric tools

As the use MRI technologies continue to increase, recent VAB research has been interested in improving the ability of MRI technologies to better correlate structural brain abnormalities with psychometrics tools designed to help quantify and scale specific VAB risk factors. These studies aim not just to investigate difference between groups, but to test the correlation between individual scores from these psychometric scales and observed brain abnormalities. By concentrating on these differences at a more individual level, these studies are held as more promising research for diagnosing VAB disorders. These technoscientific practices would ostensibly sidestep and/or improve upon diagnostic procedures for VAB related personality disorders that currently rely on DSM classification and interviews.

For example, a study by Ami Antonucci and colleagues (2006) tested the association between the orbital frontal cortex—a sub-region of the prefrontal cortex, said to be involved in decision making and important in regulating aggression (Blair 2003)—and observed that reduced OFC grey matter volumes were associated with the frequency of antisocial and aggressive acts—a self-reported measure of the lifetime history of acts. Moreover, a study by Philipp Sterzer and colleagues (2007) found that ROIs correlated significantly with the empathy scores—from the Impulsiveness-venturesomeness-Empathy Questionnaire, designed by Hans Eysenck (Eysenck and Eysenck 1991)—of their study's population of youth diagnosed conduct disorder. Although, structural MRI imaging does not detect function, these uses of MRIs allow researchers to speak somewhat to the function of specific areas. Tracing VAB risk factors such as empathy to abnormal cortical size or grey matter density allows findings from structural imaging to be utilized as surrogate biomarkers for (dsy)function in the brain. Therefore, MRI studies that link a reduced amygdala to psychopathy ultimately signify to researchers that the person's amygdala is not properly functioning as well, even before the link between brain structure and function is made in the study population. Other examples have also used psychometric scales to help better delineate unique biomarkers for specific VAB groups.

In a study by Yaling Yang and colleagues (2010), they found *reductions* of grey matter in the amygdala *and* cortical *thinning* in the PFC regions of 'unsuccessful' psychopaths compared to 'successful' psychopaths and normal control groups. In this study, psychopaths were divided into two groups based off their history of criminal convictions, although Yang and co-authors noted that both groups had similar self-reported crimes. ‘Unsuccessful’ psychopaths were defined as individuals with a high psychopathy scores on the PCL-R and were prosecuted for their crimes. ‘Successful’ psychopaths also had high PCL-R scores, but they are considered successful because they had avoided any legal convictions (i.e., they were not caught). They found that unsuccessful psychopaths had significant grey matter deficits and abnormal cortical thickness in key ROIs areas compared to both successful psychopaths and normal controls. While a structural brain study, Yang and colleagues (2010) conclusions spoke to functional processing, noting that these abnormalities in structure may, “predispose unsuccessful psychopaths to poor behavioral control and impaired decision-making, thus making them more prone to convictions.” Similar to Gregory’s group (2012), this study also supports the notion that each VAB group represents a distinct phenotype, one that is discoverable through imaging. They suggested that abnormalities in cortical thickness not only helped to explain antisocial behavior in unsuccessful psychopaths, but that it also mediated their chances of being caught and convicted! To be fair, Yang’s group were among the first to acknowledge and attempt to capture the heterogeneity within a specific VAB group, and they did note that the findings should be interpreted with caution; in part because of the differences of PCL-R scores between the psychopathy groups were not matched. Still, they reduced the severity of psychopathic behavior to arrest records, which may actually tell more about the arresting practices and the operation of the criminal justice system, than an individual’s cognitive and emotion (in)abilities to control their behaviors. Therefore, by suggesting that unique biomarkers can help differentiate sub-populations of a specific VAB phenotype (psychopathy), Yang’s group helped to reinforce the longstanding biocriminological principle that socially ascribed VAB differences are best understood through corporeal factors via technoscientific means.

Overall, VAB research that employs the combination of MRI technologies and psychometric scales reinforce the notion that technologically more advanced science will provided a more valid and useful understanding of the causes of and risk for VAB. In doing so, such research also helps legitimate the function of VAB psychometric scales to capture biological processes, even if such measures are subject to significant outside factors that go well beyond biology. As is the case for neurobiological research that relies on metrics for the frequency or severity of arrest or criminal acts by using self-reported accounts or arrest records, which are subject to numerous factors outside of individual’s brain or genes, such as the neighborhood factors, policing practices, and/or previous experiences with VAB. Moreover, as I noted in the chapter 3, imaging VAB studies still have to deal with complexities arise through the recruitment of and heterogeneity within study and population groups. Where the groups disaggregated the best way? How does the allocation of study and population groups effect the production of these neuro-knowledges and varied interpretation of the imaging data?

Technoscientization of VAB via Functional Imaging

In this section, I focus on VAB studies that utilized functional brain imaging. These technologies hold the promise of better understanding and accounting for the neuronal networks that give rise to, or inhibit, VAB. Functional imaging techniques have been utilized more often than structural techniques in VAB research. Nearly 63% of all the studies reviewed for the content analysis used functional imaging, with PET and fMRI imaging techniques being the most popular (at 91% [51/56] of reviewed studies). Functional imaging VAB research, like structural imaging studies, most often focused on the prefrontal cortex (PFC), temporal lobe and limbic regions of the brain. Such studies have argued that individuals labeled as criminal, violent and/or diagnosed with a DSM personality disorder related to VAB, have demonstrated functional impairments in key ROIs compared to control groups.

While structural imaging has been utilized as a way for researchers to better elucidate brain volume and structure, the use of functional imaging has been noted for its potential to better understand how the brain processes information. Functional imaging measures brain function by calculating the consumption of a blood flow in the brain (either through glucose metabolism-PET or blood-oxygenation levels-fMRI) to help estimate brain activity. The potential to measure or uncover the inner workings of the brain is often dubbed as a way to see the *brain in-action*, and functional imaging technologies have been a vital part of the increased use of imaging technologies in biomedical and behavioral research (Abi-Rached and Rose 2010; Aguirre 2014; Dumit 2004; Pickersgill and van Keulen 2012). Rose and Abi-Rached (2013:73-74) captured the 'conditions of possibility' and biomedical allure made possible through functional imaging as follows:

> As functional brain imaging, whether by PET or by fMRI, came to supplement images of anatomical structures, we now seemed able to observe metabolic activity in living…the very interior processes of the living and dynamic brain, its anatomical normalities and pathologies, its activity in delusions and normal perception, its section of blockade of neurotransmitters, could be rendered visible and correlated with a phenomenology of mental life. At last it now seems that we can see the physical basis of mind in the activities of the living brain.

As the practices of seeing the *brain in-action* expanded, and the subsequent images and knowledges produced through such technologies traveled, they have operated as powerful cultural icons within society, affecting how we think about the value of scientific knowledge and how we vision and reinterpreted the potential of neuro-knowledges to unveil hidden truths about our health, identities and bodies (Dumit 2004, 2013; Pickersgill 2009, 2013; Rapp 2012; Rose 2007; Rose and Abi-Rached 2013; see also Clarke et al. 2009, 2010; Duster 2006a, 2006e).

Functional VAB imaging: seeing brain dysfunction of VAB through PET

In one of the first studies to use PET imaging, psychiatrists Nora Volkow and Laurence Tancredi (1987) used PET imaging, in combination with CT and EEG technologies, to examine four mentally-ill patients with a history of violent behavior. The study titled, "Neural Substrates of Violent Behavior" found abnormal functioning in the temporal lobe and PFC brain areas of the study population compared to the normal control group. The study was notable because it was the first attempt to use PET technologies in a study of psychiatric patients defined as aggressive and/or violent. It also helped promote VAB related research beyond lesion associations—meaning particular areas of structurally damaged brain tissue, that was thought to compromise brain function—toward accounts that could trace the 'actual' functional differences in neuronal processing to VAB. As Volkow and Tancredi (1987:672) concluded:

> New imaging techniques such as PET allow us to detect cerebral pathology which was unrecognized by the EEG and the CT scan. PET, being designed to investigate cerebral function, is a very promising tool to help evaluate cerebral derangements in individuals with violent behavior, and hence may help in the design of better preventive and therapeutic interventions.

However, because all four of the participants in the study's patient group had been diagnosed with concomitant psychiatric disorders and/or habitual drug/alcohol abuse, Volkow and Tancredi's findings faced very limited possibilities to be generalized to all individuals characterized as violent, aggressive or criminal.[13] Nevertheless, the number of PET studies on VAB increased following Volkow and Tancredi's (1987) work.

Just a few years later, Goyer and colleagues (1994) conducted another study using PET on a population of former military personnel. All of these participants had been diagnosed with a DSM defined personality disorder, they all self-identified as "impulsive-aggressive," and all had been admitted to a mental health hospital for various personality disorders prior to the study.

This study stood out because it was one of the first imaging studies to use a neuropsychological performance task with imaging (Brower and Price 2001). These tasks can include a number of mental and/or combination of mental/physical stimuli that test processing related to cognition including: memory, impulsivity, and anger among others (Raichle 2000; NBC 2013). Thus, researchers state that the addition of functional task during imaging better isolates and observes neurological functioning associated with violent and aggressive behavioral traits. Yet, how are researchers confident that the brain regions and corresponding brain function are indeed the roots of one trait and not of another affective or cognitive trait, or even something else? Properly examining this question starts with taking a closer look at the role of neuropsychological tasks used in imaging studies.

The most commonly used neuropsychological task for the reviewed PET studies in this dissertation was the continuous performance task (CPT). CPT is a neuropsychology task that dates back to early twentieth century EEG imaging research on brain damage (Rosvold et al. 1956). This task assesses impulsivity and attention, and poor performance on the task suggests possible underlying brain abnormalities in the PFC and temporal lobes (Nuechterlein et al. 1983; Rosvold et al. 1956; Buchsbaum et al. 1990). During the scan, participants are asked to watch a monitor that will briefly display a set of stimuli at a predetermined rate, and each time the participant recognizes the stimulus they are told to acknowledge it by pressing a button (Nuechterlein 1983; Raichle 2000).[14] In its more contemporary form, the test has been administered through computer-assisted technologies in conjunction with imaging techniques (Raichle 2000), and overall functional tasks have become part of the standard procedures in VAB imaging as well.

In neuroimaging studies on VAB, the goal is to link the participant's cognitive abilities (assessed through tasks) to behavioral traits that have been associated with VAB (i.e. impulsivity, empathy, etc.). The brain is constantly in a state of activity, and even at a state of assumed rest, neurotransmitters are still exciting or inhibiting neurons that underpin the *action* that is referred to in the brain. However, there is a necessary assumption here that *the task used in an experiment will elicit a unique response from a specified area of the brain responsible for the trait* (Aguirre 2014). While functional imaging has allowed researchers to better investigate molecular-level processes in the brain, there are still some spatial limitations of these technologies; this is especially the case for PET imaging. Therefore, during the acquisition of the image, the scanner detects the action of a relatively large number of neurons that are all rapidly firing or signaling within a ROI. To isolate the specific task, many functional studies utilize a method of 'cognitive subtraction' (See Figure 4.5) in which the wanted cognitive response(s) is subtracted away from other controlled brain responses, thus allowing researchers to isolate only the desired activation in the ROI (Aguirre 2014, 2013). If such assumptions were not in place, researchers would not be able to assess the meanings of the detected activity in the specified areas of the brain because there would be no way to differentiate between targeted and unwanted brain activity. However, what are the impacts of producing knowledge through such assumptions?

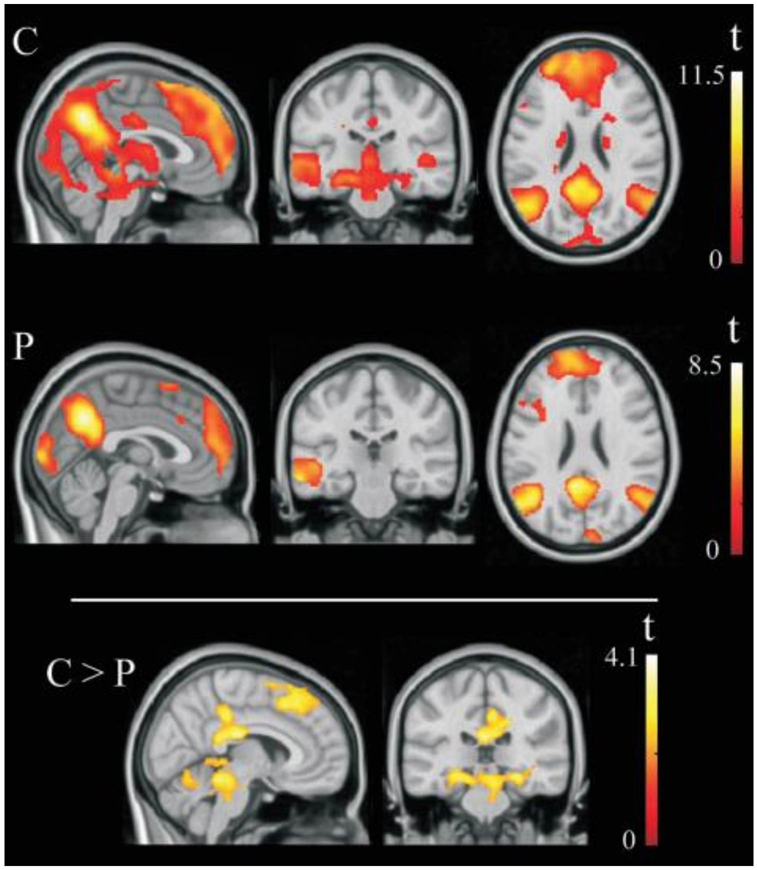

Figure 4.5 A visual of cognitive subtraction, specifically how activity in the brain of control responses are subtracted from desired functions to isolate activity in the brain regions thought to underlie dysfunction for the specified task – these are images from a fMRI study on the relationship between moral judgment in the brain of criminal psychopaths, C, is the brains of control subjects and P, psychopaths, C> P: are sagittal and coronal views of images demonstrating the areas of dysfunction (no activation) in the psychopathy group. Source: Pujol et al. 2012. *Social Cognitive and Affective Neuroscience* 7, 917-23.

In order to move closer to better understanding the brain function related to VAB, Raine and colleagues (1994, 1997, 1998a, 1998b) published a series of PET studies. These studies were different from both Volkow and Tancredi (1987) and Goyer and colleagues (1994) because they focused more explicitly on groups that society generally recognizes as violent, i.e. murderers. In these studies, Raine's group utilized PET imaging in conjunction with the CPT performance task to study a population of murderers they recruited through pre-trial psychiatric assessments.[15]

Overall, these studies found brain abnormalities in both PFC and temporal regions of murderers compared to group of normal controls, and they were very influential in helping develop the trajectory of neuroimaging VAB research.

Interestingly, while the CPT task was utilized in this research to help better identify abnormal functioning in the PFC, the use of CPT task did not seem to help clarify the relationship between the brain and VAB. As Raine and colleagues (1997) noted, they found no differences in the CPT task between the study and normal groups. However, if no differences were found, what does this tell about the production of VAB knowledges from the study? What were the causes of the observed decreased brain activity in the PFC, the brain area said to be at play during the task, of murderers if not the CPT task? Does it challenge or diminish the associations presumed between VAB and impulsivity? Raine and colleagues (1997:504) stated:

> The fact that groups did not differ in behavioral performance on the CPT suggests not only that difference in brain functioning is not easily accounted for by motivational or attentional deficits in the murderers, but also that the significantly greater occipital activity (visual areas 17 and 18) in murderers may possibly represent compensation for the reduced activity in the prefrontal cortex, an area which is critical for the execution of this challenge task, [CPT].

Essentially, the benefit to using neuropsychological performance test in tandem with neuroimaging is to help increase the ability of researchers to better localize areas of the brain that *should* be activated during cognitive or affective processes. In the case of this study, there was an assumption that these murderers, those who pled not guilty by reason of insanity, would not do well on the CPT because of motivational and or attentional deficits. Thus, this group of murders reduced PFC activation should have also been demonstrated in their CPT results.

This example also highlights the complexities of imaging that can arise through the interactions between imaging techniques and secondary tools used to help better clarify functioning observed in the brain. Here the lack of clarity is used help construct an alternative explanation of the CPT and observed functional activity. Even though there were no demonstrated differences between the control and target group on the CPT, its functionality is nevertheless legitimated through a different explanation, "that the significantly greater occipital activity…in murderers may possibly represent compensation for the reduced activity in the prefrontal cortex, an area which is critical for the execution of…[CPT]" (Raine 1997:504). Thus, pointing to the way in which new assumptions may be built into neuroimaging research along the research process. Moreover, such complexities in results may also be lost during citation practices (Star 1983), in which results of the research may omit or not clarify unexpected findings and only note the 'main' findings of the study (e.g. Wahlund and Kristiansson 2009; Yang, Glenn, and Raine 2008).[16] Specifically, while research teams often contend that their results cannot speak to the actual cause of brain dysfunction —noted in this study as well—there are new assumptions concerning the basis of behavior that become part of the larger processes. Such assumptions are not necessarily part of the scientific procedures, but instead are key social practices of the technoscientization of VAB.

These explanations highlight the ambiguities that are part of the larger production of knowledge processes, embedded within data generated through imaging and demonstrated through the complex discourses and practices employed to interpret its relation to VAB (Dumit 2004; Pickersgill 2009). What happens when these added imaging procedural techniques do not yield the expected results? How do researchers make sense of unexpected differences? In *Picturing Personhood*, anthropologist Joseph Dumit (2004) asked similar questions in relation to the cultural flows of technoscience and its influence on the questions, procedures and practices used to structure, generate, and disseminate neuro-knowledges. Dumit (2004:15) argued:

> Each piece of experimental design, data generation, and data analysis, necessarily builds in assumptions about human nature, about how the brain works, and how person and brain are related. No researcher denies this. In fact, they constantly discuss assumptions as obstacles to be overcome and as trade-offs between specificity and generalization.

What can be generalized or taken from these findings? How do these findings speak to the utility of the CPT task in VAB imaging research? What are the assumptions built in about the workings of the brain and its relationships with human nature and behavior? These types of question, while not ignored, are not retained when results are translated outside of the lab for other purposes, or when such knowledges are used to buttress other knowledge claims that are made about the brain and VAB.

In this case of Raine and colleagues (1997) noted that the dysfunction in the PFC may not be specific to VAB, since reduced PFC activity has also been found in other psychiatric conditions. Moreover, while the CPT did not help them isolate a specific function in the brain, they surmised that the lack of differences on the CPT as a strength of the study. Specifically that the presence of dysfunction—which cannot be accounted for by the task but only as a subtraction of activity between the average responses in the study group and control group—is assumed to be important because of based on prior theory of dysfunction in the PFC of mental health patients, how the study allocated VAB and control groups, and an non-tested assumption that the lack of differences on the PFC may be a function of greater activity in the visual cortex of VAB individuals. To be clear, dysfunction in the brains of VAB individuals have been found in subsequent studies, however it is still notable to point out the assumptions that are built into the production of knowledge, and they impact these findings have on the continued production of VAB imaging research. Important here for this VAB study, as well as many others produced through neuroimaging research, is that there is a clear assumed association between *differences* observed and the *significance* of observations, or as put by Dumit (2004:84), "*difference* between brain images is another one of the words, such as *significance*, whose multiple meanings often ambiguously and productively play off each other. Here difference (as no-similarity) between the two groups is layered on top of the difference (as the result of an arithmetic subtraction) between two brain sets." Therefore, with or without clear meanings of observed brain activity/dysfunction, research on the brain and VAB continues to thrive, keeping viable the link between biology and violence through expectation of the significance of difference, without necessarily having to fully clarify how such relationships are established through the experiment.

PET imaging provided a conduit for VAB researchers to start to outline what they thought a murderers or violent person's brain should function. Even with the questions concerning ambiguity in imaging VAB research outlined here, PET imaging nevertheless did grow more interested in better outlining brain functioning that may underlie VAB, specifically on the notion that better technologies would provide even greater information. As the use of PET imaging has declined in within the last decade, an increased interested in the use and promises of fMRI technologies have exploded within the last decade.

Functional VAB imaging: 'blood flow is only a proxy for activation'

Nearly 80% of all the functional VAB imaging research reviewed in the content analysis over the last decade (2002-2012) used fMRI technologies. Similar to PET, fMRI is also utilized to see the *brain in-action*. However, fMRI technologies are also accredited with greatly expanded the possibilities of brain research on violence for several reasons. First, it is preferred over PET or SPECT technologies in behavioral research because it does not require radioactive tracers to measure blood flow in the brain, thus enabling greater and expanded use with fewer residual health complications (Aguirre 2014; Yang, Glenn and Raine 2008). Moreover, fMRI technologies are also said to provide improved spatial resolution over other functional imaging modalities, which has led to an even greater potential to disaggregate the brain's cortical regions into smaller sub-regions (Aguirre 2013; Feinberg and Farah 2000; Kevles 1997) providing an even sharper understanding of the localization of specific regions of the brain during activation. Lastly, fMRI imaging expanded the possibilities of to be paired with neuropsychological performance tasks and advanced statistical modeling. This expansion of the types of tasks used in imaging studies has also increased the possibilities of using fMRI technologies in VAB studies; specifically, the use of imaging technologies to explore neurobiological underpinnings of VAB in normal populations.

PET imaging works by measuring the location and amount of radioactive modified glucose used by the brain, or neural metabolism. In contrast, fMRI is a measure of neuro-vascular changes in the brain. The most common technique for fMRI technologies is blood oxygen-level dependent (BOLD) technique, which measures oxygenation via changes in blood flow within brain. The measure of blood flow can be seen as a *proxy for activation.* Neural activity in this technique is equated with an increase in the need for oxygen in the brain. Thus, as blood is carried to particular areas of the brain, bringing oxygen and carrying away carbon dioxide, neural activity is assumed to be taking place and the brain in-action can be measured not as a direct calculation of specific neurons firing, but as brain activity via blood flow (Aguirre 2013, 2014).[17] However, as fMRI imaging practices exponentially increased, the expectations for and promises of fMRI technologies have in many ways exceeded the actual power of this imaging technique. In light of the enormous weight of cultural authority that fMRI images have gained within the last decade, neuroscientists, philosophers, law professors, and social scientists alike are all quick to point out that we should proceed with some caution concerning what neuroimages actually tell us and the types of questions that that can realistically be approached using such technoscientific practices (Aguirre 2003, 2014; Chancellor and Chatterjee 2011; Choudhury, Nagel, and Slaby 2009; Dumit 2013; Farah 2005; Illes and Racine 2005; Pickersgill and van Keulen 2011; Rose and Abi-Rached 2013; Satel and Lilienfeld 2013).

VAB researchers themselves expressed caution as well, noting that there are still many questions left unanswered when using functional imaging. This sentiment was captured in my exchange with a neuroscientist who utilizes fMRIs to study VAB traits in youth populations.

Oliver: Are there any drawbacks or limitations, things that you wish you could capture, but can't right now with the imaging technologies used in your research?

Dr. Smith: The fMRI has revolutionized the kind of questions you can ask. So, with brain imaging we actually can *see*, you know, if two groups of different people seem to have different neural strategies to answer a common question. And, we can get *some* confirmation that's true, right? I mean – especially if you triangulate your data using lesion studies, animal studies and behavioral studies – you can draw pretty good conclusions about what the changes in blood flow mean. But, you do have to be very careful because of course blood flow is not really the *brain in-action*. Especially, for more complicated questions. Are you measuring inhibitory neurons or excitatory neurons? Are you measuring what neurotransmitter systems are active in the regions you are looking at? Are there only sub-populations of this big structure that are active?…[fMRI] is better than anything else, but it's still not as good as it could be. *The fact is, blood flow is only a proxy for activation*.

This quote succinctly captures a few of the limitations of fMRI, including understanding the type of neuronal activity that you are measuring and determining if you are measuring relevant activity for the ROI. Other limits apply to generalizing results to populations, such as how researchers handle morphological differences in the size and shapes of brains (of particular importance as images are created of average subject responses) and lifestyle differences between study populations in which certain foods, medications, and substances can affect neuronal activity during the scan (Aguirre 2014). These questions and concerns regarding the imaging procedures and analysis of neuroimaging data, as well as the critiques of 'puzzling high correlations' between the brain and measures of emotion, personality and social cognition in fMRI studies (Vul et al. 2009), are continually expressed within neuroscience. However, my focus here is narrower. I will use the remainder of this section to elucidate the relationship between fMRI research on VAB, with special attention on the social implications imbued through relationships between fMRI procedures, functional tasks, and study participants. I am particularly concerned here with the assumptions needed to successfully scan, including the participant's aptitude and cooperation, and the researchers' ability to evoke the correct emotions and subsequent brain reactions. These questions are specific to biomedicalization processes and the technoscientific impacts of neuroimaging to transform our understandings of and dealings with behaviors within society. Once again, I turn to the practices of combining specific neuropsychological task with imaging to demonstrate this point.

Technoscientization of VAB: normalization to customization?

> The rhetorical image of the brain as viewed by the social expert is one of anxiety. The normal brain is taken as a baseline of social norms, but if the brain is perturbed, it goes only one way, down, into abnormality, into personal and social problems. In this world of constant brain risk, the job of the brave new science of molecular psychology is to predict, surveil, and intervene whenever brains deviate.
>
> Joseph Dumit (2004:147)

In this section I will discuss the potential impacts of the technoscientization of VAB on what Clarke and colleagues (2003, 2010) have called the shift from *normalization to customization*. I will start with a discussion of the use of more sophisticated neuropsychological task in fMRI studies. I focus on the assumptions that arise as VAB neuro-knowledges are produced through fMRI procedures and the role these assumptions have on how researchers make meaning of their findings. This section will also highlight how fMRI techniques and new neuropsychological task have enabled biocriminologist to trace the roots of VAB brain dysfunction to normal populations.

The most often used neuropsychological tasks for the fMRI studies of VAB reviewed in this dissertation were image/visual expression tasks. In these tasks, participants are shown a series of images designed to evoke emotions such as sad, happy, and neutral. The goal is to record the specific neural correlates or cognitive processes that govern human emotions. While it may be possible to 'observe' and statistically link neurobiological correlates to the activity of viewing emotive expression, extrapolating the meanings of brain functioning/dysfunction in these ROIs and further mapping these findings upon VAB seems to require many more assumptions. This would include the ability of the participant to accurately interpret what the facial expressions mean, and at the very least this is a complex process between the visual cortex and other areas of the brain, which can vary from individual to individual (Farah and Aguirre 1999) and can be structured by cultural and socialization processes that can affect how one understands and interprets such stimuli.

What does it mean for one's past, or future, conduct if there is reduced activity in the brain when viewing sad images? How do researchers know that the feeling they are trying to invoke it the feeling that participants are experiencing when viewing these images? For example, VAB studies that have used facial expressions as a stimulus for fMRI imaging have demonstrated an averaged reduced activity in amygdala when viewing negative or angry facial expression for adults and youth populations with psychopathic traits. Such reductions in activity have been described as an impairment, compromising an individual's ability to recognize emotional stimuli and possibly increasing an individual's tendencies to behave aggressively or violent (Jones et al. 2009; Marsh et al. 2008; Passamonti et al. 2010; Sterzer et al. 2005). This is demonstrated in the findings by Sterzer and colleagues (2005) who found that in comparison with a normal group, youth with conduct disorder (CD) had abnormal brain responses when they viewed affective pictures. Essentially, this finding suggested that children with CD may be predisposed to aggressive behavior due to an impairment in brain functioning that reduces their ability to recognize emotional stimuli and comprises the cognitive regulation of VAB (Sterzer et al. 2005:11-13).

In contrasts, neuroimaging studies that investigated VAB groups that have been defined as impulsive—with intermittent explosive disorder (IED)— had *increased* amygdala activity when viewing angry and negative facial expression (Beaver et al 2008; Coccaro et al. 2007, see Figure 4.6). As noted by Coccaro and co-authors (2007:1), "these findings provide evidence of amygdala-OFC dysfunction in response to an ecologically-valid social threat signal (processing angry faces) in individuals with a history of impulsive aggressive behavior, and further substantiate a link between a dysfunctional frontal-limbic network and aggression."

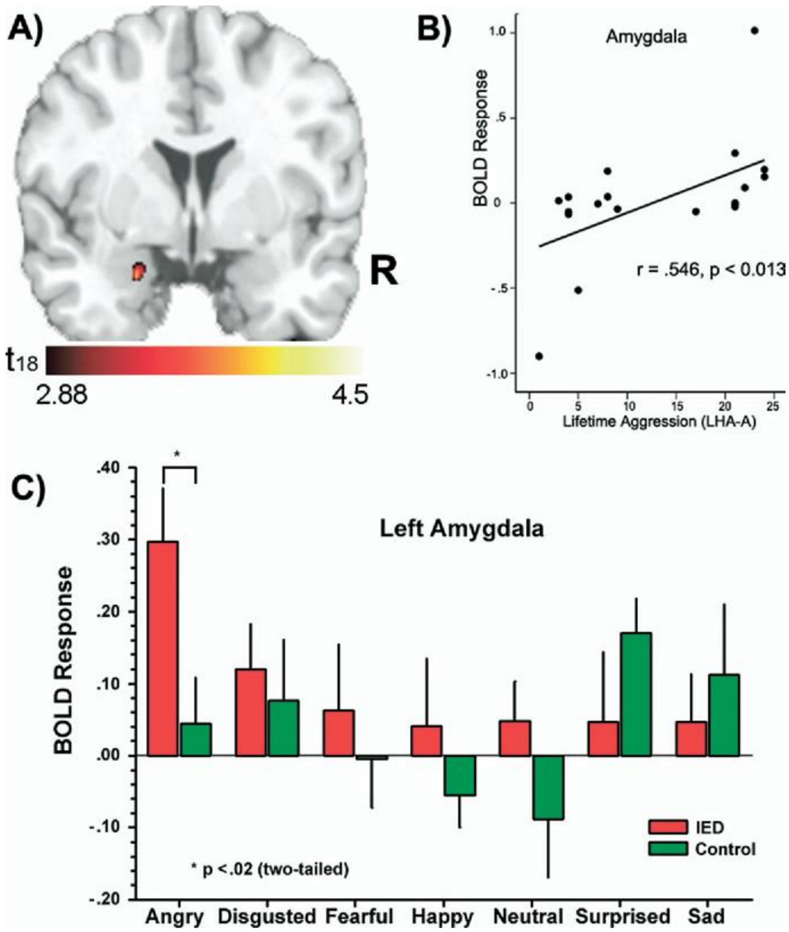

Figure 4.6 - A visual of showing greater activation in the amygdala of individuals with IED (A), as well as a graph showing that amygdala activity is linearly tied to increasing lifetime aggression scores (B). The bottom figure (C) provides a comparison between amygdala activity of control and IED populations. Source: Coccaro et al. 2007. *Biological Psychiatry* 62(2):168-78.

At best, these studies only infer that the amygdala activity plays a role in how participants think about emotions. However, what is concluded is that there are neurobiological differences between emotional processing in different VAB groups. While the results of these studies are not entirely comparable (because of differences in normal groups) there is an implication made between groups for whom VAB is understood as a results of psychopathic traits (reduced amygdala activity), and groups for whom VAB is described by trait impulsivity (increased amygdala activity). In a simplistic view, these studies have interestingly provided contrasting views about the cause of VAB, as either the result of over- or underactivity in the amygdala.

However, there are also other important social implications that can be drawn from this research. For example, in the study by Sterzer's group, they noted that although there were many confounding differences between normal and VAB groups used in the study, "[they] could clearly demonstrate that the observed between-group differences were indeed related to aggressive behavior, which was identified as an independent predictor for the responses in the ACC as well as the left amygdala." However, there are confounding factors that limit the possibilities of these findings being extrapolated to general population, in particular the heterogeneity within the studies control and target groups. As shown in Figure 4.7, while the average response rates between the groups do show a significance average difference, that was demonstrated to be statistically significant ($p<.001$), there is also considerable overlap between the response of the groups. This is a limitation of the technologies used, and while it is usually stated in studies that the images and statistical correlations reflect the average differences between groups, such complexities are often lost when images travel into use outside of science.[18]

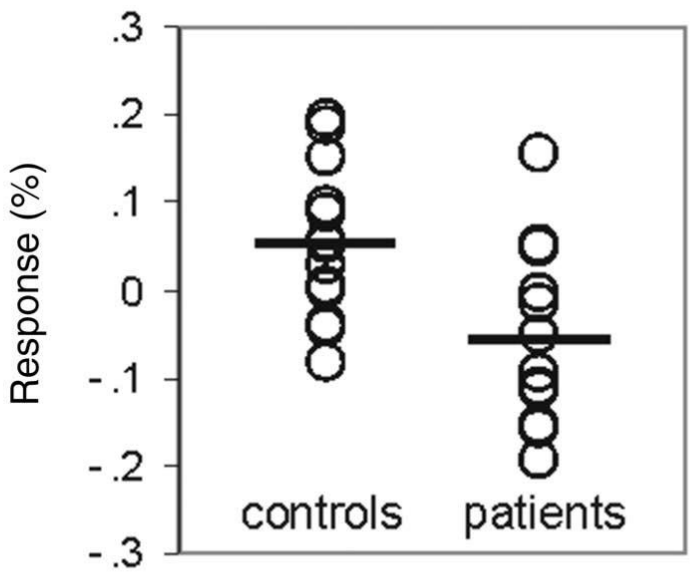

Figure 4.7 - Shows left amygdala individual responses between-group differences of controls and VAB patient group (male adolescents with CD admitted because of abnormal aggressive behavior). Reduced amygdala activity is shown for the VAB group relative to control. Source: Sterzer et al. 2005. *Biological Psychiatry* 57: 7-15.

In other imaging studies of VAB using only normal populations, we see even more elaborate suggestions made about the relationships between amygdala and VAB traits. The goal of imaging studies on normal populations is not necessarily to make the link between the brain and VAB, but to make a more general association between the brain and certain VAB traits, such as impulsivity, anger, and/or empathy. In a study conducted in Korea, neuropsychiatrists Lee and Ham (2008) found a possible genetic moderator for amygdala activity in a volunteer group of Korean women. They argued that women with the long allele gene polymorphism of serotonin (5-HTTLPR) had greater amygdala activity in response to angry facial impressions. Serotonin has been linked to VAB through the MAOA gene in populations characterized by impulsivity. Essentially, MAOA helps control the regulation of serotonin, and if serotonin levels are not regulated individuals are said to be at higher risk for impulsive behaviors (Buckholtz and Meyer-

Lindenberg 2008; Pezawas et al. 2005). Lee and Ham (2008) noted that their findings were in contrast to prior research on 5-HTTLPR and angry facial expressions, which actually found that the short allele of the gene was associated with higher amygdala activity. Interestingly, Lee and Ham (2008) explained the significance of these differences as a result of ethnic differences between the groups used in their study (Korean women), and the populations used in the contrasting genetic imaging research (described as 'Caucasian' populations). Lee and Ham (2008:902-903) noted that:

> The discrepancy between the present and earlier studies may be the result of ethnic differences…Although the causes of such ethnic differences remain to be clarified…our results suggest that there may be differential effects of 5-HTTLPR that are specific to different ethnic groups. These ethnic differences reflect a genetic background to the relationships between the variation in 5-HTTLPR and neural activation in the amygdala in response to affective stimuli.

Thus, when trying to better understand the conflicting results between their study and others, Lee and Ham (2008) argued that these differences could be a result of genetic differences between ethnic groups. This assumption has important implications on the presumed association between race/ethnicity and genetics, and adds a new biological component, that the genetic makeup of specific ethnic groups may result in differing brain functions. The meanings of behavior that are attempted to be established at the brain level are mediated through a racialized lens, in which behavior is reduced, as linked between the brain to gene, and the differences between this association are mapped upon socially mediate differences among race/ethnicity.[19]

Social categories have also been taken up as possible confounding determinants in relationship to gender. Duke University neuropsychologist Justin Carre and colleagues (2011) conducted an fMRI study that traced the relationship between trait anxiety and anger to the function of the amygdala. The neuropsychological tasks utilized here showed a series of facial expression to a normal group of twenty-eight men and thirty-six women, to test the amygdala response to 'angry' facial expression as a proxy test of its role with cognitively understanding anger. They found that, individual differences in trait anger were positively correlated the reactivity in the amygdala when participants viewed angry facial expressions. However, interestingly Carre and colleagues (2011:1) also noted that the findings were gender-limited to male participants and that the "findings add to the growing body of evidence indicating that variability in personality traits contribute to individual differences in threat-related amygdala reactivity and further suggest that heightened amygdala reactivity to angry faces may be uniquely involved in the expression of reactive aggression in men" Thus, in this study, gender specific characteristics are seen as a mediator in brain function of emotions.

There are of course sociological critiques here concerning the variability of emotions and emotive perceptions, the amount of *work* needed to understand, feel and engage emotions beyond cognition, and the impact of identities, social environments, culture (Hochschild 1979; Tuner and Stets 2005) are all at play, yet seemingly assumed to be held stable across participants during imaging experiments. Meaning, emotions are much more complicated, and must be first reduced to very basic biological functioning in order to be useable in fMRI research. The question that concerns me here is not the ability to record a brain response in the lab, but whether this informs us about the behavior of the individual outside of the laboratory setting. These critiques also extend to the social construction of gender and its relationship to VAB behaviors. As James Messerschmidt (1993: 85) contended, "[C]rime [including violence] by men is not simply an extension of the 'male sex role,' rather crime by men is a form of social practice invoked as a resource, when other resources are unavailable, for accomplishing masculinity." The use of normal populations of men and women further reinforces the assumed *naturalness of* *biological gender differences*, and especially in relation to violence, aggression, and criminality within society. Such complex understandings of emotions, violence, and behavior are much harder, if not impossible, to fully capture during scanning.[20] However, just as important are the *assumptions* that research procedures need to help re-create the situations and/or conditions needed to replicate an appropriate emotional response from participants. How do you create a task that can accurately evoke a behavioral response that characterizes an individual's cognition of emotions outside the lab? How do you know that your participants are cooperating with your instructions, that they are thinking about the emotion that your task is demonstrates?

These ambiguities do not function as liabilities of the techniques but strategic points where the conditions of possibility are extended in relation to how VAB can be explored in the lab. As underscored by Dumit (2004:9-10 emphasis in original):

> Idioms and metaphors (e.g., flexibility, efficiency, circuitry, and inhibition) are produced in part by cultural uses and travel back into laboratories. It is out of this busy intersection of technical, social, and cultural flows that scientists attempt to stabilize and conduct their experiments, and it is back into the intersection that their results must go… The lack of ultimate clarifications as to what brain images mean—in abstract or in a particular use—is a consequence of our considering them in use (and potential reuse and thus reinterpretation). Objective-selves, received-facts, and brain-types are thus *not terms that avoid ambiguity, but terms that clearly reveal the strategic spots at which ambiguities necessarily arise.*

These assumptions both procedural (technical designs and task needed to conduct the technoscientific practices) and functional (the operationalization of VAB traits and the refashion and extension of socially imbued assumptions about behaviors) are needed elements in knowledge making practices. They help stabilize the knowledges produced through imaging and also legitimate use and authority in other realms of society (a key example of this would be the rise of neuro-disciplines like *neurolaw* and *neuroeconomics*).

Lastly, I want to discuss the possibilities of using biocriminological imaging practices to help reinvigorate the future therapeutic goals of contemporary researchers, which was also a key characteristic of its early organization and practice during the medicalization era. On the one hand there is a *very small* minority of neuropsychologist who directly market imaging as a diagnostic tool. This push for diagnostic use of imaging demonstrated best by Daniel Amen of *Amen Clinics* with at least six locations across cities in the US (San Francisco, Los Angeles, Bellevue, WA, Washington DC, New York, and Atlanta). Amen has been highly criticized by his peers for the claims that he makes about the use of imaging as well as the economic gains he has made from his clinics. Amen uses the more outdated SPECT imaging in his clinics. Amen Clinics described their services in the following:

> The Amen Clinics combines comprehensive evaluations, SPECT imaging, and brain-healthy habits in our methodology for treating a variety of conditions. Our patient historians are adept at conducting interviews with patients that lead to previously-undisclosed health information. Next, SPECT technology captures data on the patient's brain. And finally, once we have obtained a greater understanding of the patient's cerebral health *a customized treatment can be prescribed*.[21]

Critics from within neuroscience, on the other hand, have noted that 1) the technologies used are outdated compared to other imaging modalities, thus Amen's practices are exposing individuals to unnecessary risk of radiation through this technique, and 2) more importantly functional imaging scans have no diagnostic value at the present time (Chancellor and Chatterjee 2011; Farah and Gillihan 2012). In regards to VAB, Amen's clinic website noted that they can help with behavioral problems including: defiance, aggression, impulsive tendencies, compulsive tendencies and irritability (Amen 2014). Moreover, the site also explicitly stated that, these "behavioral problems are often symptoms of an unhealthy brain, which, when *properly treated*, *often shows significant improvement*," and outline five ways in which SPECT will help including:[22]

- Helping zero in on areas of the brain that are over- or under- active. People gain a better understanding of their condition through images they can see.
- Helping determine if the treatment prescribed is working as intended.
- Helping determine if there could be co-existing problems or conditions that need addressing.
- Showing that symptoms and behaviors are brain-based and not necessarily the result of choice or a lack of will or moral resolve.
- Increasing treatment compliance by giving patients actual pictures of brain activity changes.

As iterated above Amen's techniques are shunned by other neuroscientists who do not agree with him about the diagnostic use of SPECT. Moreover, much of the treatments that Amen proscribes come from line of pharmaceutical herbal treatments supposedly designed to help improve brain function.

While Amen has been reprimanded by his colleagues, his services and fame have nevertheless not seemed to falter. His services are very well-known and he still appears on fundraising ads for his clinic on public television this clinics (http://publictv.amenclinics.com/), and the success of his clinic has inspired others to also start using SPECT as a diagnostic (Chancellor and Chatterjee 2011).[23] I point out this *pseudo*-science not as a linked or representation of the larger imaging practices in VAB, but instead to demonstrate future possibilities of the technoscientization of VAB. Similar to the trajectory observed in genetics, the popularity of neuroimaging and cultural authority of brain images will inevitably increase the possibilities of more profit-driven clinics based on premature promises of functional imaging.[24]

Biomedical practices tied to notions of customization operate as powerful discourses within the era of biomedicalization, especially in relation to the commodification and fetishization of health products and services (Clarke et al. 2003, 2010). As noted by Clarke and colleagues (2010:78), services like those advertise by Amen's Clinics, offer "niche marketing or boutique medicine to select healthcare consumers…wherein health products and services become revered, valued, and imbued with social import that has little to do with their use value or physical properties." Such practices in relation to VAB may be demonstrated less as customization per se, but as a facilitator of *self*-control or what Foucault noted as *disciplining the body*. As Clarke and colleagues (2010:80) noted, "although no less normalizing or disciplining, biomedicalization enacts its regulation of bodies through offering not just 'control over' one's body through medical intervention but also 'transformation of' one's body, self, health." The impacts the technoscientization of VAB will be realized in this shift from normalization to customization. As greater access to imaging technologies increase so will the number of fee-for service ventures, thus placing greater concentration on modifying behaviors in *normal* populations, and elucidating individualized susceptibilities of future deviancy (bio-prediction) in individuals diagnosed with VAB personality disorders or labeled violent or criminal.

CHAPTER IV CONCLUSION

In this chapter, I demonstrated the shift from the medicalization of VAB to the biomedicalization of VAB by emphasizing the importance of the *technoscientization of VAB*, a sociotechnical process that I argued is dependent on the utilization of and cultural authority provided through neuroimaging technologies. I providing a brief understanding of the importance of neuroimaging, stating that while imaging is one of many neuroscience tools, the use of imaging has been important for VAB research because it 1) helped re-address past biocriminology questions using what is consider more sophisticated and powerful tools of investigation, and 2) because of the malleability of this tool to be paired with many other neurobiological, genetic and psychological tools and practices. Such abilities underscore the technoscientization of VAB.

This chapter described the impacts of the technoscientization of VAB in two parts: structural imaging and functional imaging research on VAB. In the section on structural imaging, I noted that the narratives of Phineas Gage can be understood as a *neurobiological artifact*, helping to continually reinforce the warrant to link cognition, the brain and VAB. As a neurobiological artifact, it operates continually over time, constantly reconstituted as a material fact, and epistemological linking past biocriminology theories to more contemporary technoscientific practices. Through the descriptions of MRI experimental design and findings in studies of VAB, this section highlighted the social nature of structural imaging practices in VAB and demonstrated how statistical correlations are utilized as risk calculations to map psychometric measures of VAB to reduced areas of the brain in VAB populations.

In the section on functional imaging, I argued that the dysfunction of neural networks is seen as a biomarker of VAB. Specifically, this section noted that functional imaging technologies provided even greater possibilities to investigate VAB at the brain level. Through the use of sophisticated neuropsychology tasks that can be combined with functional imaging modalities, researchers are able to establish a link between abnormal brain activities (measured by glucose metabolism, PET or oxygen consumption via blood flow, fMRI) of cognitive processes for particular VAB traits, such as impulsivity or empathy. This section notes that as scientific creativity has increases (technoscientization), it has also increased the number of confounding factors of VAB that are often left unanswered in imaging research.

Both the section on structural and functional imaging VAB research independently described the relationships between knowledges produced through neuroimaging VAB research and the ambiguities that arise through the imaging processes. Such ambiguities become important to the cultural and social practices that help stabilize and extend the usefulness of VAB knowledges produced through these modalities (Dumit 2004). I closed the chapter with a prelude to chapter five, which investigates the operationalization of social factors in contemporary biocriminology. In the close of the current chapter, I outlined the conditions of possibility that are enabled through the utilization of normal populations in fMRI research on VAB, ultimately analyzing the significance of these future possibilities in VAB research through the biomedicalization concept of *customization* (Clarke et al. 2003, 2010). The key point of neuroimaging VAB research may be less about what it can do alone, but the possibilities that are made when these tools are utilized in tandem with neuropsychological task, and other scientific research modalities.

In closing, the technoscientization of VAB essentially operates through a combination of neuroscientific technologies, social practices, and discursive knowledges of both VAB and the brain. More specifically the technoscientization of VAB includes: innovative bioscientific technologies, classifications, and practices; new and renewed funding opportunities in both private and public sectors; restored relationships with the legal field (see chapter five); and an intensified focus on claims of risk and the potential applications of neuro-biomarkers for bio-prediction. Moreover, as demonstrated the *technoscientization of VAB* helps better elucidate the social implications of VAB knowledges produced through neuroimaging research. Therefore, this chapter stressed that neuroimaging research on VAB is better characterized as both a product and active agent of biomedicalization. In the next chapter, I will extend my evaluation of the technoscientization of VAB in relation to the question about social factors in imaging VAB research. Specifically, this chapter is interested in how researchers address the critiques of biological determinism in biocriminological theories, including how the social is operationalized, how social categories like race and gender are conceptualized, and how research think about and handle the potential racialized and gendered effects of biocriminology.

CHAPTER V:
THE LINGERING 'QUESTION OF RACE' IN BIOCRIMINOLOGY

> Biological insights are often dubbed Lombrosian, suggesting that some behavioral scientist retain notions of a born criminal easily identifiable using some magic test. Continued aversion to anything biological on these grounds is anachronistic and will hamper the development of theory and policy. *Lombroso's time has clearly passed, and the idea of a born criminal is only historically relevant*. There is no present claim that insights from neuroscience permit a program to control pre-crime, and it appears neuroscientists understand that the image of aggression and/or violence is far from complete.
>
> Jana Bufkin and Vickie Luttrell (2005:188)

CHAPTER V INTRODUCTION

The move 'away' from Lombroso and eugenics by contemporary biocriminology was supposed to mark a shift from more ideological driven, racist/sexist pseudoscientific practices, towards a 'new' vision of biocriminology that would optimize the most sophisticated tools and theories available to accomplish what Lombroso and others failed to do, 'scientifically' validate the biology inquires on VAB. Thus, as biocriminology re-emerged post WWII, it do so with the goal of divorcing away from its troubled image of Lombroso and eugenics, while simultaneously preserving fundamental ontological claims of such perspectives. More recently, biocriminologists, as demonstrated in the quote above by Bufkin and Luttrell (2005:188), *re*-asserted their claim that "Lombroso's time has passed." Contemporary biocriminologists have sought to *re*-assure the public that the search for biological determinants of VAB *will not* reinforce racist practices. Thereby, they have ostensibly deemed critiques of the biocriminology and the 'question of race' as being "only historically relevant." (Bufkin and Luttrell 2005:188).

In 1992, critics and proponents of biocriminology collided once again during the lead up to a proposed NIH sponsored conference titled, "Genetic Factors in Crime: Findings, Uses and Implications." The goals of the conference were captured in the meeting's brochure:

> R]esearchers have already begun to study the genetic regulation of violent and impulsive behavior and to search for genetic markers associated with criminal conduct…[As a result], [g]enetic research holds out the prospect of identifying individuals who may be predisposed to certain kinds of criminal conduct, of isolating environmental features which trigger those predispositions, and of treating some predispositions with drugs and unintrusive therapies."[1]

Thus, the conference promoted three goals for contemporary genetic study of VAB: 1) greater success in identifying individuals at risk for crime and VAB by identifying the genetic biomarkers for such behaviors, 2) detecting and distinguishing environmental/social factors from biological factors of VAB, and 3) using genetic-based knowledges and practices to help develop biomedical interventions that seek to address and treat criminality. However, critics countered by arguing that such justifications are not enough to protect against the misuse of such knowledges, and that NIH should not sponsor any conference in which research can, and possibly will be, used to further subjugate already marginalized racial groups. Moreover, the critics had reason to be very weary of NIH's involvement in such a conference, particularly after the remarks made earlier that year by Frederick Goodwin—then director of Alcohol, Drug Abuse, and Mental Health Administration. Goodwin suggested that violent behavior committed by inner-city African American youth was synonymous with the hyper-aggressive, hyper-sexualized behaviors of monkeys in the wild (Duster 2006d). While, his remarks were not directly tied to the genetics and violence conference, critics successfully leverage these remarks to force NIH to withdraw their funding for the event, and subsequently compelled officials to cancel the conference.[2]

In response, proponents of the conference quickly tried to clarify the justifications for the conference and the continued warrant for biological research on VAB. They noted that: 1) contemporary biocriminologists were very cognizant of the etiological complexities of VAB, 2) the conference *was not* advocating for the search of a single ‘gene’ for violence, nor did they believe that a single genetic expression for VAB existed, and 3) that genes for violence does not denote destiny to be violent, meaning that if genes are found to influence VAB, it would not automatically doom the individual to a life of crime or VAB (Wasserman 1996).

Other biocriminologists were more direct in address the racial undertones of the conference. Adrian Raine (1993:315) downplayed the incendiary comments made by Goodwin as “misconstrued as racist,” and asserted that the bases for the opposition’s perspective, that the conference could support racism, was “more imaginary than real.” Raine, like many others who support evolutionary theories of VAB, sidestepped the obvious racial undertones in Goodwin’s comments to focus only on the biological ‘value’ of such claims. However, the reactions to Goodwin’s comments were not the results of a misinterpretation, and the racial impacts of his remarks were certainly real to African Americans. Goodwin’s statements circumvented sociocultural factors on VAB and crime. Furthermore, Raine’s justifications also obscured the effects of social factors on VAB, and advocated that the very nature of scientific ‘facts’ enables such knowledges to also skirt larger sociological forces such as race. However, as Duster (2006d) noted such justifications are not new, and that similar conjecture concerning the objectivity of biological facts were used to justify racial projects like the Tuskegee experiment and other biomedical interventions that subjugated particular groups to medical experimentation for the benefit and progress of science. Genetics, VAB and the ‘question of race’ continued to be debated throughout the 1990s, but what about neuroscience research on violence. While the debates about race and violence played out in *genetics*, VAB research from the *neurosciences* were quietly coming into shape itself, seemingly without the larger controversies faced by genetic research concerning race.

This chapter focuses on the conceptualization and operation of the race in neuroscience research on VAB. In particular, it argues that there has been a lack of clarity about the impacts of race on neuroscience research, and less is known about the more discursive interactions between the operation and maintenance of inequality in society and the production and use of neuroscientific knowledges of VAB and crime. How do contemporary *neuro*-criminologists think about their work and the ‘question of race’? How is race/ethnicity conceptualized in neurobiological studies of VAB? How do these *neuro*-knowledges differ, or support, the conclusions drawn by genetic research on VAB?

This chapter provides a better understanding of the approaches and uses of race in neuroscience research on VAB. This chapter 1) addresses how the lingering historical debates among, biology, crime/VAB and race have impacted contemporary neurobiology research on VAB, 2) provides greater clarity of the ways race is conceptualized utilized in VAB research, and 3) presents an understand of how neurocriminologists think about the potential impacts of their science in relation to race and racial discrimination.

Chapter V Overview

This chapter is divided into two parts. In the first part, I elucidate a few of the ways that contemporary genetics research on VAB addresses the ‘question of race.’ I begin by providing a slightly different historical context than provided in chapter 2, by focusing more generally here on the seemingly entwined relationship between race and crime. By providing a context for the seemingly natural link between race and criminality that has been discovered through criminological research, I am able to better situate the continued reliance of objective facts, and the seemingly neutral manner in which such data is both obtained and utilized to address crime. I follow this discussion with a brief overview of research on genetics and crime. This section focuses specifically on the use of the MAOA gene and the utilized of such research to1) further biologize race and/or ethnicity, and 2) promote and justify contemporary racialized views of VAB. This section ends with a description of *biosocial criminology*. This section focuses on the emergence of biosocial criminology in the last decade, and the claims implied by biosocial criminologists concerning evolutionary biology, crime and race. For analytic purposes, I make a qualitative distinction between *biosocial criminology* and *neuro-criminology*. Here, I argue that biosocial criminologists are typically trained not trained in genetics or neuroscience. Instead, biosocial criminologists investigate crime through a combination of literature reviews/analysis of published genetic and neuroscience research on VAB, and through heritability research using quantitative analysis. On the other hand, *neuro*-criminologists, for the purposes of this dissertation, refer to researchers who *are* trained to use neuroscientific methods, and specifically are researchers who utilized neuroimaging technologies to investigate the neurobiological underpinnings of VAB.

The remainder of this chapter addresses how neurocriminologists think about the ‘question of race.’ I use data obtained through interviews with neurocriminologists to examine how they conceptualize and utilize race in their research, and how they think about the racial impacts of contemporary biocriminology. I start by examining how neurocriminologists have operationalized race, and the complexities and challenges in which ‘question of race’ exhibits on neuroimaging. Next, I discuss some of the ways in which neurocriminologists have 1) thought about the causes of racial differentials in VAB, 2) the potential impacts of their work on the future of biocriminology, and 3) the ‘therapeutic possibilities’ for such technoscientific practices and knowledges.

RACE, GENETICS AND BIOCRIMINOLOGY

Genetics, race and VAB

Contemporary biocriminology has become increasingly more reliant on highly technoscientific practices and sophisticated computer software to make statistical correlations between VAB traits and biomarkers. The definitional boundaries that deem particular behaviors suitable for biocriminological study are continually reworked, in favor of more medicalized and biomedicalized approaches and understandings to VAB, the technoscientization of VAB. Moreover, in this chapter I contend that *the technoscientization of VAB has also helped reimagine and reinforce racialized and gendered understandings of VAB*. For example, the aforementioned MAOA genetic polymorphism known as the ‘warrior gene’ (Gibbons 2004) has served as a reliable biomarker of VAB in both genetic and neuroscience work. However, the uses and production of MAOA knowledges on VAB have also helped reinforce enduring associations between race and VAB.

The term ‘warrior gene’ was first used to denote the potential associations between the gene and aggressive behaviors in animal populations. In particular, this literature suggested that a higher prevalence of the short version of the MAOA gene variant was linked to hyper-aggressive behavior in the Rhesus macaque monkeys (Merriman and Cameron 2007). However, in 2004 an article published in journal *Science* included a quick reference concerning the potential links between the gene variant and violence in human populations. Further, the article also mentioned that a higher incidence of the low variant of MAOA was found in the Māori population of New Zealand.

The article was referring the work of Rod Lea and Geoffrey Chambers (2007), who genotyped allelic difference in the MAOA gene between different ethnic groups including Caucasian, Chinese (which interestingly had the highest rate of the low allele frequency), African, Hispanic, Pacific Islander, and the Māori people. Essentially, the work of Lea and Chambers (2007) operated as a genetically informed *biographical artifact*. This artifact both relied upon and reinforced specific cultural tropes of the Māori history through the lens of genetics., by suggesting that 'warrior-like' tendencies and characteristics of the Māori population were shaped, at least in part, due to a higher prevalence of the MAOA low variant gene in the population (Lea and Chambers 2007). Like other contemporary biocriminologists, the authors cautioned against reading too much into the findings. Lea and Chambers (2007:3-4 emphasis mine) stated:

> In an effort to explain the significance of our research findings we reason that the MAOA gene may have conferred some selective advantage during the canoe voyages and inter-tribal wars that occurred during the Polynesian migrations and may have influenced the development of a substantial and sophisticated culture in Aotearoa (New Zealand). It is important that the incidental formation of this "warrior gene hypothesis" is interpreted for what it is—*a retrospective, yet scientifically plausible explanation* of the evolutionary forces that have shaped the unique MAOA gene patterns that our empirical data are indicating for the Māori population… *negative twisting of this notion by journalists or politicians to try and explain non-medical antisocial issues like criminality* need to be recognized as having *no scientific support* whatsoever and should be ignored.

Still, the correlation between VAB and the Māori population was immediately critiqued for a lack of scientific rigor, including very low numbers of participants in the study—only 17 persons were used to make the generalization of the Māori population (Merriman and Cameron 2007; Wensley and King 2008). In addition, no genetic test was performed in a larger sample of the

Māori people to confirm the claims made between their supposedly innate behavioral traits and warrior gene (Hook 2009; Merriman and Cameron 2007). Yet, there continues to be a proliferation of books, academic peer-reviewed articles, online blogs and websites, and newspaper stories about the possible biological links to VAB with references to the 'warrior gene.'[3]

Another important point to highlight here is Lea and Chambers' comments on the relationship drawn between the mishandling of scientific evidence and stigmatization. The biocriminologists that I spoke with agreed that the greatest potential negative consequence of their work is *stigmatization of the study groups*. However, as I will demonstrate in this chapter, the potential for individualized *stigmatization* does not capture the ways in which these behaviors have already been *raced*, or how racialized and gendered meanings are built into the construction of such definitions, reconstituted through biological research on VAB, and potentially operationalized to reinforce both racialized and violent stereotypes of certain groups.

As a *biographical artifact*, the narrative of the warrior gene continues to be utilized as a suitable title for the MAOA gene, and such cautions by the authors have not stopped the larger stereotypical associations to be continually made and remade concerning the Māori population, genetics and VAB. As noted by Gillett and Tamatea (2012:50-51):

> The idea of 'the warrior gene' crystallizes a western individualist way of looking at human behavior, social structure and crime. It is based on the idea of defective individuals who carry within them the seeds of badness. This political 'regime of truth' is often aided and abetted by reductive biomedical science and popular genetics…such 'branding' serves only to distort reality and create misleading findings reflecting scientific and political convenience and a media-friendly package of poorly understood concepts conducive to moral panic.

Thus, the focus on biological determinants of VAB, especially without adequate notice of social and cultural factors, can further marginalized already disadvantaged groups. Therefore, Lea and Chambers' caution concerning the misuse of their work, does not fully or sufficiently capture the more subtle, more systematic, and/or more infrastructural ways in which the relationships between racialization and biological research on VAB persists.

'Bio-social' criminology and race

In a recent example, Florida State University *biosocial criminologist* Kevin Beaver and colleagues (2010) demonstrated the used data from the National Longitudinal Study of Adolescent Heath to argue that the presence of the 'warrior gene' in males correlated to gang membership. They also contended that gang members with the low variant MAOA gene were more likely to use weapons in fight compared to other male gang members without gene variant. While the majority of the population used in the study self-identified as white—and race was noted as non-significant factor—the conclusions made regarding the relationships among gang membership, weapon use and innate genetic make-up are still very troublesome. Moreover, even without an explicit effort to engender racism, such claims do not address how this knowledge is utilized within society, or how interpretations of such knowledges can help reinforce highly racialized stereotypical views around violence and gang membership already prevalent in the United States.

The work of Beaver and colleagues (2010) represents a more contemporary approach to biology and VAB that is solely within the discipline of criminology. This research represents a branch of criminology that has been rebranded as *biosocial criminology* (see Beaver 2009; Walsh and Beaver 2009b; Wright and Cullen 2012). While not very distinct from the ontological and epistemological claims made and used in *neuro*-criminology, there are some methodological distinctions between the two biocriminological perspectives that are helpful to outline in order to fully understand their current and future impacts.

As a sub-discipline of criminology, biosocial criminology is devoted to revising criminological theory to view crime and VAB as a product of the interaction between both biological *and* environmental factors. Since the turn of twenty-first century, the larger infrastructure of criminology has gradually shifted to incorporate the bourgeoning views of biosocial criminology. The sub-discipline's recognition as a contributing section and presence at national criminology conferences has expanded, the number of undergraduate criminology textbooks with sections devoted to biosocial criminology has increased, and there has been a steady rise in number of undergraduate and graduate classes on biosocial criminology (DeLisi and Piquero 2011; Wright and Cullen 2012). Moreover, as I will show below, there are also very significant differences between the biosocial criminology and neuro-criminology perspectives regarding the operationalization of race in biocriminology research, and the current and potential ways in which the effects of racism on and racial disparities of VAB have been conceptualized. Biosocial criminologists argue that sociologically-based criminology has placed too much emphasis on environmental and social causation models of VAB, while ignoring and/or condemning biological determinants of VAB (Ferguson and Beaver 2009; Walsh and Beaver 2009b; Walsh 2002). These criminologists have essentially argued that traditional criminology has lacked the empirical power to best understand VAB and crime, contending that such gaps in criminological theories can make more complete with the addition of a combination of genetic, neuroscientific and evolutionary biology perspectives (Walsh and Beaver 2009a). At the same time, biosocial criminology is not exactly synonymous with the more neuroscientific-based research on VAB presented throughout this dissertation.

Biosocial criminologist have noted that their brand of criminology emphasizes and illuminates the often overlooked individual differences in VAB and crime, which has led to attempts to re-conceptualized older criminology theories by incorporate biological factors into these models. Yet, these researchers are not neuroscientists or geneticists by training. In place of these more contemporary technoscientific tools, these researchers have relied solely on *quantitative heritability genetics*.[4]

Recently, biosocial criminologists have attempted to reinsert biological claims of VAB into traditional criminological theories, to help buttress their own claims about the validity of biosocial models for VAB. For example, John P. Wright and Kevin Beaver (2005) tested Michael Gottfredson and Travis Hirschi social control theory of crime.[5] Gottfredson and Hirschi's (1990:90) theory claimed that persons with low self-control are more prone to VAB and crime, and can be characterized as "impulsive, insensitive, physical or [less mental], a risk taker, short-sighted, and nonverbal." Gottfredson and Hirschi's emphasized that low self-control was essentially a product of inadequate parenting. Thus, it is not too surprising that Gottfredson and Hirschi's theory, which focused on an individual level explanation of VAB, has been used as a template for biosocial criminology. Wright and Beaver's (2005) genetic revision of the theory ultimately concluded that parental measures used to understanding social control theory are often inconsistent, and that the parental effect on a youth's low self-control—stressed as vital in Gottfredson and Hirschi's theory—was actually negligible. Using a genetic heritability model of VAB, they argued that a more *genetically* informed measure can address the theory's shortcomings on parental measures.[6] These attempts to *transform* the very basis of older criminological theories are regarded by biosocial criminologist as attempts to make such theories more 'complete,' or to elucidate all the 'facts' of VAB. The idiom 'more complete,' or the concentration on the 'facts' of VAB, is used to rebuttal critiques of biocriminological models of VAB and to legitimate claims of biological causation. My concern here is on the attempt to inscribe biological and neurobiological claims into general criminology theories, and the more troubling assumption; that genetic or neurobiology information *always* provide a more informative or complete understanding of the causes of VAB.

Two years after Wright and Beaver's publication, they teamed up with Matt DeLisi to retest Gottfredson and Hirschi's theory in relation to executive brain functioning. In this retest, Wright, Beaver and DeLisi 2007) used data from neuropsychological performance tests to argue that Gottfredson and Hirschi's theory can be reformulated with the addition of neurobiological measures and theories of VAB. Again, the authors relied on statistical analysis to make this point, and did not perform any neuroimaging scans on the population at question, nor is there evidence that these populations underwent any neuroimaging scans. As mentioned in chapter four, neuroimaging studies that have used neuropsychological performance test to help buttress claims about VAB and brain function or structure have often been critiqued due to ambiguous findings and the difficulties in interpreting the meanings of such findings. Therefore, the conclusions drawn here *without* any attempt to actually measure brain function would seem to be limited by this critique as well. Still even if these methodological issues are resolved, the most disturbing elements of this contemporary biosocial criminology movement are the views on race and racism.

While it does appear that biosocial criminologists have been more open to addressing the 'question of race,' the conclusions they reached concerning VAB and race do not represent fresher attempts to understand the complexities of race on crime and VAB, but unfortunate attempts to revive older racist assumptions.[7] These attempts, while not explicitly advocating eugenics, work to restore older racist explanations for crime and VAB through *pseudo* bio-social scientific theories that are more analogous to the works of Lombroso's 'born criminal thesis', psychologist Arthur Jensen's claims on IQ and race, and/or Mark, Ervin and Sweet's thesis on brain diseases as the underlying cause of riots by African Americans.

The epistemological stance taken by biosocial criminologists seem to be rooted in antiquated evolutionary biology claims. Such claims become clear through research on race and gender by a few of the leading biosocial criminologist. For example, in an article on race and criminal behavior titled, "Inconvenient Truths: Race and Crime," biosocial criminologist John P. Wright (2009:151) argued that:

> The connection between race and criminal behavior is clearly complex and involves a range of historical, social, psychological, and individual variables. Evolution, however, provides a powerful mechanism to understand the development of human races and the distribution of traits and the behaviors within and across races. It helps explain why races would appear and under what condition races would appear. It helps to explain why certain traits would be beneficial and why these traits, such as higher IQ, would be unequally distributed across races. Moreover, evolutionary theory helps explain why race-based patterns of behavior are universal, such as black over-involvement in crime. No other paradigm organizes these patterns better. No other paradigm can explain these inconvenient truths.

Wright regarded this attempt as 'inconvenient,' but a truer and more accurate account of the relationship between race and criminality. He contended that VAB rates are *universal* and *constant* across specific racial populations, and that there is a clear pattern of black over-involvement in crime. Such claims are less of a true bio-social understanding of VAB, and are more accurately understood as neo-Lombrosian theories of crime that privilege biological factors as the roots of crimes and promote racist understandings of VAB. Thus, Wright's 'inconvenient' thesis excuses larger social practices, discourses, and institutions that structure the meanings of race, ostensibly excusing larger social inequalities and prejudices as contributing factors on racial disparities in crime rates in favor of an explanation centered on 'natural' inabilities or deficiencies of specific races and genders. While, Wrights views are certainly repulsive, unfortunately they are not the only such views represented by biosocial criminologists.

In an attempt to explain the relationship between race and violence, Walsh and Beaver (2009a) attempted to tie evolutionary biological theories and recent research on the brain and violence to traditional social disorganization and subcultural theories of VAB. In particular, they used Elijah Anderson's (1999) "code of the street" thesis as evidence that crime committed by African Americans is the products of a subculture of violence, and molecular biological changes in this population has enhanced the probability of violence in these neighborhoods.[8] On the one hand, Walsh and Beaver's explanation attempted conceptualize the role of the social environment as a possible trigger for biological changes at the gene or brain level, which has gained much more credibility through contemporary epigenetic research. On the other hand, they essentially committed the same mistakes as Wright (2009), in a pseudo attempt to tie biology and social environment, as they contended that elevated crime rates by some African American neighborhoods are the products of African Americans males *naturally* having more testosterone than their 'white' or 'Asian' counterparts.

Here they tried to repurpose Anderson's notion of 'campaign for respect' to terms of biological natural selection. They argued that higher levels of testosterone in African Americans represent an evolutionary advantage when it comes to selecting women for sexual reproduction. Walsh and Beaver (2009a:93) pointed to the 'campaign for respect,' as a positive consequence of genetic fitness, that is settled through 'aggressive' competitions over limited resources and often 'trivial challenges' to male's reputation. Furthermore, Walsh and Beaver (2009) also noted that such disorganized social conditions can lead to brain level changes. Specifically, they stated that since African American children are more likely to suffer from child abuse (which was not defined), or to witness violent crime, they are more prone to changes neural circuitry.

Beyond the racist undertones present in this claim, there is also a problem with the methods used to structure such claims. While neuroscientists do agree that the brain is not static and that it does continually change throughout our lifetimes (Interviews: Dr. Garrett 11/07/2012; Dr. Jones 04/23/13; Dr. Lewis 11/14/12), Walsh and Beaver (2009a) did have any imaging data to support their claims, nor is there any indication of the baseline or what the normal brain looks/operates like before these proposed environmental changes take place. Thus, it would be difficult to empirically prove that the brain has changed due to the living conditions, and it would be nearly impossible to link these supposed evolutionary root causes to higher VAB rates in these communities.

In two more recent publications, biosocial criminologists have concentrated on the relationship between VAB and experiences with racism. These accounts did not explicitly stress biological differences, but both attempt to erase or minimize research that links the effects of *racism* on youth behavior. In one account, Beaver and colleagues (2011) argued that they found *no evidence* of bias toward African American children by American grade school teachers. Instead, they stressed that racism plays no role in the way teachers evaluate academic or behavioral performance of African American students, and that their poorer academic and behavior execution is the result of substantial social skill deficits compared to their peers. In another publication, this time by Wright and colleagues (2014), they also argued that racism has no role in structuring or affecting the behavior towards or conduct of African American students. Using the same data as Beaver and colleagues (2011), they focused on differences in school suspensions between African American and white students, and said that such differences were best explained by their history of *prior bad acts*. While, the focus on prior bad acts is not an illogical variable to examine, there is little doubt that these current attempts to render racism a non-factor is aligns well with the larger color-blind movement within the US, that considers racism a problem of the past, and often reinforces racial stratification through contemporary practices that supposedly favor ‘race-neutral’ policies and practices (Bonilla-Silva 2006; Brown et al. 2005; Goldberg 2009). Essentially, I argue that research from biosocial criminology illustrates well what sociologist Troy Duster (2006b) termed the ‘reductionist challenges.’

Duster (2006b) warned of the expanding influence of reductionist science, through the growing authority of technoscientific practices and technologies, would lead to an even greater search for individualized and biologized explanations for society’s problems. Biosocial criminology exemplifies the need for this ‘reductionist challenge.’ While, the majority of biocriminology has adamantly professed that the discipline has shifted its stance on race, the views provided here from biosocial criminology illustrate a renewed effort to explain racial differences in crime and VAB as innate, biological and mental defects. Such research excuses or ignores larger social factors, institutions, and practices that structure and make meaning between identity and lived experiences. Therefore, I argue that these views espoused by segments of biosocial criminology represents a contemporary reductionist attempt to re-make *race* (through the biologization of race) a more *serviceable variable* for current biosocial research on VAB, and as a result it render *racism*, or the effects of and lived experiences with race, *an insignificant factor* for crime and VAB. In contrast, my conversations with contemporary *neuro*criminologists (see below) revealed a different viewpoint on the role of race in biocriminology. Neurocriminologists suggested that race was *not* a useful factor in biocriminological research, but maintained that racism *could* affect how *VAB* manifests within society.

THE USE OF RACE IN CONTEMPORARY NEUROBIOLOGICAL VAB RESEARCH

While the mention of race in neuroscience research on VAB was often absent, the neuroscientists I interviewed provided an understanding of neurocriminology's approach to the 'question of race' and VAB. Neurocriminologists conceptualized race through social, economic and/or cultural frameworks, which deviated from the perspectives of biosocial criminology Here, I argue that in contrast to biosocial criminologists, neurocriminologists diminished the role of race as a causal factor in crime or VAB, but recognized that racial discrimination can affect VAB.

Taboo: the 'question of race'

When talking to neurocriminologists about the 'question of race' in neuroimaging research on VAB, it become clear that the 'question of race' does affect how researchers think about their research and how they present their research findings. Researchers stated that while aware of the past issues concerning race and biocriminology, talking about these issues or contemporary concerns with race was regarded as a restricted area of conversation within the discipline. My conversation with neuropsychiatrist Dr. Garrett made me aware that the difficulties with addressing race, and it suggested that the practice of 'avoiding' race may be more pervasive throughout biomedical behavioral research. Moreover, as Dr. Garrett (11/14/12) alluded to, these issues are perceived as more salient in the United States.

> I guess that the racial differences in [VAB] that you're asking about are [the product of] *socioeconomic and environmental factors*. I mean, it's very interesting that it's not something that's touched on particularly well in logical work at this stage. But, it's just too sensitive. For example, there was very interesting work concerning immigration and the effects of ethnicity and the over-representation of black and minority ethnic groups in British psychiatric systems, which all came from British data. This research wasn't the sort of thing that was looked at by American epidemiologists, so there can be cultural

biases operating at that level, concerning what types of research can actually be done. On the one hand, Dr. Garrett's initial reference that the source of racial differences are rooted in SES and/or environmental processes is important because such comments represented a common interpretation of these differences by other neurocriminologists (see below). However, Dr. Garrett's statements are also important because they exemplified the larger sentiment concerning the difficulties, or underlying *taboo*, surrounding the 'question of race' for biocriminology. While I only interviewed three neurocriminologists outside of the USA, all reiterated similar statements concerning the differences in thinking and addressing issues of race/ethnicity in the USA versus other countries. All three commented on their observations of *more* resistance and/or anxieties to addressing the question of race in US biocriminology. While, these three perspectives are not enough to draw any clear conclusions about the differences in research practices in the USA and other countries, my conversations with American scientists supported these sentiments. Most American neurocriminologists reiterated that race continues to be a taboo subject to talk about even among peers.

As mentioned at the start of this section the mention of race is very limited mention in published neurocriminology studies. Even when describing demographic information about the study's sample, data on race was often absent from the final publication. Some of these omissions may be the product of larger infrastructural practices for scientific journals, in which very limited space may constrain how researchers present their research. However, in the articles mentioned race the concept was often only touched upon briefly. Alternatively, race may be included only in reference to the study's sample, as a way to confirm that the sample was *matched* for race/ethnicity, assumingly allowing the researchers to control for any racial differences in findings. Anthropologist Joseph Dumit (2004) reported similar findings on the ‘absence of race’ in his ethnographic examination of PET imaging technologies. Dumit (2004:62-63) stated that published PET neuroimaging research often had inconsistent measures for race, or as a preventive measure these studies removed race altogether to minimize any cofounding effects. However, I found that even when there was information provided on race, articles still had very little written about race beyond demographic information. In addition, there were even fewer discussions about race and the potential and/or future effects of VAB knowledges used beyond the lab. To be clear, I do not mean to suggest here that race *should* be a variable neurocriminological studies. Race and ethnicity are not biological products, but instead are produced and reconstituted through discursive social practices, institutions, and relationships. Moreover, the politics of race structure and make meaningful lived experiences, social environments, and behaviors—including criminal, violent, or aggressive behaviors (Anderson 1999; Duster 2006a, 2006c; Gabbidon 2007; Hawkins 1995, 2003; Pinderhughes 1997; Wacquant 2005). Therefore, the ‘question of race’ is important to acknowledge and even discuss in a discipline that studies VAB and crime, and understanding how VAB knowledges affect specific racialized communities is important if we are to take serious the prevailing ways racism continues to unequally structure lived experiences.

When I asked neurocriminologists to describe their thoughts on race, and how they think about the implications of their research in comparison to past research from biocriminology, it was reiterated that race was just not an easy subject to talk about. Dr. Smith (05/07/13), a neuropsychologist from an American east coast university highlights this point:

> Well, I mean what I've tried to do is a lot of community outreach. [It] is part of our recruitment strategy, and it ends up serving multiple goals, which is good. We go to local groups that work with kids with behavioral problems, and ask [the groups] to help us with our recruitment goals. We talk to them about what our research finds and *what it doesn't find*. I feel like the questions that you are asking about race are really interesting, but a lot

> of researchers will be *extremely* reluctant to address them at all.
>
> For me, I think of the really racist historical events that have happened as not too distant history, and I actually teach about them in my classes. I teach a class on the social impacts of research on aggressive behavior, and I *certainly* teach undergrads about how important it is to not fall prey to older assumptions [about race and aggression]. I talk about the history of believing that there are racial differences in aggression, you know? So, I talk about [the question of race] quite a bit with students, *but I don't bring it up as often in professional talks, mainly because it's such a loaded topic, you know? Again, a lot of people are just afraid of addressing questions about [race].*

This researcher's comments highlighted the importance of teaching students about the history of biocriminology and race. However, it also conveyed a much different message in relation to conversations among colleagues. Dr. Smith's responses point to the difficulties of having these conversations about race with colleagues. And while it is inevitable that off the record conversations about race are probably taken place, the more *public* conversations on race—*as in open discussion among researchers*—in neurobiological research have most often remained silent. Thus, this suggests that some neurocriminologists may view race as irrelevant for contemporary biocriminology.

This perspective that race is not important for neurocriminology, was voiced Dr. McKinney, a researcher who studies the neurobiological mechanisms of psychopathic traits in youth populations. Dr. McKinney (04/11/13) said, "I just don't think that any evidence that currently exists shows any major differences based on race or culture or even gender that we can pick up with fMRI... if we do see any differences it is probably just 'noise.' However, interestingly Dr. McKinney went on to tell me that "the fact is journal reviewers get very excited about the ['noise']" and want us to tell them more about such differences which, "we'll do for a reviewer, but we never find any [significant] racial or gender differences." Therefore, the 'question of race,' (as well as gender), does have one platform in which it is 'permitted' to be explored in neurocriminology, during the article review processes. However as stated above, such conversations, excitements, and/or concerns, are not reflected well in final publications. This suggests that such processes are intimately embedded within the larger infrastructure and knowledge production process of biocriminology, and may operate as a way to shield researchers from any potential backlash coming from either outside and within the discipline.

Other researchers, such as neuropsychiatrist Dr. Hollowell also shared trepidations about concerning race. Specifically, Dr. Hollowell (10/29/12) expressed concern about finding racial differences in the biocriminology research.

Oliver:	How do you recruit the participants for your study?
Dr. Hollowell:	We run ads and they read them on Craigslist or in the newspaper, or an ad on a bus or the radio. The ads may say something like, “Does anger get you into trouble?” or “Can you keep [anger] from getting you in trouble?” And that's when they come in.
Oliver:	And, can you describe the demographics of the populations recruited for your research, and are there any significant findings related to these measures?
Dr. Hollowell:	Yeah. So, there's a little bit of an excess of men versus females in our studies, and we have more African-Americans in our sample than typical samples for [this personality disorder]. Which probably means that less of our participants are white [compared to typical samples]. And then, we have some participants that identify as Asian and some that identify as Hispanic.
Oliver:	How do you think your research is perceived in relation to race?
Dr. Hollowell:	You know, I don't know how my work is perceived around the issue of race, because I haven't really reported any race issues. So it's not like I've written any papers and said, ‘aggression is more likely in blacks, and it's more likely because of serotonin levels are abnormal more in blacks than whites’ I don't have those kind of findings, so hopefully people will not think of my work in those terms.

> We don't think there's any race thing going on here. We do think, however, it is probably, you know, *socioeconomic factors* here, and certainly an *education thing*. And certainly younger people tend to be more susceptible to this [VAB personality disorder] than older people, but that's kind of expected. But, we haven't been overwhelmed with any demographic differences…And let me tell you something. *I'm glad I don't have those findings.*

Oliver: What type of findings?

Dr. Hollowell: *I'm glad we don't have any findings that show [racial differences].*

Dr. Hollowell works with adult populations, and the combination of study locale, and advertisement strategy has enabled this research group to recruit fairly diverse populations compared to other researchers. However, while remarking on the more racially diverse study population, Dr. Hollowell also expressed a sense of relief that their research has not found any racial differences. By comparison, other researchers that work more explicitly with youth populations actually reported having a more difficult time amassing a racially diverse population, yet still described some hesitation in talking about race or finding racial differences in VAB. As Dr. McKinney told me, their lab has had difficulties recruiting 'targeted groups' due to longstanding historical and cultural barriers, and the stark social and class differences between study and normal populations. Dr. McKinney (04/11/13) stated that:

> The one chronic problem we do have in recruitment is a high proportion of scientist's kids, researcher's kids, and physician's kids, so we get kids with relatively high IQ scores because the easiest healthy kids to recruit tend to be kids of people on campus. The good news is that [my campus] is very, very diverse, so we get a pretty good population. But, that's not the case in our target population, although we do look at a lot of different communities and recruit through community advertising right now. Honestly, when you look at it, it's a bunch of white people right now in the lab, and although we have an African American scientist in our group, this still does not dramatically improve our recruitment numbers [in terms of race]. *There is still kind of historical and cultural barriers that we have not overcome.* We have tried so many times to work with [inner city school districts]. However, [I feel] there's some suspicion of us. *Again, it's always*

the poor communities that get experiments done on them, and they're again, understandably, somewhat dubious about it.

What I find important here in Dr. McKinney's statements is the awareness of the historical and cultural barriers and the types of methodological and recruitment steps taken by researchers to quell such concerns. As mentioned in chapter two, a challenge for contemporary researchers is to both embrace technoscientific practices as a means of better elucidating the determinants of VAB, while at the same time avowing that such research will not be used as a eugenic, social controlling, or discriminatory device. As demonstrated in the comments above, even as the popularity and allure of neuroimaging tools have increased, marginalized groups are still seem weary of the promises of such tools, and the overall goals of such science; even when these technoscientific practices are presented as potentially promising ways to address pressing issues like VAB. Thus, for potential study participants, the *taboo of race* is not so much the fear of being labeled prejudicial, but instead these 'historical and cultural barriers' (as Dr. McKinney observed) are expressed through mixed feelings of anxiety, mistrust, and/or awareness of the potential misuse of scientific experiments on marginalized groups (Duster 2003; Montoya 2011; Reardon 2005; Roberts 2011; Washington 2006).

Also important here is Dr. McKinney's description of the processes through which meaning is made through the correlations between normal and targeted groups. While it was not clear what the respondent defined as a 'very, very, diverse' campus population, overall trends in higher academia and biomedical research suggest that there are a low number of African American and Latino faculty members.[9] Moreover, the construction of normal populations using faculty member's children may reflect more than just differences in race/ethnicity. Instead, the use of normal populations also illuminates the disparate social qualities between the groups such as social class, education, and social and cultural capital. All of these factors affect one's experience with and understandings of VAB. Thus, how do neurocriminologists make sense of these effects in their work? And, how do such interpretations impact the overall understanding of race and VAB for biocriminology?

Complexities in conceptualizing and measuring race, a 'colorblind' biocriminology

When speaking about the difficulties researchers have when discussing the 'question of race,' neurocriminologists also suggested that race was *too difficult* to conceptualize and measure in neuroimaging research on VAB. As said by Dr. Moore (01/24/14), a neuropsychiatrist who uses various neuroimaging techniques to understand psychopathy, 'I think the scientific community tries to be scientific without, you know, looking too much into race." Others such as Dr. Jones (04/23/13), a neuropsychiatrist from a northeastern American university, explained why the question of race has been ruled a 'non-issue' in contemporary VAB research.

> You see, [neuropsychiatrists] have fidelity to the phenotype, and then all the rest we don't care. It's not that we don't care, but we sort of blindly look for the things that predict the phenotype of aggressive behavior. And, *the phenotype has nothing to do with race or even education or things like that*. It has to do with very specific questions and very specific psychiatric interviewing [practices], which does not ask about demographics or anything like that. So, I don't feel like [race] is an issue too much, although I'm aware of past problems, I think all the young scientists are aware of the history of aggression research.

Therefore, while researchers noted the complexities in defining and operationalizing race in their studies, they contended that race actually plays *no role* in their research. Dr. Jones's comments implied that there has been somewhat of a paradigm shift in how scientists think about the make-up of useful phenotypic characters, and race is just not seen as a useful factor anymore. This statement also highlighted how researchers understood the 'question of race' as being a question exclusively about racial differences, and specifically that race as a variable does *not* help them predict anything concerning differences VAB. Throughout my interviews when I asked neurocriminologists about race, they often interpreted my question as a query specifically about racial *differences* in VAB. Thus, if race is useful, it is understood as an operational *variable* for researchers to use. This conceptualization overlooks the complex ways in which race/racism structures, interacts with, helps produce lived experiences, and makes meaning of VAB.

Dr. Smith (05/07/13) further exemplified this point in another way, declaring that the effects of *racism* on VAB are complex, but at this point are too difficult to operationalize in neurobiological research. Dr. Smith's comments alluded to the idea that such complexities may also be somewhat inconsequential since many factors used to measure VAB are 'race-neutral.'

> So, because I'm looking at such incredibly basic, low-level, simple variables, I really don't end up spending a lot of time thinking about racism and those levels of complexity. I mean we're just not there yet in understanding [aggression]. I know that there are interesting questions to be asked, but I don't feel ready to actually add that layer of complexity in my work yet. And it's not that it's not important. I see [racism] as a covariant that is important to keep in mind, but not one that I have any theories about right now. Now we certainly would never speculate about the role of race in any of our findings. We just kind of leave it unsaid. Now, I suppose it's possible that people reading the research assume that if we're studying kids with behavior problems, that these kids in our studies are black. But, I don't know. Does that mean I should state strongly that the variables that we're looking at are *race-neutral*, which they are as far as we can tell, I don't know. It's tricky.

These comments illuminate researcher's concerns with the 'question about race' and the possibilities of re-enforcing stigmatizing social stereotypes. The concern that many neurocriminologists have with stigma does not reflect the potential stigmatization that can be imbued by scientists themselves during research practices, but with others outside of the science who may mis-interpret neuro-knowledges of VAB in prejudicial ways. Plainly stated by Dr. Lewis (11/07/12), "I think a scary consequence of the research would be that people who are diagnosed with a [VAB] personality disorder are *labeled* as something. The problem with [VAB] is that it's kind of bad to have it, so people aren't going to be rushing forward wanting to be identified as having [VAB] personality disorders. It's not like depression, you know?...Potentially, everything that comes from research can be viable or useful, except unexpected stigma."

Overall, the majority of neuroscientists I talked with gave similar comments, noting that they may use predetermined self-identified categories like race in research, but all of their findings are *race-natural,* or that the 'question of race' is just too complex to understand right now through current technoscientific practices. What we see here is the complexities of race for contemporary biological research on VAB, through a *color-blind* racial framework (Bonilla-Silva 2004; Brown et al. 2005). Moreover, as Troy Duster (2006c:3) has accurately noted, the 'unenviable task' of researchers is that they must think about how to effectively consider racialized experiences of VAB, without "endowing race with a false sense of biological determinism," or contributing to and/or buttressing individualized racist explanations for VAB. When I pressed harder to ascertain a better definition of race and for more clarity concerning how researchers thought about the potentially racial effects of neurocriminology, researchers attempted to elucidate the 'complexities of race' as products of *culture* and/or *socioeconomic influences.*

Racial differentials in VAB as a product of class or culture

As highlighted in earlier responses from neurocriminologists Drs. Garrett and Hollowell, the effects of race on VAB were understood by researchers as products of socioeconomic or cultural factors. These two factors accounted for the bulk of responses given by interviewees to better elucidate the relationship between race and VAB. These factors were framed as better explanations for observed racial differences in VAB, and they were utilized in neurobiological research to demonstrate the ineptness of race as an explanatory variable for VAB. Dr. Lewis'

(11/07/12) explanation captures this viewpoint.

Oliver: What are your thoughts about contemporary critiques of biological theories of criminology, which are weary that neuroimaging or genetic research on VAB can help reinforce racial stereotypes of criminal or violent behavior?

Dr. Lewis: *Well, certainly, I think it's important to understand culture, race, gender--all of those different types of variables that might lead to differences*. With respect to [VAB] personality disorders, however, I think that there's lots of evidence that says that they *do not discriminate*. They're equal opportunist…I think that the reason why there's such inequality in violence is because of *socioeconomic problems and socio-demographic kind of problems*. I mean, if you grow up white, black, or Korean, in a gang-infested area because of poor supervision, or no parents—all different social reasons—you're going to have an elevated rate of getting into trouble, arrested and going to prison. Unfortunately, minorities generally are more likely to come from low socioeconomic, high-poverty, high-crime areas. So, they tend to be over-represented in the prison population. And like I said at the beginning of the interview, there's lots of very good explanations why people commit crimes, and it has nothing to do with the neurobiology of violence, you know-- because all of us are capable of being violent.

During this interview, Dr. Lewis also expressed frustration with other biocriminologists who have attempted to apply a biological lens to *all* VAB and crimes. Dr. Lewis drew a distinction between psychopathy (as a more recognized problem that is biologically based) and other types of antisocial behaviors, including some types of criminal behaviors, that he noted could have any number of good explanations for their causes. While, Dr. Lewis does believe that *all* behaviors are brain-based, the description here also reinforced earlier responses concerning VAB as too complex to be fully elucidated using the current technological methods. However, this response also inadvertently points to another key point used to help understand race and VAB, the use of culture as a proxy for race.

Dr. McKinney (04/11/13) argued that cultural plays a much larger role in VAB than differences in race, but also noted that such differences cannot be picked up with the current technologies.

> It doesn't matter where you're from men are men and women are women. And, there is not culture in the world that doesn't have a concept of male and female. It's robust. So if we can't gender differences, something that so universal that it cuts across all cultural boundaries, we can't pick up differences based on race. We are not there yet. It's not that I don't believe that racial differences exist. I think that ultimately though we'll find that *culture plays a dramatically larger role than the actual genetic variances that make people appear one race or the other*.

Dr. McKinney's description translated racial differences in VAB into an expression of *cultural differences.* It also suggested that contemporary technological tools are not sophisticated enough to even consider elucidating the causes for racial differences in VAB. Thus, this description seemingly rejects that contemporary neurocriminology could, or is capable, of reproduce the more racist biocriminology practices and misuses of past biocriminology.

Dr. Young who studies aggression in both humans and animal populations also mentioned the salient role of culture. Dr. Young (01/15/14) said that, "understanding aggression in animals is a lot more cut and dry. You know? You can count the number of times where one mouse chases the other one, or bites the other one. Whereas with humans and aggression, it seems to me *culture* is going to be the big factor." Dr. Moore (01/24/14) reiterated this view when describing the varying rates of psychopathy. This statement remarked on the rarity of the diagnosis its pervasiveness across the world's populations, which, for Dr. Moore, serves as a reminder that VAB understandings differ across cultural locales.

> The same diagnosis may differ across countries. If you go to countries in the Middle East, there's variation there when you compare specific countries in terms of the rates of psychopathy. If you go to other countries like Japan, the rate also varies. However, interestingly some studies argue that some countries have no rates of psychopathy, which is unlikely. Such understandings are products of cultural and protective mechanisms functioning within the community.

Cultural explanations were employed here to help better explain VAB as highly pervasive but contextualized behaviors that mirror larger values and customs of particular countries, cities, and groups. Dr. Fitzpatrick (01/14/13), who further emphasized this point when talking about the differences between biologically measurable factors and socially mediate factors used in VAB research.

Oliver:	Can you define what you mean by differences in sex and gender?
Dr. Fitzpatrick	Sex is biologically defined by the set-up of sex chromosomes, something that we measure in the DNA. If you have a Y-chromosome, you would be male in terms of sex, and if you don't, you'd be the female. The presence of a Y-chromosome determines differentiation of the body into the male domain. Gender, on the other hand is your psychosocial assignment of male or female, and there are whole shades of gender that exists here that divulged from biology. So gender is psychosocial, and there are differences between biology and psychosexual, right? So gender, in terms of operationalized in my research is simply self-categorization. In regards to race, this is a very fuzzy concept. Two biological entities are of different race if they cannot inter-breed, right? *So there are no human races*. What we are talking about are *ethnicities*. And, *we treat ethnicity like gender.* We ask people to provide their ethnicity, and we can confirm this by looking for it in their genome. Again, we're looking for something called et*hnic stratification or mixture*, which does not map onto people's self-definition completely. We're just controlling for [ethnic] variability of ancestry through genetic means.

Dr. Fitzpatrick statements further complicate the view of race; here *race is seen as a much less useable variable than ethnicity*. The use of ethnicity also suggests that these effects are viewed within a cultural framework. As noted in Chapter 2 of this dissertation, similar moves were made by the UNESCO panel when attempting to discard the use of race as a biological variable, they instead replaced it with ethnicity (Reardon 2005; Shilliam 2013; Whitmarsh and Jones 2010).

Such reliance and uses of culture to explain race reflect larger color-blind attempts within society (Bonilla-Silva 2006; Brown et al 2005; Moore, Kosek and Pandian 2003). As pointed out by Donald Moore, Jake Kosek and Anand Pandian (2003:43):

> [Identity] politics emerge in relation to the contradictory efforts to treat race in contemporary America not as a problem of bodily biology but as a question of cultural heritage. Liberal multiculturalism often disavows the complex history of racial violence, domesticating social antagonism through a celebration of cultural diversity. 'Color-blind' vision have emerged from a liberalism often blind to its own historical legacies—and contemporary politics—of exclusion.

The use of a cultural lens of race may overlook how race operates relational to other social factors including culture, but it also fails to recognize that race is not synonymous with culture. Thus, replacing race with culture does not solve the larger complications of capturing the operation of racial effects into biological or biosocial models of VAB (Whitmarsh and Jones 2010). Nevertheless, my interviews suggest that neurocrimiological technoscience is viewed as 'race-neutral,' or 'color-blind,' and that such views may help rationalize the perception that contemporary practices of neurocriminology are not capable of reinforcing racial inequalities, meaning that these technoscientific practices are seemingly regarded as being able to transcend the omnipresent influence of race or racialized practices/discourses.

In her work on the politics of risk and inequality in heart disease, sociologist Janet Shim (2014:108; 2005) has illustrated what she called the 'cultural prism,' or the biomedical practices of understanding racial/ethnic health differentials between racial/ethnic groups as a product of the group's cultural values, understandings, and practices. Shim (2014:108) described the impacts of the use of a 'cultural prism' in biomedical research in these words:

> At the least, the ritualized inclusion of race as a taken for granted variable, as well as the continued study of race-as-culture in etiologic research...neglects the role of race in organizing social relations of power and the effects of racialized interactions and structural racism on health. At worse, such practices can replace structured

> understandings of race with individualized ones that ignore the ways in which relations of power are embedded within the reciprocating representations of race and the material consequences such representations have on life chances.

I contend that neurocriminologists have also utilized a *cultural prism* to understand race and racial differentials in VAB, and like Shim (2014, 2005), I also argue that the impacts of this approach can and do minimize the effects of power. Therefore, while biocriminology has embraced bio-social theories of VAB, the social factors that they have found important for these models are often reduced to the biologically operable variables, or the impacts of race are reframed though a 'cultural prism' to help better individualize one's racially structured experiences, thus researchers can seemingly avoid accusations of racism or the taboo of discussing race among colleagues, by using a more culturally or socioeconomic based understanding of differences in VAB, thus demonstrating a 'color-blind' position on the issue of race and VAB. Moreover, the technoscientific practices and procedures that govern neurobiological research, including the construction of and comparisons with normal populations, may also contribute to researchers decontextualizing VAB, that is stripping it of its racial, social class, and cultural meaning (Duster 2006c). While such complexities were acknowledged in the remarks by researchers Drs. McKinney and Smith, ultimately they have been regarded as problems too complex to figure out at this point. While, I agree with them that race should not be used blindly to help rendering VAB diagnoses, the *social experiences* with race that their participants both live with and within are important factors to consider when trying understanding the causes of their participant's behaviors. Without properly unpacking these routine replies that essentially denote that 'race does not matter,' researchers may miss an opportunity to better address how racialized experience affect behavior.

The 'therapeutic promise' for contemporary neuro-research on VAB

In the last chapter, I pointed out how the technoscientization of VAB captures the shift from the *medicalization of VAB* to the *biomedicalization of VAB.* This transformation hinged on the proliferation of technoscientific practices, but also was enabled because of the revised stance regarding the therapeutic abilities of biotechnologies for VAB. In the era of biomedicalization of VAB, the therapeutic abilities of technologies for VAB— that were key to the medicalization of VAB (i.e. psychosurgeries)—have been reframed as *future promises* of therapeutic treatments and ambitions of bio-prediction of VAB for at-risk individuals. Three main findings emerged from respondent's interviews about the future therapeutic possibilities for VAB. *First*, interventions were said to work best if they are applied to youth populations at an early stage. Moreover, part of the efficacy of these future interventions would be to more precisely diagnosis and classify youth populations into groups that represent a) youth with antisocial traits alone and b) youth with antisocial traits and callous-unemotional (CU) traits (many times also thought to be more prone to *life-course persistent* antisocial behavior).[10] *Second*, researchers expressed that imaging techniques may actually help better enhance current treatment programs and potentially help deter future criminal activity for older youth groups and adult populations that are more at-risk, or already within psychiatric treatment centers or correctional facilities. *Third*, the therapeutic promise of contemporary biocriminology may help address race differentials in VAB. Since most researchers posited that the neuroimaging of VAB practices are 'race-neutral,' the possibilities of treatments were, stated their most mild form as being equally beneficial to all racial groups, and in the most extreme view alluded to as the *best* solution for addressing racial disparities in VAB.

The first point was best captured by Dr. Garrett, who explained that one of the future goals of research should be to better identify youth groups who are at-risk. This goal was seen as a needed requirement in order to properly diagnosis kids with antisocial traits as different from kids with antisocial traits *and* callous-unemotional traits. In chapter three, I noted that contemporary biocriminologists categorized children with callous-unemotional traits as the highest risk of developing psychopathy as adults (Blair 2003; Viding, Fontaine, and McCrory 2012). Below, Dr. Garrett (11/14/12) explained the importance of getting these classifications *right*, in order to effectively treat VAB in the future.

Oliver: Could you describe some of your future goals, or the ways in which you see your work potentially contributing to future research on violent or aggressive behaviors?

Dr. Garrett: Sure, I mean the first thing is to try to distinguish differences between sub-groups, and that's happening both in childhood and in adulthood. From here, we can begin to clearly define the neurochemical differences that inform treatment approaches. One thing we are very much in the dark about is the neurochemistry of these disorders, and this area of research will be huge the next few years. But really all the focus should be on early identification of people who are on this life course persistent pathway, and to help better optimize their treatment, or try and ensure we can help them get off the life-course pathway as a way to reduce the risk that they will go on to criminal courts or prisons in adulthood.

Oliver: And when you say treatment, what exactly do you mean?

Dr. Garrett: Well, working with the parents and the child to try and make sure that you're rewarding good behaviors, and that you're being structured and predictable in how you punish bad behaviors. As we talked about, the callous, unemotional kids don't really respond particularly well to being punished. So, for them we may focus more on rewards, on their self-interest, or even something like the interesting research that is using hormonal treatments like oxytocin to help callous-unemotional kids better respond to treatment programs. It's this psychopathic sub-group that's difficult to treat, so it's trying to specify the underlying neurochemistry, and deem to what extent the brain changes that we're demonstrating are revertable, you know? To what extent changes in the brain in any

> way inform their prognosis is an interesting question. Structural brains scans have been used to help predict if individuals are going to do more badly ahead of time, and we find that individuals who have empathy without any brain volume loss in [targeted] areas respond well to treatment programs, which makes you a little more sanguine about their future.

On the one hand, Dr. Garrett stressed the importance of better identifying youth on these *two* paths that neuropsychiatrists have outlined (ASPD with and without CU) because children with ASPD alone *have* demonstrated promising results with some treatment programs. Two interesting points should be pointed out here, both of which extend previous findings from this dissertation concerning how to best define and measure VAB. First, researchers who have prescribed to understanding youth VAB as either *life-course persistent* or *adolescent-limited* (Moffitt 1993), may not be capturing the incredibly dynamic way in which VAB actually manifests and varies over time. In conjunction, psychiatrists Rolf Loeber and Dustin Pardini (2008) have argued that changes in VAB must also be understood in relation to the potential changes that a person may incur at the brain/genetic level over a life-course. So the question is, do the same neurobiological mechanisms and variables (which are treated as static influences across a life-course), affect all VAB the same over time? Moreover, if it is true that VAB is changing over time, the brain is plastic, and gene expression is *not* static, then how does the combination of such factors affect the current ways in which scholars have linked neurobiological and genetic factors to VAB behaviors? Do the operation of these mechanisms also change over time, and if so which mechanisms best explain differing diagnosis of VAB? Another interesting point here was that most of the treatment programs discussed, and those provided throughout the neurobiological literature on VAB, prescribed most often to behavioral- or social-based treatments. While not ruling out future pharmaceutical treatments for CU youth, Dr. Garrett's response to general ASPD kids seemed to suggest that treatments would focus on improving which child-rearing practices work best to teach kids not to behave badly. Such approaches seem to be similar to the social learning theories of criminology, which argued that deviant behaviors can be mitigated through the combination of 'good' parental role modeling and the use of behavioral reinforcers and rewards.[11]

Secondly, Dr. Garrett's response also underlined the therapeutic promises of neurocriminology in referring to goal of potentially finding a future method to treat youth with CU, or adults with psychopathic traits. These aspirations were also noted by other researchers who specialized in psychopathy, and they were captured in the comments by Dr. Lewis, who argued that not all types of VAB would be beneficial to study at the neurobiological level. As stated in the quote above by Dr. Garrett, youth with CU traits have not responded well to any treatments thus far, therefore these behaviors that are said to effect a very small part of the population, potentially would benefit the most from neuroscience and genetics research by helping find newer treatments that can better target the neuromolecular and genetic basis of such disorders.

Dr. Lewis also noted that the key to future treatments for VAB is to better define and understand which individuals respond best to treatments. However, Dr. Lewis went one-step further, arguing that *good* research recognizes that the causes of VAB are multifaceted, and that it may not be productive to study all VAB at a biological level. Dr. Lewis (11/07/12) firmly stated:

> So I think we really need to focus on understanding people that have personality traits and problems, and understanding how these [violent] behaviors manifest as problems in all aspects of that person's life. Researchers need to be assessing and quantifying behaviors and traits and not just saying that they want to study violence in general. If it's a biological trait, a person will be violent at home, at work, at school, with their family, with friends. Whereas crime per se is very much a social problem. The best way to stop people from committing crimes is to keep them from going and returning to prison, to keep them off drugs, to get them a job, and to get them in a good relationship. It's

> miscarriage of justice and science to try to treat somebody who commits a single crime, as a violent individual. There are a million different reasons why people are violent, which means there's a million different brain neurons that were engaged differently. My point is, you need to be a good psychologist.

Being a good biocriminologists for Dr. Lewis, meant being more responsible in defining your population group, and like Dr. Garrett, Dr. Lewis agreed that the key to future research and treatment is to help individuals with psychopathy or CU traits, those individuals who are life-course persistent trajectory. However, a few neurocriminologists expanded this argument, stating that neuroimaging may be able to have a more robust effect on VAB. These neurocriminologists argued that technoscientific practices on VAB may be used as a way to evaluate which intervention programs for VAB work best, and for which populations.

Neuroscientist Dr. Holmes made a similar point about the use of brain imaging to better the chances of treatments for VAB. Dr. Holmes noted during our interview that modern work in neuroimaging might be able to address the issue of recidivism by neuroscientifically testing the efficacy of current community-based VAB interventions. Dr. Holmes said that imaging work in this area could help better elucidate neural circuits underlying risk-taking, which will lead to long sought answers concerning why some individuals continue to commit crimes or behave violent, while others do not. Here the renewed therapeutic promise is more directly tied to the technoscientific practices of neuroimaging. Essentially, Dr. Holmes suggested utilizing sophisticated neuroimaging tasks with fMRI technologies in an attempt to *recreate* scenarios that are similar to the current intervention approaches. In theory, these scans would help show if a person's brain reacts differently to varying intervention approaches. The hope is to narrow down which approach work best—using past information about which neural circuits are related to VAB risk factors like, risk taking—by isolating the approaches that do best; i.e. the tasks that do not activate brain processes related to risk-taking. While certainly a notable goal, if we could understand which programs work best then we could, more easily, tailor the right types of interventions to at-risk youth. However, the more complicated task, and assumption imbued here, concerns developing scenarios that can actually recreate intervention tactics. Moreover, there is an even bigger hurdle here regarding the conceptualizing and meaning of *environment*. Regardless of how well the task is constructed, it will be nearly impossible to know if the brain processes that are picked up on the scan actually represent the *same* brain functioning patterns that one would experiences outside of the lab, and in the midst of criminal behavior or VAB.

The final point I want to make in this section goes back to question of racial differences in VAB, and how the therapeutic promises of neurocriminology can potentially deal with the 'question of race.' For the researchers that I spoke with, the question of dealing with racial differences was often noted as less of a focus, because as many noted, their work was race-neutral. However, from the responses that people gave around neuroimaging research and possible treatments options—such as enhancing current-community based VAB interventions through neuroimaging, or the difficulties in recruiting at-risk youth populations, which often meant African American youth—I argue, that the therapeutic promise of neurocriminology will no doubt have to deal in the future with the 'question of race.' Questions raised by critiques concerning state sanction social control will also be important, due to the disproportionate ways in which our criminal justice systems are raced. The neurocriminologists I talked with all expressed a need for a paradigm shift in criminal justice. They argued that to replace the current prison system with a treatment programs and facilities that would work to better rehabilitate persons with VAB disorders, i.e. what they were suggested was and expanded mental health system. Such systems are already in place outside the US according to Dr. Fitzpatrick (01/14/13) who works in Europe, there are vast differences with the approach to VAB as a personality disorder in the US compared to European countries.

> The United States is obviously the most violent society in which I've worked. I don't see a difference in any of the biological or psychosocial contributors to violence between populations in the United States and Europe. But, maybe one huge difference that impacts my practical work is prison populations; and especially if you're interested in psychopathy. Given the overall horrendous state of the United States mental health care system there's a ridiculously high amount of patients with mental illness that are placed in prisons, and many of these patients are psychopaths. If they were mentally ill in Europe, these individuals would be treated through the mental health care system. So, if I wanted to study psychopathy in the US, I would go to a prison. In Europe, I would stay away from prisons.

Given that most neurocriminologists come from fields of psychology/psychiatry it is not surprising that one of the solutions they would provide is to expand mental health facilities. Moreover, Dr. Fitzpatrick does make an important point around the use of prison systems in the US as default mental health facilities, thus we see that the failure to address the larger more pervasive mental health problem has been shifted to the criminal justice system and ironically we see the opposite of medicalization of VAB here, the criminalization of mental health. However, an expanded medical model does not relieve biocriminology from dealing with the 'question of race,' in the United States. As scholars have shown, mental health care systems and medical practices too have their own problems with racial inequality (see Smedley, Stith and Nelson 2009). However, the questions that remain here are related to the processes of racialization, who gets such labels (criminal vs patient), and which types of bodies and violent/aggressive or criminal behaviors would we deem in need of therapy versus continued incarceration? While neurocriminology may claim to be race-neutral, the therapeutic promise of neurocriminology that seeks to expand the mental health system will be faced with addressing racially impacted populations, and dealing with prevailing questions of quality and access to health, not to mention longer standing critiques of stigmatization of marginalized populations.

While most neurocriminologists maintained a *race-neutral* stance on questions concerning race and rehabilitation of VAB, such questions have been addressed more directly by one of the leading—and arguably the most publically known—contemporary biocriminologists, Adrian Raine (1993, 2002, 2013). As noted throughout this dissertation, Raine's work has been imperative to the rise of neurocriminology. Raine has written about similar therapeutic promises for neurocriminology as presented above, and too has often advocated environmental improvements as a way to help quell VAB (see Rocque, Welsh and Raine 2012). However, Raine has also stressed that biological interventions are the way of the future to both treat and potentially 'cure crime' (Raine 2013).[12]

For example in his latest book, Raine (2013) outlines his version of the therapeutic promise of neurocriminology through a fictitious future project he called, the Legal Offensive on Murder: Brain Research Operation for Screening of Offenders, or LOMBROSO. Yes, that is correct, LOMBROSO, Raine's future of biocriminology is an eerie reminder of its past! LOMBROSO is hypothetically described as a neuroscientific and genetically informed program that will predict future VAB, but in reality, it can be better described as biopolitical screening and surveillance agenda with a boost of technoscientific steroids, that is unmistakably parallel to the 2002 science-fiction movie *Minority Report*.[13] Raine noted that under the LOMBROSO program, all males in society would be forced to submit multiple brain scans (functional and structural) as well as DNA testing on their 18th birthday (which he later noted would be moved up even early to the age 10). However, what was also interesting about the hypothetical functions of LOMBROSO is that Raine argued that it would actually eliminate racial differences in VAB. As Raine put it (2013:345):

> The jury system in the 2010s was undoubtedly racially biased, with a black offender more likely to be convicted of the same crime as a white offender. LOMBROSO, in contrast, is scrupulously objective and data-driven, and the results have pleased civil libertarians and minority leaders alike. After all, it was known all along that minorities are

> disproportionately the victims of violence, and now they are disproportionately benefitting from violence reduction.

While these statements here could be ignored as simple conjecture, they do demonstrate Raine's willingness, unlike many of his colleagues, to publicly address some of the more controversial issues in VAB, such as the 'question of race.' However, much more troubling is the suggestion that biocriminology will be the solution to racial inequalities, which has been suggested by many biocriminologists (Fishbein 2000; Raine 1993, 2013). In his book, *Psychopathology of Crime*, and in the wake of the cancelling of the aforementioned 1992 genetics and race conference, Raine (1993:315 emphasis in original) commented on the 'question of race' and the critiques of biocriminology by stating that:

> The paradox is that although it is often mentioned that there is a disproportionately high level of crime in blacks [sic], it must also be remembered that blacks are disproportionately the *victims* of violence and crime. Blocking research that aims to understand and control crime and violence may therefore prove to be a major disservice to selective minority groups, and in this sense, attempts to block our further understanding of violence in all groups could even be constructed as racially biased itself.

Therefore, Raine not only stated that suppressing biocriminology may do more damage to racialized communities, he also noted that suppressing such research may actually be racist in itself! What is absent from Raine's assertion is any mention of the contentious history between science and the African American community. Statements like Raine's (1993, 2013) dehistoricize these contentious relationships between biomedicine and marginalized communities. The simple application of novel 'objective' biotechnologies and bioscience does not shield this research endeavor from dealing with the concept of race, or the *deep* racialized consequences that are systematically embedded in and reconstituted through our social institutions, relations, knowledges, and practices. Throughout history, the misuses of biomedical and scientific research have help produced and reproduce significant disparities that have disproportionately affected African Americans (Duster 2003; Nelson 2011; Roberts 2011; Skloot 2011; Washington 2006). Such historical and contemporary inquiries into the use and consequences of biomedical research—such as the fierce opposition to the 1992 genetics and crime conferences—are immensely appropriate and necessary objections given the history of such criminological practices and its effects on already marginalized populations.

CHAPTER V CONCLUSION

In this chapter, I focused on the 'question of race' in neurocriminology as a lens through which I could both 1) describe how neurocriminologists think, in much more dynamic terms, about VAB as a product of the *interaction* between *both* biology and social factors, and 2) examine the claims that biocriminology has conquered its past in relation the 'question of race.' Neurocriminological researchers expressed that publicly talking about race, both within and outside, the disciplinary walls of neurocriminology is often regarded as an inappropriate area of conversation, what I have called the *taboo of race*. While contemporary neurocriminologists are certainly more cautious about how they talk about race, and many are also clearly thinking more about the adverse effects of biocriminology on race, they did not believe that they could talk about these issues, at least publically or professionally, among fellow biocriminologists. Here the taboo of race may also be understood as the 'weight of race' (Goldberg 2008). University of California, Irvine professor David Theo Goldberg (2008:8-9) described this concept as constant:

> Tensions between cutting and biting back, alterity and counter, distantiation and embrace – existential as much as analytic, perhaps analytic because existential…though there is a clear conceptual distinction we must mark between race and racism, they are deeply connected conceptually and politically…[and] the weight of race is at once a racist weight. A different, if related metaphor may be equally revealing. Race is the glove in which the titanic, the weight, hand of racism fits.

Here, I see the taboo of race as an artifact of the historical legacies of biocriminology. Like

Goldberg (2008), I believe that the *taboo of race* in biocriminology is in some ways a struggle with neurocriminologists' own anxieties about race, and the posturing, confusions and constant tension that envelop larger society in reference to the 'question of race.' I argued that the 'weight of race' in biocriminology endures as a paralyzing force believed to be too powerful to take on, giving the current tools of investigation. Yet, without any action this paralyzing force can enable, and possibly reinforce, racial inequalities and hierarchies that continue to persist.

Neurocriminologists, not wanting to be labelled racist, have taken a different stance on race than their counterpart researchers in genetics, who have shifted toward a more racially consciousness stance concerning biology and race (Bliss 2012). The stance on race in biocriminology has not meant greater participation in debates about or greater research on the 'question of race.' To be fair, neurocriminologists are right that the question of race in biocriminology is quite complex. However, the complexity that I see is also different from their views of a 'race as complex.' Here, dealing with race brings up to challenges. First, neurocriminologists have to deal with race being re-inscribed as a biological fact. As noted in previous sections of this dissertation science has continued to struggle with the questions around race a biological fact or race as a social construct, and biocriminology has been no different. Secondly, and related, violence has a social behavior is continually racialized, gendered, and classed. Race here gets mapped upon biological notions of VAB, as the source of naturalized innate detrimental negative traits such as low IQ, or hyper-masculinity due to abnormal testosterone levels. Instead of taken more of a political stance regarding the question of race, neurocriminologists race has been to leave it out of their consideration of VAB altogether, or as I argued take a *race-neutral stance*.

The race-neutral stance, essentially wrestles with the complex ways in which the relationship between race and racism produces and effects our conceptions of and actual manifestations of VAB. But, is adopting a race-neutral stance enough for contemporary neurocriminologists to quell the anxieties concerning the reconstitution of racial/gendered based stigmatization and VAB? Neurocriminologists who take the race-neutral stance did not seem to support racial inequality, and seemed to acknowledge that social factors such as racism can affect VAB. However, they insisted that 'race' was just not a factor in their research. Moreover, when talking about 'question of race,' many researchers were only concerned with the concept as it regards to biological VAB factors that may operate distinctively in specific racial groups; this they argued, could possibly result in the biggest potential problem with the use of race and VAB research, the stigmatization of certain groups by forces outside of biocriminology (i.e. political or social groups). While I certainly, am not encouraging researchers to figure out ways to operationalize one's racial identity as a biological or individualized variable in their criminological models, the problems with race in neurobiological research on VAB are much more dynamic than simply stigma.

I contend that such biological research on VAB will continually have a difficult time truly understand the impacts of race on VAB without more effectively conceptualizing and operationalizing the ways in which *racism* structure VAB. Race neutral stances, or color-blind approaches to race, can minimize the ways in which racial experiences or racialization (as constant processes of living as a raced person in USA society): make meanings within society, help structure and discipline how one thinks about and behaves violently or aggressive, and reciprocally how society defines and punishes VAB. As argued by scholars such as Eduardo Bonilla-Silva (2006), and Michael Brown, Troy Duster, and colleagues (2005) color-blindness in regards to race has steadily shifted to *colorblind racism*, a more subtly less recognizable form of racial inequality, but nevertheless less quite effective way that racism has continued to persist in modern USA.

As the race-neutral stance operates in neurocriminology, the discussions of these possible racial effects on VAB were also reconfigured through a ‘cultural prism’ (Shim 2014; 2005). The cultural prism in neurocriminology extended to both SES factors and cultural based explanations, and it operated as a way to re-envision racial differences as SES or cultural differences. Essentially, neurocriminologists can avoid talking about race per se, because the causes of racial difference in VAB are said to be based in cultural or SES. However, as Janet Shim (2014:108) noted, interpreting race through the *cultural prism* “neglects the role of race in organizing social relations of power and the effects of racialized interactions and structural racism on health.” In addition, such practices also allow researchers to further individualize the factors that they find imperative to living or behaving healthy (Duster 2006c; Shim 2014). Therefore, while I agree with neurocriminologists that SES and cultural factors are important for understanding VAB, such concepts cannot simple serve as substitutes for understanding race. Instead, neurocriminologists should think about these terms in relation to the ways they work with and through race within society, and therefore such concepts (including gender) should be thought about as *intersectional* factors with race (Collins 1991; Crenshaw 1989).

In the final section of this chapter I examined the potential ways in which neurocriminologists think about using neurobiological models and technoscientific practices to treat VAB, i.e. the ways in which neurocriminologists think about the *therapeutic promise* of neurocriminology. Here neurocriminologists stressed that the therapeutic promise of biocriminology will be best achieved if 1) researchers continue to think about how best to defined and differentiate individuals based on their specific VAB diagnosis. Moreover, 2) the therapeutic promise will have its greatest effect by identifying youth as earlier as possible, who have callous-unemotional traits, are at highest risk for continual VAB throughout life. Historically, these individuals with CU or psychopathy have not responded to traditional VAB treatments or community based interventions, therefore the goals that through the elucidation of their brain function, researchers will be better able to develop interventions that will help this group. However, the 'question of race' still plays a role in understanding the therapeutic promises of neurocriminology.

While I did not get the sense that the neurocriminologists I spoke with shared the racist views expressed by some biosocial criminologists, I do think that bio-prediction and the allure to understand and prevent crime *before it happens* is still a very tantalizing mission for neurocriminology.[14] Moreover, while not explicitly expressing that neurocriminology will cure VAB, or solve the 'question of race,' as seemingly suggested by Raine, I do think that the *therapeutic promise* of VAB is seen by neurocriminologists who proclaim a race-neutral stance, suitable way to address the question of race. I argue that such technoscientific potentials should not automatically thought of as race-less, anti-racist or beneficial for marginalized communities. Technological and therapeutic promises cannot be looked at as objective, because they are constructed, operated, and made meaningful in social practices. As many scholars have demonstrated, even with the increasing use of sophisticated technoscientific modes of treatment in biomedicine, racial inequalities in contemporary medicine and healthcare have endured, and new(er) ways of racialization have emerged both continuing and rewriting ways in which race (as well as gender and class) continue to structure our lived experiences and health potentials (Bliss 2012; Duster 2003; Kahn 2012; Montoya 2011; Nelson 2011; Shim 2014; Reardon 2005;

Roberts 2011; Washington 2006). Therefore, I am in agreement with sociologist Darnell Hawkins (1995:41 emphases in the original) who opined:

> I remain firmly convinced that biological/genetic research despite its increasing sophistication and renewed popularity today, offers little in terms of understanding groups differences in the rate of contact with the criminal law. Race, crime, and criminality are social constructs. Social researchers must not replace the quest or a measure of *real* crime with a renewed search for the *real* criminal.

Thus in conclusion, I do not believe that racial differentials in crime and VAB can be alleviated through the technoscientization of VAB, but instead the lingering 'question of race' will continue to haunt neurocriminologists who will have to deal with the disproportionate ways in which criminalization and racialization intervene and reciprocally operate in US society.

CHAPTER VI
CONCLUSION

CHAPTER VI INTRODUCTION

This dissertation provided an overview of the procedures, practices, and technologies of neurobiological research on VAB, and examined how such researchers conceptualized and used race in their studies. Moreover, this dissertation also traced the critiques and rebuttals about the use and cause for contemporary biological research on VAB. As such, each of the proceeding chapters helped better understand the impacts of contemporary biocriminology, and helped better contextualize and evaluate both the perspectives critical of biocriminology and the responses and actions by contemporary biocriminologists that have helped address such oppositional points of view. In this final chapter, I will first provide an overview of the dissertation, summarizing its overall goals and the substantive and theoretical contributions of this project. I will then provide with a more expansive understanding of the potential future implications and applications of neuroimaging research on VAB, and conclude by outlining specific areas of future research.

SUMMARY OF DISSERTATION

This dissertation first provided a concentrated historical overview of biocriminology. Chapter 2 described the lasting impacts of Cesare Lombroso, the decline and later reemergence of biocriminology during the mid-twentieth century, and the impacts of race on past biocriminology research. This analysis allowed the dissertation to provide a greater context of the: ontological/epistemological underpinnings of biocriminology, technological abuses and misuse during research practices, and how biocriminological knowledges were incorporated and utilize within social, political, and legal spheres. Thus, Chapter 2 helped better situate how and why biocriminology has, and continues to be one of the most controversial and heavily debated modes of inquiry on VAB and crime.

The chapter started with a description of Lombroso's work. I argued that Lombroso's legacy, while recognized as problematic, continues to serve as an important ontological starting point for biocriminology. Therefore, Lombroso's work should not be simply reduced to a methodological point of departure, a hypothetical chasm that has ultimately been used to 'demonstrate' the progress of biocriminology today. Instead, I argue that Lombroso's work can be better analyzed in conjunction with contemporary biocriminology, as an *analytic* for helping better evaluate the claims made and practices used in contemporary research on VAB.

The chapter also helped analyze how biocriminologists defended the production and use of their work and other biomedical knowledges of VAB against critics of biocriminology. Many biocriminologists censured Lombroso's work because of the 'subjective' choices he made and the sub-par research practices and technologies available to him. However, as demonstrated, Lombroso and others from this era are still praised for the types of questions they employed, thus biocriminologists of the past were considered on the right track with the question they asked, but had the wrong tools to complete the task (Clarke and Fujimura 1992; Dumit 2004).

This chapter then moves to describe the decline and subsequent reemergence of VAB after WWII. This section was important because it outlined one of the earliest attempts by biocriminologists to make changes to the research practices of biocriminology, and address claims of eugenic, racist, and sexist applications of biocriminological knowledges. The remaining sections provided a context to help evaluate the operation of race in biocriminology. I note that race has *always* been intimately tied to research on VAB (in both more sociologically- and biologically-based research). Moreover, even after scientists reconfigured their stance on race in the mid-twentieth century (UNESCO 1961), the use of race did not dissipate from scientific study (Reardon 2005). Similarly, after the reemergence of biocriminology post-WWII, the use of race in biocriminology also remained constant. Thus, I argue that the use, and continued reliance, on race in biocriminology is not just the result of ideologically driven research or irrational thinking, but instead race has continually been entangled in the construction of such research, the types of behaviors and bodies it focused on, and the subsequent employment of such knowledges and/or recommendations within society.

Chapter 3 described how VAB is defined for use in biocriminology research; thus what behaviors are included and what individuals take part in contemporary biocriminology research. This chapter was concerned with critiques about the 'social' nature of VAB, and the responses from biocriminology. Critics have argued that violent, aggressive and/or criminal behaviors are socially defined, and therefore the determinants for, meanings of, and/or treatments to such behaviors are products of sociocultural influenced policies, laws, discourses and actions. Biocriminologists today have countered such arguments, stating that they are not interested in crime per se, but instead their interests are limited to VAB behaviors that are medically/psychologically relevant, i.e. psychopathologies known as personality disorders.

In this chapter, I argued that contemporary biocriminology has used the DSM and other VAB classification systems and scales to help frame VAB as a unique psychopathology. As such, medicalizing VAB via the DSM and other technoscientific practices has seemingly transformed VAB into an individualized, biological/psychological problem. Thus, the medicalization of definitions for VAB has legitimated the search for genetic and neurobiological underpinnings of VAB within the body.

This ‘infrastructural work’ (Bowker and Star 1999) helps to create and maintain particular ontological and epistemological visions of VAB that ultimately help researchers validate the source of such behaviors within the brain. Classification systems and standards are universally relied upon in biocriminology to help make knowledge and to sustain and defend knowledge claims and biotechnological uses. By refashioning VAB as psychopathology and utilizing advanced biotechnological techniques for research, biocriminology has better positioned itself to defend critiques concerning the ambiguous and socially constructed character of definitions and interpretations of violence, aggression, and crime.

Chapter Four further described the medicalization of VAB by concentrating more specifically on the types of imaging technologies used and the types of knowledges they produce. This chapter investigated the rebuttal from biocriminology concerning the advancement of technology, and especially the claim that better technologies have allowed the discipline to provide more objective, detailed and factual knowledge about the biological underpinnings of VAB. Thus, newer biotechnologies themselves are seen as a key solution to concerns of pseudoscientific practices of the past. Using Clarke and colleagues (2003, 2010) work on *biomedicalization*, I argue that the transformations of medicalization have also influenced biocriminology, and are best captured in what I call the *technoscientization of VAB*.

The technoscientization of VAB helps better elucidate the social implications of neuroimaging research on VAB. This transformation can be described as the shift away from *therapeutic control and modification* to the technoscientization via neuroimaging and behavioral genetics of *all* behavior. Thus, the technoscientization of VAB essentially refers to the assemblage of innovative bioscientific technologies, classifications, and practices; new and continued funding sources; restored relationships with law; and discourses of risk and neuro-biomarkers for bio-prediction and potential future applications of biocriminological knowledges. This shift also focuses more heavily on psychological and behavioral risks for deviant behavior, and the *therapeutic promises* of VAB. The *therapeutic promise* refers to the future potentials of using biomedical technologies to treat violence, or for biocriminological knowledges to help improve existing therapeutic approaches and/or make future medications for VAB.

This chapter also argued that the technoscientization of VAB has resulted in the expanded use of and dependence on the brains of *normal* populations to help discover and explain the brain processes and morphology of violent and criminal individuals. The use of normal populations represents a shift in biocriminology, away from a strict focus on 'criminals' or psychopathologies. Such a move also helps biocriminology address concerns over the social character of VAB. Instead of needed criminals or individuals with personality disorders to partake in a study, contemporary biocriminology can rely on 'normal' populations to assess 'risk' for VAB. As part of the technoscientization of VAB, newer imaging technologies and imaging performance task, have allowed researchers to map and 'see' biological risk factors for VAB in normal populations via brain processes and structure. Thus, emotional control and decision-making abilities become important proxy measures for diagnosing the actual or future risk for VAB.

Finally, in Chapter 5, I used interviews with neuroscientists to examine critiques of biocriminology concerning biological determinism. Specifically, this chapter assessed the potential for *neuro*-criminology to handle the challenging and enduring interrelationship between race, biology, and violence/deviant behavior. I argue that neurocriminologists—biocriminologists who are specifically trained to use neuroimaging technologies in their research—expressed trepidations concerning the 'question of race.' Neurocriminologists were certainly more conscious of the past exploitations of biocriminology in terms of race, and such awareness has made them more cautious when talking about race today. Many expressed that they were uncomfortable talking about race issues publically, and especially among fellow biocriminologists. Therefore, the 'question of race,' while acknowledged as important, was often considered an inappropriate area of conversation for contemporary biocriminology, what I have called the *taboo of race*.

This chapter also noted that neurocriminologists have opted to leave race out or deem it unimportant for their research. I argued that such practices can be seen as a *race-neutral* stance. This race-neutral approach essentially wrestles with the complex ways in which race produces and effects our conceptions of and actual manifestations of VAB, the abilities of researchers to capture such processes within their research, and the potential backlash against using or thinking about race within biological models of behavior. Similarly, researchers also contended that 'race' as a variable was too complex of a concept to operationalize in neuroimaging research on VAB. I argue that this approach is also part of the race-neutral stance. This approach allows researchers to rebut claims of racism by arguing that race was not a useful for their research, thus race was not a 'variable' that mattered much for their research. However, such claims may miss the more dynamic ways in which race, is much more than a quantitative variable, and strip it of its social, political, and culture relevance.

Importantly, neurocriminologists who take the race-neutral stance do not support racial discrimination through their research, and they more often acknowledge that social factors such as 'racism' can affect the manifestations of and responses to VAB. However, these researchers often place much of the blame for racist uses of VAB knowledge on individuals and institutions outside of biocriminology, thus if racism does have an effect it is due to misuse and ignorance of biocriminological knowledges from outside of the discipline, and/or racism is defined through a 'cultural prism' (Shim 2014). Thus, neurocriminologists tended to diminish the role of race as a causal factor for crime or VAB, but recognized that discrimination and/or disparity can affect how VAB is experienced, viewed, and managed in society.

Overall, such research practices will continually have a difficult time truly elucidating the complete impacts of VAB without more effectively conceptualizing and operationalizing the ways in which race effects VAB. While taking a race-neutral stance may help quell charges of racist biocriminology, neurocriminologists should be cognizant about and attentive to the potential ways in which the 'absence of race' in biological research on VAB may inadvertently help reinforce or reconstitute longstanding racialized understandings of violent and/or criminal behaviors. By deeming race not important, a race neutral stance could help discount, and silence, the active role that *racism* plays in constructing how people act violently and how society conceptualizes and adjudicates to such behaviors.

THEORETICAL AND SUBSTANTIVE IMPLICATIONS

This project has several theoretical and substantive implications. In this section, I will outline a two: the use of biocriminological research in courts, and the entwined relationships between race, science, and progress.

The use of neuroscience research for law purposes, *neurolaw*, has exponentially increased in recent years to address an array of legal issues that include lie detection, cognitive and affective mental abilities, criminal culpability, and criminal rehabilitation. In anticipation of neurolaw's impacts, law professionals are increasingly demanding greater comprehension and training in neuroscience (Gazzaniga 2010).[15] I became more aware of this need last summer, while attending the University of Pennsylvania's Neuroscience Boot Camp. The boot camp devoted full sessions to issues of neuroscience and law, and nearly half of the attendees were law professionals including law professors, judges, and practicing attorneys. However, neuroscience and law has also lead to many debates over the potential ethical problems with introducing and using the science in the courtroom. For example, some have noted that a greater use of neuroscience research in the criminal justice system may help reduce incarceration rates, and it may help foster more effective violence prevention strategies (Eagleman 2011; Eagleman and Flores 2012). On the other hand, others both neuroscientists and law professionals have argued that the use of neuroscience may not lead to any dramatic effects on law's functioning, and instead may produce more ethical dilemmas concerning how to evaluate such evidence in the courtroom (Greely and Illes 2007; Morse 2012). However, whichever side of the debate one is on, it seems evident that neuroscience is transforming the landscape of the law in ways never seen before.

I argue that we are seeing a transformation in the way knowledge is being introduced, and evaluated, for use in the courtroom. For example, during our interview Dr. McKinney (4/11/13) noted that it is more common for neuroscientists to 'train' law professionals on how to *understand* and *evaluate* the merits of neuroscientific evidence.

> I actually do a bunch of trainings for judges and education for judges, and I actually organize whole seminars on the neurobiology of aggression and violence. I've also discovered that the only way to really make a change is not to convince [judges] through behavioral and clinical evidence, even though I honestly and fundamentally believe it is much more informative. We have figured out that the only way to get them to pay any attention to the work that they really need to be looking at is to show them pictures of brains.

Dr. McKinney's comments suggest that the visual culture of neuroscience is used to help convince law professionals of the potential usefulness of neuroscience. Thus, neuroscientists now play a vital role in structuring what evidence should be included as 'good' and or 'clinically relevant' science. Moreover, the publication of training manuals for judges and lawyers such as, "A Judges Guide to Neuroscience" (Gazzaniga 2010)—funded by the Law and Neuroscience Project from the John D and Catherine T. MacArthur Foundation—exemplifies the collaboration between law and neuroscience. This guide was put together by neuroscientist Michael S. Gazzaniga and the Honorable Jed Rakoff, US District Judge for the Southern District of New York. The purpose of the publication was to help demonstrate the usefulness of neuroscience in the courtroom. Thus, the technoscientization of VAB has helped shift the foundations by which knowledges, and the value of such information, are introduced and evaluate in the courts. Such discursive practices may be an important 'site of knowledge' (Duster 2006b) to examine. On the one hand having training in neuroscience may allow judges to make informed decisions about such research in the courts. However, on the other hand, by going inside the courts via training, neuroscientists are able to better shape the conditions as to how their research is received, and possibly influence the reception of such claims and uses for purpose of the law.

This dissertation also contributes to ongoing scholarship on race, science and society. As such, future research should focus on better understanding and analyzing race in relation to the operation of *progress*. Specifically, I believe that future research should evaluate how the larger narratives of racial inequality and progress interact with, support, or counter narratives of scientific or biomedical progress. The emergence and maintenance of both narratives of progress seem to play a vital role in the way race and science operates. Moreover, such an evaluation may also help better understand the discursive ways in which institutions/practices reliant on biomedical/scientific knowledges impact racial formation and inequality in the United States.

I take the position that the *space* needed to give rise to this narrative of racial progress is similar, and may even overlap, with the socio-historical and cultural conditions that were, or are, in place to make possible a transformation of medicalization, i.e. biomedicalization. The roots of both of these transformations seem to stem from political agendas that came into fruition in 1980s and 90s, the subsequent rise and dependence of privatization in the economic sphere, and the social movements that fueled new understandings of how each operated in society. What constitutes race and racism went through, or is still going through, a shift. This phase began at the conclusion of the Civil Rights Movement, in which the societal perceptions of race and racism moved from a concentration on *controlling the world around particular groups* (i.e. through individual and group level overt acts of oppression) *to controlling the internal nature of those group* (i.e. controlling groups through discourse, hegemony and disciplining of the body). Ironically, in the process of trying to be more respectful and inclusive the conceptualization of and interactions with race, our understandings of racism have actually become more discursive. Due to the rise of new ideologies and discourses, racial inequality has actually become more "normalized" and seemingly evanescent during this process (Bonilla-Silva 2006; Brown et al. 2005; Goldberg 2009).

Moreover, I argue that to best trace the impacts of such transformations, it is helpful to think about the ways in which the narratives of racial progress has impacted and/or intertwined with the narratives of scientific progress. Particularly, both narratives seemed to usher in a stream of discourse that was predicated on a definition of race or health that works at the level of the self. In order to elude racism or reach an optimal level of health, responsibility has been placed solely at the individual level. Instead of operating by limiting access or knowledge, the processes and practices that surround both narratives tend to operate within society by aggressively seeking to appear as open, neutral, universal, and natural as possible. One possible next step for my research is to address such questions of progress by examining the scientific understandings of discrimination and/or bias.

Recently, neuroimaging research on implicit bias and unconscious bias has sought to understand the operation of racism at the level of the brain. Such research is deemed an ideal way to best understanding the lingering problems of racial inequality in the US, and it sits at the nexus between these narratives of progress for both race and science. By better evaluating the ways in which this science operationalizes and thinks about the impacts of race/racism, it may provide an greater understanding of the discursive ways in which specific understandings of 'progress' get operationalized in science and race research, and how these two narratives may potentially interact in US society. Such a project would be significant given the shifting racial/ethnic dynamics in the US, and the parallel unequal outcomes in areas of criminal justice, health and education; emerging shifts toward understanding the roles of unconscious thoughts and behaviors to effectively address discrimination; and anticipation of the Obama administration's groundbreaking BRAIN initiative, which seeks to have wide-ranging effects on the development of neuroscientific technologies and treatments of brain based disorders and diseases.

NOTES

Chapter 1 Notes

[1]This group represented the 2000 Aspen Neurobehavioral Conference (ANC). The ANC was an annual conference on issues related to mind and brain. The group convened for two sessions 1998 and 1999, and were represented by participants from neurology, neuropsychology, psychiatry, trauma surgery, nursing, evolutionary psychology, medical ethics, and law. Although the title of the article uses the term 'aggression,' Filley et al. (2001) purposely used the term violence throughout their review to demonstrate that the occurrence of violence is a the product of brain malfunction, and to suggest that VAB neurobiological research can contribute positively to violent prevention efforts and treatments.

[2] The mid 1980s was specifically chosen as the cut off point for the historical analysis because it corresponds with the emergence of the 'molecularization' or 'geneticization' of society (Lippman 1991; Rose 2007). This era in history has be accredited as a the point where greater emphasis was placed on the search for scientific explanations, and such explanations proliferated under the guise that such research could elucidate the most "basic," or smallest, units of life. Contrasting the 'molecularization' of VAB, through neuroscientific technologies, and the larger historical scientific practices of VAB highlighted in the historical chapter is a key point in this dissertation (see chapters 4 and 5).

[3] See also Cassandra Crawford (2007) *Ghost in the Machine: A genealogy of Phantom-Prosthetic Relations*. Crawford's work serves as an exemplar for using a qualitative content analysis method that was grounded by 'situational analysis.'

[4] According to the World Health Organization, "Interpersonal violence is defined to include violence between family members and intimate partners and violence between acquaintances and strangers that is not intended to further the aims of any formally defined group or cause. Self-directed violence, war, state-sponsored violence and other collective violence are specifically excluded from these definitions (Waters et al. 2004:x).

[5] See chapter 4 for more on the importance of rise neuropsychology its relationship with the emergence of imaging technologies, and the biomedicalizaton of VAB.

[6] Schizophrenia is a disorder that effects cognition and is most often characterized by hallucinations and disillusions. Although people with schizophrenia may display VAB, the risk for such behaviors is low (NIMH 2009). Likewise, borderline personality disorder (BPD) is also said to affect cognition, but is also characterized by impulsivity and unstable patterns of emotion (NIMH 2008). Researchers and clinicians may investigate violent or aggressive behaviors associated with BPD, but the display of such behaviors is not a requirement for a diagnosis (NIMH 2008). By contrast, the personality disorders that I focused on are all described as pathological disorders primarily characterized by behaviors defined as violent, aggressive and/or maladaptive.

[7]The definitions provided are from the DSM-IV-TR. Although a fifth edition of the DSM (DSM-5) was published in 2013, the definitions provided here come from the revised 4th edition of the DSM (DSM-IV-TR). I used the DSM-IV-TR for two reasons. First, the research I analyzed was conducted between the years of 1990-2012, and therefore the categories that were used in these studies reflected the DSM-IV-TR. Also, questions and debates continue to development regarding the use of DSM-5. In particular, there are questions regarding its diagnostic validity and use. These concerns have been voiced by current NIMH director, Thomas Insel, who has stated that NIMH will not be using the DSM-5 going forward (Insel 2013).
[8]Here I highlight the PCL-R because it is the most widely used metric for psychopathy. However, there are other scales that also measure psychopathy such as the Psychopathic Personality Inventory (PPI), but the majority of studies I reviewed regarded the PCL-R as the most reliably and utilized tool for psychopathy.

Chapter 2 Notes

[1] Biocriminology refers to criminological scholarship that focuses on the relationship between biological factors (including physical—body, physique and/or components—or mental/psychological traits) and behaviors defined as criminal or violent. See Rose 2000; Rafter 2008; Spallone 1998; Walby and Carrier 2010. Examples of a critical analysis of the history of biocriminology include: Becker and Wetzell (eds) 2006; Rafter 2008.
[2] From 1885-1914, there were eight-planned ICCA meetings, although the final conference, Budapest (1914), did not take place. They included: Rome (1885), Paris (1889), Brussels (1892), Geneva (1896), Amsterdam (1901), Turin (1906), Cologne (1911), and Budapest (1914) (Kaluszynski 2006, see also Horn 2006).
[3] See Stephen Jay Gould's (1996:151-173) *Mismeasure of Man* for a more detailed description of Lombroso's work, which Gould (1996:154) described as "scientifically vacuous."
[4]Goring's theory would later be credited with linking notions of *born criminality* with innate mental deficiencies, essentially spurring research into the much controversial area of intelligence (IQ) and criminal behavior (Rafter 2008). Specifically, work on cognitive defects and criminal/violent behavior include both biologically based (See Eysenck 1964; Raine 1993; Wilson and Herrnstein 1985) and sociologically based theories (Hirschi and Hindelang 1977) that will become important for criminology after WWII.
[5] Shaw and McKay's (1942) theory of social disorganization argued that criminal/violent behaviors are caused by a community's *inability* to work collectively in order to fulfill common objectives and values, as well as the community's failure to maintain effective mechanisms of social control. When these mechanisms of social control fail, the community is said to be disorganized and criminal and delinquent behaviors may prevail.
[6] The doctors on trial were charged with four crimes. These include "1. conspiracy to commit war crimes and crimes against humanity; 2. war crimes; 3. crimes against humanity (including

persons not protected by the laws of war); and 4. membership in a criminal organization (the SS)." (Harvard Law School Library, USA vs Brandt et al., 2013).

[7]Ivy contested this accusation, and touted that the experiments on prisoners in the US were models of good medical research ethics, although no official ethical standards were in place during this time in the US (Harkness 1996; Rose and Rose 2012). A later examination of these events demonstrated that Ivy spearheaded an attempt to convene a commission to write such procedures only after he was made aware of the defense's strategy during the trial (Harkness 1996). Moreover, a closer look at the Stateville Study revealed that at best, the lines between consent/coercion were very blurred. For their willingness to be infected with malaria and then injected with experimental vaccines, prisoners were promised early parole and decreased sentencing time (Comfort 2009).

[8] The reticular formation (RF) is a bundle of nerves that runs along the length of the brain stem (area of the brain that connects the brain to the spinal cord). Evolutionary wise it is consider one of the oldest parts of anatomy, and therefore is said to control the most basic functions of the body (i.e. the automatic nervous system, such as heartbeat or sleeping cycles).

[9] Twin studies were used to support the notion that VAB and criminality were hereditary. Using evidence of behavioral concordance from monozygotic twins (MZ) (who are genetically identical), these studies argued that MZ twins tended to behave (in terms of criminality) more similarly than dizygotic twins (who share fifty percent of genes).

[10] XYY or 'super-male' research concentrated on the relationship between heredity and criminal behavior. It focused on the hormone testosterone, and its proposed link to VAB, specifically that. XYY men are more violent than men with the XY genotype are. It was popular in the press and the public, but claims made by XYY research were never fully substantiated, and it this mode of research all but disappeared during the late 1970s and early 1980s.

[11] EEG, electroencephalogram studies concentrate on differences in electrical activity of the brain, between different DSM defined psychiatric states. For example, it concentrates on the differences in electrical brain functioning of psychopaths and normal controls (See Raine 1993).

[12] Sociobiology is defined by Wilson (1975:7) as "the systematic study of the biological basis of all forms of social behavior…in all kinds of organisms, including humans" (For a critique of this perspective see Gould 1985).

[13] Although the term neuroscience has been used in the past, I purposely use the term 'brain sciences' here to denote a more expansive definition of the brain sciences before the formal emergence of the neurosciences. The neurosciences, as we know of it today, were actually developed during the medicalization era; the very same time that biocriminology was reemerging. Joelle Abi-Rached and Nikolas Rose (2010; Rose and Abi-Rached 2013) have referred to this development as the 'neuromolecular gaze,' and they date the emergence of this style of thought between 1960s-1970s (also see Schmitt 1967, 1970; Schmitt and Melnechuk 1966, Swazey 1975).

[14] Hoffman worked for Prudential Life Insurance Company, and the conclusion he drew about African American inferiority was used to help justify withholding insurance from African Americans. See Wolff (2006) and Muhammad (2010).
[15] For a critical review of Jensen's thesis on I.Q., see Duster (2003) and Gould (1996).
[16] Cartwright argued that enslaved African Americans that had a tendency to attempt escape or to successfully 'runaway' suffered from the diseases *drapetomania*. Cartwright (1851) stated that, "the cause in most of the cases, that induces the negro to run away from service, is as much a disease of the mind as any other species of mental alienation, and much more curable, as a general rule. With the advantages of proper medical advice, strictly followed, this troublesome practice that many negroes have of running away, can be almost entirely prevented."

Chapter 3 Notes

[1] The phrase 'I know it when I see it' is use colloquially, but it also has legal origins. The phrase was famously used by U.S. Supreme Court Justice Potter Stewart in reference to 'obscenity' in the case *Jacobellis v Ohio, 378 US 184* (1964), a First Amendment case concerning the use of pornographic material. In his concurring opinion, Justice Potter noted that. 'Under the First and Fourteenth Amendments criminal laws in this area are constitutionally limited to hard-core pornography I shall not today attempt further to define the kinds of material I understand to be embraced within that shorthand description; and perhaps I could never succeed in intelligibly doing so. But I know it when I see it, and the motion picture involved in this case is not that (Jacobellis, 378 US., also see Gewirtz 1996).
[2] I made a distinction between review and empirical articles in the content analysis. Review articles refer to the sub-set of articles that I used to help develop appropriate content analysis themes and codes. Further details on these articles can be found in the methodology section of this dissertation.
[3]These 26 scales do not capture all of the subscales that have been created from these measures, nor do they capture all the revisions and variations that have been developed from these scales. However, they do provide a greater understanding of the complex manner in which neurobiological VAB knowledges are produced and how they operate within the larger neuropsychiatric information system.
[4] 'Neuroaesthetics' was a termed used by University of Pennsylvania neurologist Geoff Aguirre during his lecture on history and use of imaging technologies (UPenn Neuroscience Boot camp). Aguirre used the term 'neuroaesthetics' as a way to denote the computerization of neuroimaging data in order to produced useful clean images for publication and public consumption (See also: Alac 2008; Beaulieu 2002; Dumit 2004; Joyce 2008; and Prasad 2005).
[5]The study utilized data collected from a complex multi-university NIH funded study on normal brain development in healthy children, which involved universities and hospitals in the US and Canada.

[6] See also chapter five of this dissertation. Also see Gillett and Tamatea (2012), Hook (2009), Merriman and Cameron (2007), for a critique of the 'warrior gene' thesis.
[7]fMRI tasks are activities (verbal and non-verbal) that participants are asked to complete while being scanned. Specific task are said to provoke specific brain functioning, and these areas of the brain are targeted which during fMRI scan in order to capture and analysis the brain's response.

Chapter 4 Notes

[1] For accounts of biomedicalization and neuroscience, see Burri and Dumit (eds.) 2008; Joyce 2010; Pickersgill and van Keulen (eds.) 2012; Rose and Abi-Rached 2013; as well as S. Vrecko (eds.) 2010, 'Neuroscience Power and Culture.' Special issues of *History of Human Sciences* volume 23 issue 1.
[2] The role of computerization and mathmatization of neuroscience is described in chapter 3. For more on the role of computerization impact on neuroimaging see Alac 2008; Beaulieu 2002; Burri and Dumit 2008; Dumit 1999, 2004; Joyce 2008.
[3] Eysenck's theory was on personality and crime. He argued that biology was the basis of personality, and that personalities (particular abnormal personalities) were the cause of crime and VAB (see chapter 2 of this dissertation, also Eysenck 1964; Rafter 2006).
[4] CT scans were not including in the larger content analysis. These studies did not meet inclusion criteria.
[5] A few fMRI studies also included structural MRI scans that are not part of this total number of 33 studies. These studies were counted as functional imaging studies because the main findings were based off the results from the functional imaging. In these studies, MRI scans were usually part of the research procedures in order to rule out any brain lesions that would disqualify participants from the study.
[6] Although it is nearly impossible to capture all the goals of MRI studies of VAB into two parts, since there are a few studies that actually have focused on both strands this is a crude way to capture all goals MRI studies; these two stands nevertheless do capture the general themes from structural imaging studies on the brain.
[7] Gage's skull is still on display at Harvard Medical School's Warren Anatomical Museum (Kean 2014).
[8] Source: found at http://brightbytes.com/phineasgage/index.html [Retrieved May 10, 2014]
[9] Clarke (2010:104-146) made a similar argument to examine the transformation from medicine to biomedicalization using the concept of 'healthscapes' to "focus on all kinds of things medical as forming assemblages, infrastructures of assumption as well as people, things, places, and images…[to] demonstrate their flows across time and space but also elaborate how they are generated by and through cumulative changes incorporated into each period." (141).
[10] For a similar account of the impact of the narratives of Gage on contemporary neuroscience of VAB, see Raine (2013:143-147). To be clear neurologist did not diagnosis Gage with

pseudopsychopathy. I assume Kiehl was referring to the work of Blumer and Benson (1975), who argued that frontal lobe damage might lead to personality changes that they termed pseudopsychopathy. Gage was also described as exhibited psychopathic traits in Damasio's group (Macmillan 2000:116-120). See also Surguladze, Keedwell and Phillips (2003).

[11] *Roper v. Simmons*, found is unconstitutional to sentence individuals under 18 years old to death under the capital punishment statute.

[12] Psychiatrist Rolf Loeber and Dustin Pardini (2008) have also noted that the influence of social factors on VAB in neurobiological studies, noting that such studies have not addressed how definitions of violence wax and wane over time in society and the lack of understanding between the ability of neurobiological models to address social and environmental factors that also influence VAB. See also chapter five of this dissertation.

[13] Factors such as comorbidity of psychiatric diagnosis, drug and/or alcohol abuse, or childhood mistreatment are common, and they make any VAB study (behavioral or biological) difficult to effectively isolate causal factors. These factors have been acknowledged through most VAB neuroimaging studies, and most studies attempt as best as possible to screen out such differences during recruitment process. Other neurobiological research has also attempted to better link these factors with changes in neurochemistry and/or brain function that may also mediate behavior.

[14] In very simplified form, imaging works by calculating the differences in blood flow rate between states of rest and activity. The measurement of blood flow at rest is subtracted from the blood flow measured during the administered task. This procedure is repeated over a series of scans (one for each participant in the study, in the case of PET or the task can be repeated by the same participant in the case of fMRI). The observed differences are then averaged over all scans to provide a mean difference; usually this is the basis for the final image of the study results (Aguirre 2013; Raichle 2000).

[15] See Chapter 3 on recruitment of populations for VAB defined groups. In addition, Raine's group used a much larger study population than previous studies. They were able to better address one of the most common limitations cited in imaging studies, small sample sizes. Compared to the number of individuals included in other VAB studies by their contemporaries, such as Volkow and colleagues (1995) which had eight participants in their VAB study group, or Seidenwurm and colleagues (1997) study with seven participants, Raine's group had been able to recruit and image 41 individuals in their target group, by far one of the largest study populations in any imaging VAB study (participants were added cumulatively to the studies such that they were able to get a total of 41).

[16] There are exceptions, in the case of Raine et al. (1997), in a review of biocriminology research using neuroimaging, Bower and Price (2001) noted the differences in the study by Raine's group between CPT results.

[17] Much of this information on the workings of fMRI comes from participant observation (lecturers, lab visits, and personal conversations) at UPenn during Neuro Boot camp, including specific lectures on fMRI given by Geoff Aguirre (2013). Also see chapter one.
[18] This issue will be addressed more in chapter 5 when talking about the use of neuroimaging in the law.
[19] The next chapter on the social factors and neuroimaging VAB research more specifically takes up the issues related to imaging research and VAB.
[20] Interactions between biology and social factors and their impact on VAB are covered in Chapter 5.
[21] http://www.amenclinics.com/about-us/faqs/ Retrieved on May 1, 2014.
[22] http://www.amenclinics.com/conditions/behavioral-problems/ Retrieved on May 1, 2014.
[23] At least four other clinics have been identified since 2011 including Mind Matters Clinics in Dallas area (afflicted with Amen Clinics), *Dr. Spectscan* (online); BrainSpect.com (Silicon Valley Brain Spect Imaging, Inc.) and Clements Clinics in Dallas, Texas (now closed, due to the indictment and arrest of owner Todd Clements, who surrendered his medical license for felony charges of fraudulent issuing prescriptions (see Valerie Wigglesworth (2012) of Dallas Morning News http://friscoblog.dallasnews.com/2012/11/convicted-frisco-psychiatrist-surrenders-medical-license.html/) see also Chancellor and Chatterjee 2011; Farah 2009.
[24] I am specifically refereeing to social and ethical impacts of the commercialization of genetics, and particularly genetic counseling companies and/or genetic ancestry testing that have dramatically increased over the last decades (see Harvey 2010; Krimsky and Gruber 2013; Lindee 2013; Nelson 2008; Wailoo, Nelson and Lee 2012).

Chapter 5 Notes

[1] Quoted in *The New York Times*, article titled "US Puts a Halt to Talks tying Genes to Crime, printed September 5, 1992 by Philp J. Hilts.
[2] However, at least two subsequent conferences on genetics and violence occurred that decade, including a make-up conference for the original 1992 meeting three years later at the University of Maryland, and a London meeting hosted by the Ciba Foundation in 1995 (Bock and Goode 1996; Spallone 1998; Wasserman and Wachbroit 2001).
[3] While the reference to the 'warrior gene' date back to 2004, the actually links to MAOA and human populations date back to the early 1990s, with the work of Hans Brunner (see chapter three). It was in 2004, that the link was made between the gene variant and the Māori population, that that popularized the moniker 'warrior gene.'
[4] One approach that is used is twin studies. These studies use twin siblings as a proxy for genetics stability. However, there has been long-standing critiques of the limitations of twin heritability studies (see Lewontin 1974; Kamin and Goldberger 2002)

[5] Gottfredson and Hirschi's (1990) is a social control theory of crime that is interested in self-control and social bonds. This theory seeks to explain how individuals learn to self-monitor themselves within society. The strength of an individual's self-control mediates whether or not the person will participate in criminal or violent acts. Individuals with high self-control will not engage in criminal activity.

[6] They used data from the Early Childhood Longitudinal Study (ECLS-K) The ECLS-K is sponsored by the US Department of Education focused on sets of twin children

[7] Although this section focuses on race, other attempts to refashion traditional criminology theories also include: Anthony Walsh's (2011) *Feminist Criminology through a Biosocial Lens.* Using outdated evolutionary models of gender and literature on sex differences at the level of the brain and gene, Walsh argues that gender differences in crime are *natural*, and that traditional feminist criminology would be advanced to re-consider and incorporate more biological based research on gendered/sex differences in behavior.

[8] Subcultural theories on race and crime have been critique in particular by Darnell Hawkins ([1983]2005) who argued that such approaches to race and crime has at least three weakness. Hawkins argued that subculture theory places an extreme emphasis on mentalist value orientations of individuals—orientations that in the aggregate are said to produce a subculture" (249); secondly, it minimizes historical-structural, situational, and economic factors, which better explain the higher rate of homicides within the African American community; and finally, he noted that these theories also under-emphasized the role the law plays in structuring patterns of criminal homicide. More specifically, Anderson's thesis has been criticized for not adequately examining the role more state and institutional level factors that play a role in structuring behaviors within certain neighborhoods, and that the theory reduces the explanation of violent acts down to individual level attributes and the adherence to mainstream values—specifically moral decency (Wacquant 2002). However, more recently, there have been attempts to re-look at Anderson's code of the street thesis, which has provided more nuanced understanding of issues between gender and VAB within the subcultural framework (see Nikki Jones 2008).

[9] See National Institute of Health (2012), Advisory Committee to the Director report on "Working group Diversity in the Biomedical Workforce" Retrieved 6/1/2014. Available at: http://acd.od.nih.gov/Diversity%20in%20the%20Biomedical%20Research%20Workforce%20Report.pdf.

[10] See Moffitt (1993)

[11] For more on social learning theories see Akers 1973, 2009.

[12] See especially Chapter 9, pp. 273-302, and chapter 11 pp. 329-366, on the hypothetical example of future uses of biocriminology.

[13] *Minority Report* is futuristic thriller about a law enforcement agency that is able to predict crimes before they happen, essentially arresting individuals before they commit the crime, and thus seemingly eliminating all crime. See also http://www.imdb.com/title/tt0181689/

[14] For a recent look at the promises of bioprediction see Singh, Sinnott-Armstong, and Savulescu (2014).
[15] See especially the work of Duke law Professor Nita Farahany, who has noted that the use of neuroscience research in trails has increased in the last decade, (http://www.npr.org/blogs/health/2013/11/12/244566090/brain-scans-shouldnt-get-their-day-in-court-scientists-say)

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APPENDICES

APPENDIX A:
REVIEW ARTICLES FOR INITIAL CONTENT ANALYSIS

The initial content analysis of these articles led to the development of themes and codes used to in the larger content analysis of empirical neuroimaging studies on VAB. Articles here were selected based on 1) the author(s) of the article; 2) suggestions or citations from interview participants and key texts; and 3) key journals published and five-year Impact Factor

Author(s)	Year	Journal/Book	5-year impact factor
Anderson and Kiehl	2012	Trends in Cognitive Sciences	16.845
Blair	2003	The British Journal of Psychiatry : the Journal of Mental Science	7.112
Blair	2010	Current Psychiatry Reports	3.23
Blake and Grafman	2004	Lancet	36.427
Brower and Price	2001	Journal of Neurology, Neurosurgery and Psychiatry	5.144
Buckholtz and Meyer-Lindenberg	2008	Trends in Neurosciences	14.466
Caspi and Moffitt	2006	Nature Reviews: Neuroscience	35.888
Coccaro	2004	Current Psychiatry Reports	3.23
Davidson et al.	2000	Science	33.587
de Aguirre	2006	Behavioral and Brain Sciences	23.173
De Brito et al.	2009	Criminal Justice and Behavior	2.364
Dolan	2008	The American Journal of Psychiatry	14.396
Dolan	2010	Criminal Behaviour and Mental Health	1.923*
Filley et al.	2001	Neuropsychiatry, Neuropsychology, & Behavioral Neurology*	1.579**
Gollan et al.	2005	Development and Psychopathology	6.399
Hoptman	2003	Journal of Psychiatric Practice	1.288
Hyde et al.	2011	Trends in Cognitive Sciences	16.845
Kiehl	2006	Psychiatry Research	2.829
Koenigs	2012	Reviews in the Neurosciences	3.102

Author(s)	Year	Journal/Book	5-year impact factor
Koenigs et al.	2011	Molecular Psychiatry	13.985
Marsh and Blair	2008	Neuroscience & Biobehavioral Reviews	9.924
Mead et al.	2010	Development and Psychopathology	6.399
Miczek et al.	2007	The Journal of Neuroscience	7.869
Nelson and Tranior	2007	Nature	38.159
Nordstrom et al.	2011	Advances in Genetics	4.102
Pridmore et al.	2005	Australian and New Zealand Journal of Psychiatry	3.102
Plodowski et al.	2009	The Neurobiological Basis of Violence	N/A
Raine	2002	Journal of Abnormal Child Psychology	4.23
Raine	2008	Current Directions in Psychological Science	5.537
Rutter	2008	Journal of Abnormal Child Psychology	4.23
Scarpa and Raine	2007	The Cambridge Handbook of Violent Behavior and Aggression	N/A
Siever	2008	American Journal of Psychiatry	14.396
Viding and Jones	2008	Quarterly Journal of Experimental Psychology	2.292
Viding and McCrory	2012	Development and Psychopathology	6.399
Vloet et al.	2008	Behavioral Sciences & the Law	1.337
Weber et al.	2008	Behavioral Sciences & the Law	1.337
Yang and Raine	2009	Psychiatry Research	2.829

*Five year impact factor not available, used current impact factor

**Journal name changed, used current journal's 5-year impact factor

APPENDIX B:
CONTENT ANALYSIS EMPIRICAL ARTICLES BY IMAGING TECHNOLOGY

Functional Imaging Technologies		
PET (15)	**SPECT (5)**	**fMRI (36)**
Raine et al. (1994)	Intrator et al. (1997)	Schneider et al. (2000)
Volkow et al. (1995)	Tiihonen et al. (1997)	Kiehl et al. (2001)
Raine et al. (1997)	Soderstrom et al. (2000)	Vollm et al. (2004)
Seidenwurm et al. (1997)	Soderstrom et al. (2002)	Birbaumer et al. (2005)
Raine, Meloy et al. (1998)	Amen et al. (2007)	Sterzer et al. (2005)
Raine, Stoddard et al. (1998)		King et al. (2006)
Pietrini et al. (2000)		Meyer-Lindenberg (2006)
New et al. (2002)		Coccaro et al. (2006)
Frankle et al. (2005)		Lotze et al. (2007)
Alia-Klein et al. (2008)		Kramer et al. (2007)
Booij et al. (2010)		Beaver et al. (2008)
Buckholtz et al. (2010)		Lee and Ham (2008)
Rosell et al. (2010)		Marsh et al. (2008)
Spoont et al. (2010)		Muller et al. (2008)
		Barkataki et al. (2008)
		Passamonti et al. (2008a)
		Passamonti et al. (2008b)
		Herpertz et al. (2008)
		Finger et al. (2008)
		Jones et al. (2009)
		Lee et al. (2009)
		Alia-Klein et al. (2009)
		Decety et al. (2009)
		Shannon et al. (2009)
		Passamonti et al. (2010)
		Veit et al. (2010)
		Carré et al. (2011)
		Strenziok et al. (2011)
		Marsh et al. (2011)
		Pujol et al. (2011)
		Finger et al. (2011)
		Kalnin et al. (2011)
		Kramer et al. (2011)
		Bjork et al. (2012)
		Osumi et al. (2012)
		Ly et al. (2012)

Structural Imaging Technologies	
MRI (29)	**DTI (4)**
Raine et al. (2000)	Li et al. (2005)
Laakso et al. (2001)	Craig et al. (2008)
Dolan et al. (2002a)	Motzkin et al. (2011)
Raine et al. (2003)	Sundram et al. (2012)
Raine et al. (2004)	
Yang et al. (2005)	
Antonucci et al. (2006)	
Narayan et al. (2007)	
Sterzer et al. (2007)	
Boes et al. (2008)	
de Oliveira-Souza et al. (2008)	
Huebner et al. (2008)	
Tihonen et al. (2008)	
De Brito et al. (2009a)	
Yang et al. (2009)	
Boccardi et al. (2010)	
Glenn, Raine et al. (2010)	
Glenn, Yang et al. (2010)	
Raine et al. (2010)	
Yang et al. (2010)	
Boccardi et al. (2011)	
Ducharme et al. (2011)	
Fahim et al. (2011)	
Fairchild et al. (2011)	
Raine et al. (2011)	
Schiffer et al. (2011)	
Yang et al. (2011)	
Gregory et al. (2012)	
Matthies et al. (2012)	

APPENDIX C:
CODING SCHEME FOR CONTENT ANALYSIS OF NEUROIMAGING STUDIES

Article Information	Date
	Author(s)
	Journal Title
	Journal Impact Factor
	Country of Origin (where research was conducted)
	Funding Information
Study Sample	Study Sample Inclusion Criteria
	Study Sample Size
	Control Sample Inclusion Criteria
	Control Sample Size
	Social Characteristics (race, gender, SES)
	DSM/VAB Diagnosis
Study Procedures	Imaging Technology
	Imaging Procedures
	Brain Region of Interest (ROI)
	Other Imaging/Genetic Technologies
	Neuropsychological Tests
Neuroimaging Findings	Study Results – location/function within the brain
	Study Conclusions
	Study Limitations
	Future Implications/Treatment Potentials

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