

BORN TO RAGE? : A CASE STUDY OF THE WARRIOR GENE

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A Thesis Submitted to the Graduate Faculty of

WAKE FOREST UNIVERSITY GRADUATE SCHOOL OF ARTS AND SCIENCES

in Partial Fulfillment of the Requirements

for the Degree of

MASTER OF ARTS

Bioethics

May 2012

Winston-Salem, North Carolina

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### Dedication and acknowledgements

First and foremost I would like to thank my family and friends for their unwavering support throughout this process and my education. With their loving support I have been able to accomplish a higher level of education than I had ever anticipated. Thank you for encouraging me to continue fighting, even when I didn't think I had much strength left to forge on.

I also would like to dedicate my thesis to the 32 innocent victims of the Virginia Tech tragedy on April 16th, 2007. As our understanding of human behavior continues to grow, I pray we find a way to utilize such knowledge to prevent future attacks, and other innocent victims. You will never be forgotten.

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## ABSTRACT

Behavioral genetic findings can change the way individuals feel about their own behavior and DNA. Depending on how individuals are exposed to these research findings, and how the results are presented, the results can determine how an individual internalizes the presented information. This internalization can alter the way an individual understands the relationship between free will and genetic determinism. These internalizations then carry over in the criminal justice system primarily in the mitigation stage of criminal court cases. By exploring academic and popular media coverage of the MAOA-L gene variant, also known as the warrior gene, I outline the differences between academic and popular media. Furthermore, I analyze a television show: *Born to Rage?*, and outline its coverage of controversial topics, use of field experts, images and language. I conclude that research findings regarding the MAOA-L gene variant should not be used, especially within the court room due to the infancy of the science and inconsistency of science regarding neurotransmitters and aggressive behavior.

## Introduction

The focus of this thesis is behavioral genetic research, primarily research associated with aggressive and antisocial behavior, and how its findings are disseminated to the public. Throughout this thesis, the MAOA gene variant, also known as the “warrior gene,” is discussed, from its discovery in the laboratory to its role in the criminal justice system. Behavioral genetic research dissemination is evolving, and its dissemination is no longer limited to just the academic sphere but now includes popular media outlets. The use of popular media for the communication of scientific findings generates specific concerns regarding *how* the scientific information *means* when exposed to audiences, in other words how is information presented to the audience and the subsequent results. In this thesis, the analysis of a television show serves as a case study that highlights key issues related to communicating behavioral genetic findings.

Dissemination of research findings is an important step in the scientific process. Research findings are only useful when disseminated in a way such that the findings may be applied to real situations outside of the laboratory. Behavioral genetic research findings have the power to change the way individuals look at themselves, as well as the criminal justice system. Use of the MAOA gene variant in criminal cases is already having prominent effects on mitigation of criminal sentencing. Outside of the courtroom, the implications of MAOA research on populations can be seen in the instance of the Maori population in New Zealand (Crampton & Parkin, 2007). The use of such behavioral research findings are having significant impacts on society in and out of the courtroom and therefore need to be monitored more closely to ensure that correct information is being disseminated to the public.

The MAOA gene, located on the X chromosome, encodes for monoamine oxidase A (MAOA), an enzyme that breaks down amine neurotransmitters, such as norepinephrine, serotonin, and dopamine (Raine, 2008). When these neurotransmitters are not broken down in the body, excess neurotransmitters interfere with communication among neurons, leading to abnormally aggressive and antisocial behavior. A specific mutation of this gene can lead to a specific type of allele, MAOA-L, which means the MAOA gene is expressed at a reduced rate. This low expression rate leads to the production of a limited amount of MAOA, which results in an excess of neurotransmitters in the body. The resulting abnormal behavior has stimulated research to understand the relationship between genetic makeup, aggressive and antisocial behavior, and the surrounding environment. From these initial findings the media disseminated information at a rapid rate, despite significant questions over the accuracy and evidence supporting the findings.

The first chapter provides background information about the field of behavioral genetics. Understanding this field's history is vital to understanding why it is so complex and controversial to talk about research findings. The field of behavioral genetics is not only providing cutting edge research into why our population behaves the way it does, but also into why individuals act differently from the rest of the population, developing individual characteristics. Furthermore, these individual behaviors, when abnormal, can have harmful effects, such as violent or aggressive behavior. By understanding these violent behaviors and where they develop from, the field of behavioral genetics can perhaps become a preventative field rather than a reactive one. The first chapter also outlines the 1992 conference "Genetic Factors in Crime: Findings, Uses and

Implications” and the controversy surrounding the conference, and discusses the shift in self perception, due to biotechnology and behavioral genetic findings. This change in perception, such as how individuals understand their actions in relation to their genetics, has vast implications.

The second chapter analyzes scholarly and popular media coverage of the MAOA gene. The scholarly sphere of communication utilizes academic publications to disseminate research findings in a specific language aimed at a very specific audience. Popular media disseminates research findings in a different way. The use of different media outlets, such as television shows, blogs, and newscasts, allows the information to reach a broader target audience. With this change in audience, it becomes imperative to use different language and tools than those used in the academic sphere. Due to the many differences between these spheres, information can be misinterpreted by the public, leading to incorrect interpretations of findings and the shunning of an important field of behavioral research. In New Zealand, the Maori tribe became a topic of controversy in the scientific field because a group of scientists incorrectly applied research findings to the whole indigenous Maori population, which led to the negative characterization of this population (Lea & Chambers, 2007).

To provide more evidence on the use of popular media as a scientific communication tool, the television show *Born to Rage* is analyzed in the third chapter. *Born to Rage* aired on the *National Geographic* channel on December 14, 2010. The show charted the journey of Henry Rollins, once a member of the highly aggressive American punk band Anti-Flag, and his undergoing of a DNA test to determine if he had the “warrior gene”. Throughout Rollin’s journey he met with groups of individuals who

were also tested for the gene, and he gives his personal insight as to whether he believes they have the “warrior gene” on the basis of their past history of violence. This case study highlights how the language and visuals of popular media can guide the audience to interpret scientific findings in a manner different from that promoted by academic coverage.

The final chapter highlights my recommendations for the use of popular media when disseminating behavioral genetic research. I also discuss the criminal case against Bradley Waldroup and how behavioral genetic information was used incorrectly during the mitigation portion of the trial. Due to the nature of the MAOA-L gene variant and its association with aggression and antisocial behavior, legal implications are the primary focus of the fourth chapter.



## **Chapter 1: Introduction to Behavioral Genetics**

The field of behavioral genetics presents many bioethical issues, very much like the field of genetics has, but by focusing on individual behaviors the field can develop internal and individual bioethics topics; the most significant topic being the contention between free will and determinism. One way individuals are exposed to these topics is through media coverage. When media coverage is directed by other factors such as newsworthiness and differences in reporting styles, scientific information can be presented in differing ways. These changes in presentation can lead to misunderstandings of current science and in turn alter the way in which individuals internalize the debate between free will and determinism. These individual perspectives become vital in regards to the criminal justice system where behavioral genetic evidence is already being implemented despite the novelty of the research findings. The field of bioethics has dealt with this contention between determinism and genetics before but the specific field of behavioral genetics stirs emotions and can become very controversial.

Behavioral genetics is a multi-disciplinary field involving such academic areas as humanities, biology, genetics, psychology, and social science. Eric Parens describes the difference between medical and behavioral genetics: “roughly, medical genetics studies the genetic influence on those traits or behaviors that traditionally have come within the purview of medical doctors – cancer, diabetes, [and] hypertension. Behavioral genetics studies the genetic influence on those traits or behaviors that traditionally have come within the purview of psychologists (and psychiatrists)” (Parens, 2004, p. S6). Plomin predicts that psychologists will soon use DNA markers in much the same way as they currently use biological markers such as hormones when deciding on treatment plans. Plomin describes two contrasting views of molecular genetics and their relation to

behavior: 1) "One-gene, one-disorder" hypothesis (OGOD) and 2) Quantitative trait loci (QTL). OGOD outlines rare cases of a single gene mutation leading directly to one disorder, in which the mutation is a necessary and sufficient cause of the disorder. QTL describes a hypothesis that assumes that in order to influence a trait there must be multiple genes affected to varying degrees; in effect, QTL represents propensities rather than determinate diagnosis. These two theories each support different branches of science, but they could ultimately work together to further our understanding of complex human behaviors. "Molecular biology traditionally favors the OGOD hypothesis, whereas quantitative genetics leans toward QTL... The merger of quantitative genetics and molecular genetics will be synergistic for the investigation of complex human behaviors" (Plomin, 1995, p. 117). Plomin argues that both of these hypotheses are likely to be in action when dealing with complex behaviors such as aggression, but that increased twin and adoption studies are needed to truly test these complex theories. Currently, traits such as depression, bipolar disorder, intelligence and aggression are being analyzed in the field of behavioral genetics. In this thesis I will focus on aggression.

Behavioral genetics explores why humans behave differently as individuals, why we act the way that we do, and what it means to be human. Individual variation is beginning to be explained by combining the discourse of environmental and genetic factors, and this research field is beginning to address a host of social topics, including intelligence, sexuality, personality and, more controversially, violence. Why, as a human race, do we care so much about why we are the way that we are? There are many reasons, but a strong driving factor is the prevention and ending of human suffering due

to illnesses and disorders. However, the outcome of looking analytically at human individuality is the deeper exploration of social structures such as, how society is organized into different social groups whether it is based upon politics or working groups, as two examples.

The development and enforcement of social structures can become an emotionally charged topic, especially when focused around aggressive and violent behavior (Parens, 2004, p. S5). This will be discussed further at a later point by way of an analysis of the criminal justice system. Eric Parens, one of the authors of the *Hastings Center Report Special Supplement, Genetic Differences and Human Identities: On Why Talking about Behavioral Genetics is Important and Difficult*, comes to a similar conclusion: “given that no less than how we understand ourselves and how we think we ought to organize our society seem to be riding on how we interpret the findings of behavioral genetics, it is not surprising that the conversation about those findings is somewhat difficult” (Parens, 2004, p. S5). The supplement calls attention to the growing significance of behavioral genetics because. Behavioral genetics is a mirror in which we see how we, as a society, have shaped civilization and how its structure may be flawed. This is a difficult subject to discuss because it invokes the nature/nurture debate as well as established social structures and the inequalities they create, not just from the standpoint of social construction but by focusing on whether or not there is a genetic component to these matters.

### *The Controversy at Hand*

While science has focused on explaining why certain individuals behave in a specific way or are mentally ill, the intentions for doing so have primarily been connected

to the search for knowledge to reduce human suffering. Such a reduction in human suffering was expected to be achieved by developing genetic therapies for persons based on their individual genetic markers. This type of research was soon integrated into practice and applied in a radical way. As Parens put it, “the desire to *explain* why human beings appear and behave differently, has converged with, or has been co-opted by, one of the ugliest and meanest of human desires – the desire to *justify* the status quo, to give a naturalistic account of why those who have, have and why those who lack, lack” (Parens, 2004, p. S6). The history of how these behavioral and genetic sciences were used to justify social injustices is a long and foul account of eugenic atrocities (Parens, 2004; Steen, 1996; Duster, 1990; Stock, 2003; Wingerson, 1998).

The current negative attitude towards eugenics has by no means always prevailed. In fact, in 1916 the founders of the American Journal *Genetics* were avid proponents of eugenics, and they were all of high reputation in the scientific community (Steen, 1996, p. 33). Eugenics was seen as a mainstream science and as a means for the betterment of future generations; it was eventually seen as a way to control the human population by specific ideals and to provide ways to measure others against those defined ideals. Francis Galton published *Hereditary Genius* in 1869. The book introduced the concept that intelligence and character were “natural abilities” that could be bred into specific populations through generations of selective mating. Galton was the first to coin and define the term “eugenics,” which appeared in the footnotes of his *Inquiries into Human Faculty* in 1873. He described it as:

The science of improving stock, which is by no means confined to questions of judicious mating, but which, especially in the case of man, takes cognizance of all

influences that tend, in however remote a degree, to give to the more suitable *races* or *strains of blood* a better chance of prevailing speedily over the less suitable than they otherwise would have.... This [is]... applicable to men, brutes, and plants (Johnson, 1914, p. 99).

In a more concise description, eugenics is “the field of study dealing with improving the inborn qualities of the human race, particularly through the control of hereditary factors” (Steen, 1996, p. 33). The nature of this selective science was originally intended to benefit the human population, but instead it came to be used to justify acts of genocide.

Alfred Binet used intelligence tests in 1899 to identify children with cognitive disabilities to enable him to provide them with the targeted special attention they needed. In 1901, H.H. Goddard, an American psychologist, used Binet’s intelligence test as a way to justify a eugenic agenda against Jews, Hungarians, Italians and Russians. Goddard claimed that a large percentage of the immigrants were “feeble-minded” and “morons” and recommended that “the feeble-minded be identified and kept from breeding” (Gould, 1996, p. 108). The United States mental health system is another reason people are disgusted by the term eugenics. Following a similar agenda of reducing the propagation of specific traits, in this case psychiatric illnesses, U.S. states permitted forced sterilization of psychiatric patients. In its 1927 decision in *Buck v. Bell*, the U.S. Supreme Court upheld a Virginia statute legitimizing compulsory sterilization of the “unfit,” including the mentally retarded, based on upholding the protection of the health of the state. After this judgment, many other states followed suit and updated their eugenic sterilization laws to include the mentally retarded (*Buck v. Bell*, 1927). However, to this day eugenics is primarily associated with the horrific events that took

place during World War II, with the systematic killing of over 10 million Jews, gypsies, and other “undesirable elements” by the Nazis (Steen 1996, p. 38).

Despite negative press, research investigating heritable traits, behaviors, and mental illnesses continues. Current heritability studies focus on isolating genetic factors and determining how they interact with their surroundings. Many of these investigations are conducted using observational studies of twins and adoptees, and on a molecular level with the search for genetic markers (Wasserman & Wachbroit, 2001, p. 1). Scientists have learned new information and understand that it is not just genetics at play, but rather the interaction between genetics and the environment that determines a lot about human behavior. “In the past, those who professed to investigate the genetics of complex behaviors fell prey to deeply mistaken scientific claims, such as traits like ‘intelligence’ or ‘mental deficiency’ are transmitted in the same simple pattern that color was transmitted in Mendel’s peas, and this was used, even in the recent past, to defend unjust forms of social organization” (Parens, 2004, p. S8). Current research has begun to find genetic links between antisocial and aggressive behavior by researching specific genes and early life maltreatment. Research focused specifically on crime and aggression runs specific risks in today’s society, especially when media coverage produces headlines such as “Criminal Genes” (*Popular Mechanics*), and “Children and Violence: The Search for a Murder Gene” (*Time*) (Wilson, 2002; Lemonick & Park, 2003).

There are many hazards when talking about a “criminal gene” or “aggression gene,” for there is a very clear stereotype of criminals in America: lower class African American males (Wasserman, 1995, p. 14-19) and the definition of crime can entail something as simple as jaywalking or theft, or, at the other end of the spectrum, murder.

There is thus a great deal of concern over the potential “racist” tendencies of this research.

In 1992, the public became concerned over the use of government funds to support behavioral genetic research and conferences, particularly those focused on crime. Frederick K. Goodwin, a leading federal research psychiatrist, announced plans for the Violence Initiative. This initiative was aimed at reducing crime in inner American cities. The initiative was set up to investigate the genetic and biological causes of “individual vulnerabilities” towards criminal and antisocial behavior (Wasserman & Wachbroit, 2001, p. 3). Goodwin’s announcement was criticized for being racist and compared to the eugenic ideals glorified by the Nazis. Goodwin’s proposal was discontinued and other activities involving behavioral genetics were brought under similar attacks. The public attitude remained consistent in dismissing and rejecting behavioral genetic research. David Wasserman’s grant for the conference, “The Meaning and Significance of Research on Genetics and Criminal Behavior,” was revoked by the National Institutes of Health (NIH) due to public outcry of similar accusations of promoting racism and social inequalities (Wasserman & Wachbroit, 2001).

*The Meaning and Significance of Research on Genetics and Criminal Behavior*

As previously mentioned, discussion of the genetic basis of criminal and aggressive behaviors very often leads to controversy. Of specific concern in this respect is the possibility for such thinking to lead to the marginalization of a specific population, such as male African Americans or low income, as well as the developing of stereotypes (Wasserman & Wachbroit, 2001). Because of the fear of marginalization, any research that is even somewhat related to this field automatically comes under scrutiny with

claims of eugenic intentions or social control. While many researchers believe that this type of scientific explanation has potential beneficial effects, such as reducing crime, there are many fears associated with its potential misuse. These contrasting responses of hope and fear regarding this specific field of study are why controversy has continued to permeate the field, which has in turn fueled media coverage and, in some cases, led to incorrect or incomplete coverage of findings or current studies. When the general public reads these stories as covered by newspapers and other forms of popular media, they are instilled with the same conflicting emotions as the researchers themselves. This is precisely what happened in 1992 with the “Genetic Factors in Crime: Findings, Uses and Implications” conference hosted by David Wasserman of the University of Maryland.

Wasserman, who originally planned the conference, was granted funding by the National Institutes of Health (NIH). However, due to the topic of the conference and the associated media coverage, it was received poorly by the public. This can be seen largely to be due to a misunderstanding caused by inadequate description of what the conference planned to address and discuss. The conference was intended to focus on *possible* genetic predispositions toward criminal behavior, but the popular media focused on individuals’ concerns that the conference was promoting racial prejudices and a modern day eugenics movement (Williams, 1994). This fear of racial prejudices was furthered fueled by the fact that one in every three young black men was involved with the criminal justice system in some manner (Wingerson, 1998, p. 301). The conference’s specific agenda was later attacked by the President of the Association of Black Psychologists, Dr. Maisha Hamilton Bennett. Bennett claimed that the conference was “a blatant form of stereotyping and racism,” and further stated that “It is the control of people under the



guise of mental health treatment. The rationale for this research is not credible” (Hilts, 1992, p. 1). Such challenges of the conference were covered in the popular media, and the public outcry that resulted led to the National Institutes of Health (NIH) revoking the funding it had granted. This controversy did not end there, though: Wasserman restructured the conference and resubmitted an application for funding.

Wasserman rewrote the grant application and renamed the conference “The Meaning and Significance of Research on Genetics and Criminal Behavior.” With an adjusted program, Wasserman reapplied for grant funding. This time he received funding from NIH’s Human Genome Project’s ELSI (Ethical, Legal and Social Implications) Research Program. Funding from ELSI proved to be a better fit for the conference because, at the time of its conception, ELSI’s focus had been human genomic research and its possible implications; it had the resources to provide an in depth analysis of this field of science from a multi-disciplinary perspective and the faculty to clearly address possible implications from the different ethical, legal and social areas. At the beginning of the conference, Irving Gottesman, a psychologist breaking ground in behavioral genetics at the time, provided opening remarks and a review of recent research findings. This brief review allowed people with little genetic background to build a general understanding of the field before listening to the rest of the speakers and thus to establish something of an equal footing when discussing matters at the conference. Discussions were carried out among attendees who were comprised of neuroscientists, geneticist, sociologists and many other professionals. When discussing the ethical issues surrounding this specific field of science, Paul Billings, an internist, highlighted the important concern that in the past eugenic information had been used unethically and

negatively, and asked what would prevent that from happening again (Wingerson, 1998, p. 297).

On the second day protestors began to bombard the conference with chants of “Maryland conference, you can’t hide! We know you’re pushing *genocide!*”(Wingerson, 1998, p. 300). The protestors were members of the Progressive Labor Party and members of Support Coalition International, a group of self-described “psychiatric survivors” who were opposed to the use of psychiatric medications. Adrienne Asch, at the time an ethicist at Wellesley College, shouted, “You don’t know what the purpose of this conference is, and you’re standing here trying to tell us not to have it! There are a lot of people here who have many reservations about biological or genetic determinism” (Wingerson, 1998, p. 300). It was clear that the protestors were protesting a meeting they knew very little about.

The controversy surrounding this conference provides an example of not only how the popular and academic media fields are inextricably linked but how incorrect coverage can lead to the miscommunication of scientific information. In this example, it led to a scandal surrounding the initial conference and interference with research in evaluating the ethics of the field of behavioral genetics. While many things were analyzed at the conference, an especially relevant outcome was the acknowledgement of the importance of choice of words when discussing this field of science. When asked what he had gained from the conference, Adrian Raine, a prolific author of criminal behavioral studies, stated,

I’ll be more careful in the terminology I use. I’ll be more careful in dealing with the press. And I really gained a lot from hearing about the history of eugenics. I

always used to think the science was shoddy back then, and that we've moved so far now we don't need to worry about it. But the speakers yesterday showed that was not true. They [the early eugenicists] were not as naïve as I thought. We do have to pay attention to the concern about the uses of our research in society (Wingerson, 1998, p. 304).

Raine touched on an important concern regarding communication between popular media and academic communities, and the conflict between internal and external responsibilities of researchers, which will be evaluated in the second chapter.

There are scholars who fear that behavioral genetic research findings will be used for a eugenic movement, specifically when concerning the pre-natal testing of children who may be at an increased risk of aggressive behavior or antisocial tendencies (Morell, 1993). According to the 2002 *World Report on Violence and Health*, in 2000, over 1.6 million people were killed through acts of violence (Krug et al., 2002). The push to prevent violence is becoming an important global campaign. The possibility of a eugenic campaign directed at children who have the MAOA-L gene variant has been compared to those children who had been wrongfully screened for the XYY chromosomal abnormality (Morell, 1993). In early 1965, researchers reported that a higher than average number of inmates had the XYY karyotype (Jacobs et. al., 1965). This overrepresentation of the XYY karyotype led to speculation that there was a positive correlation between XYY individuals and aggressive antisocial behavior. Soon after the story broke, a select few parents screened their children before birth for the XYY “defect.” Later studies determined that there was no increased incidence of aggression or crime in those

individuals with the XYY karyotype, and therefore children were screened under false pretenses (Freyne & O'Connor, 1992).

Although geneticists currently warn against such infant screening, due to the brief existence of the science, concerns still arise, as they should. Jonathan Beckwith, a Harvard geneticist and member of the Human Genome's Ethical, Legal and Social Implications of Human Genetics Research (ELSI) project, shared his views on screening populations: "there are always serious doubts about extending these extreme situations to the general population, because so many societal factors come into play. It would be a disaster if people suddenly decided to begin screening babies for monoamine oxidase deficiencies- as some did for the XYY defect" (Morell, 1993). Discussion of possible misuses should be brought to light before the specific technologies have been created. A delay period may offer more time to address ethical concerns, give time for specific sciences to be refined, and determine long term implications, such as screening infants for the XYY karyotype.

#### *How is Genetic Technology Shaping the Way We View Behaviors and Self Identity?*

Genetic findings have the potential to provide relief as well as dread depending on the audience. Schizophrenia was once thought to be a product of bad parenting; however, once evidence began to appear supporting a genetic link, the genetic information provided a sense of relief for parents. No longer were parents thought of as the root cause for schizophrenia due to bad parenting. "The idea that genes – not parenting practices – cause schizophrenia was enthusiastically welcomed. A genetic view of etiology [the cause of a disease or abnormal condition] provided more than hopes for advances in research: it offered both private and public exculpation for being ill" (Tobin,

1999, p. 2). Proponents of decreasing the stigmatization of mental illness have argued that further analysis of genetic markers will aid in the de-stigmatization of mental disorders; the medicalization of diseases and disorders allows dialogue to occur on a social and medical platform (Schmidt, 2007). Such de-stigmatization of mental disorders is one benefit of genetic research, but there are other, more intrinsic reasons for the continuation of behavioral genetic research.

Why do scientists want to find *the* gene responsible for specific phenotypes? I believe that the answer to this question goes deeper than curiosity and the desire to cure diseases, and hits at the core of human self-discovery, the learning of what makes humans the way that they are, and not just what makes us a specific way, but also *why* we are that way; is there an evolutionary explanation for individuality? It is not enough to develop a unique identity; the journey of self discovery is a lifelong expedition. Why this journey? In one sense, self-control: being able to control yourself begins with learning about the self. Bruce Bower reinforces this concept in “Violent Developments: Disruptive kids grow into their behavior”: “in the end, the goal is finding out the truth about yourself so that you can better control yourself” (Bower, 2006, p. 329). Genetic predispositions are a point of contention among scientists as well as the public. The concept that we are predetermined by our genes is a difficult notion to understand when we, as a human race, enjoy and relish the power to change our own outcome, to decide our own destiny. Learning that our predetermined genes may prevent us from controlling our future or deciding our fate is a powerful conception: “one can argue in each case over the relative weights of the genetic and social causes, but the mere existence of a genetic factor makes discussion of these traits highly controversial because it suggests a limitation of moral

agency and human potentiality” (Fukuyama, 2002, p. 39). This limitation of moral agency and potentiality feeds into the nature/nurture debate and the question regarding the extent to which our environment affects our outcome. What is the extent of our free will?

### *Implications of Control and Future Research*

Humans have an innate personal drive to overcome challenges. As technology and research becomes more precise and powerful, our genes may come to seem our most pressing limitation, and the best way to overcome our limits is by learning about them and controlling them. Previous attempts at social control on a genetic level include such extreme acts as those of the Nazis as well as the United States mental health system and the forced sterilization of psychiatric patients to prevent their “defective genes” from being inherited by future populations. This is an area that I think needs more focus, especially since this is where this type of genetic behavioral research could have the most detrimental implications, and, rather than reacting to such acts, we should take a proactive role in discussing them. The use of research findings is not easy to predict, but as the technology does yet not exist, it should be spoken about proactively to discuss possible problems with its use and, more importantly, to begin to establish a forum in which concerns may be addressed.

Society has other means of controlling behavior. By instilling specific rules and regulations, and enforcing punishments, it rewards and deters specific behaviors that are typically socially decided. While laws and regulations may vary between countries, it is generally understood that violence should be deterred. Fluctuating violence rates are becoming a great concern in the protection of national welfare. Typically in the past,

violence rates have increased during recessions however, this trend has proven opposite during our current recession (Opiel, 2011). Determining when crime and violence rates will increase has demonstrated to be more difficult than determining trends in the past. Current communication technologies -- television, internet, and social networks -- have increased the rate at which acts of violence can be shared, which has made violent acts more visible. Being able to understand violence, where it originates, or if certain individuals are predisposed to it, is a step in the direction of prevention. Francis Fukuyama, discussing Aristotle's view of human nature and the relationship with understanding humans notions of right and wrong, states that "Aristotle argued, in effect, that human notions of right and wrong – what we today call human rights – were ultimately based on human nature. That is, without understanding how natural desires, purposes, traits, and behaviors fit together into a human whole, we cannot understand human ends or make judgments about right and wrong, good and bad, just and unjust" (Fukuyama, 2002, p. 12). An attempt to obtain a genetic understanding of issues such as good and bad or violence is the first step along the path toward the control of such behavior. In an ideal world, there may be no violence, but in the current world and its possible future, such technologies could be harnessed to modernize and optimize violence. The idea of screening military members for this gene, to increase military defense, has already been discussed and will be covered in the subsequent chapters.

Screening specifically for or against a gene begins the conversation of therapeutic uses of genetic selection, or the use of genetic therapies to remove or treat a perceived genetic defect (e.g., the MAOA-L gene variant). Curing individuals, or even screening embryos for the MAOA-L gene variant, may begin to sound like a eugenic program. The

act of such screening and development of genetic therapies for the MAOA-L gene variant is a hazardous path that needs to be discussed, for there are advantages and disadvantages to using this type of technology. Because this type of research is still in its infancy, we are having a hard time understanding all of its implications and assumptions. What if the gene is evolutionarily favorable? Removing the gene completely from the genetic pool could have devastating effects on the human species. What consequences will there be to the genetic pool if we begin determining what genes should or shouldn't be added for genetic variation? Small changes to the genetic pool and the human genome can have major detrimental effects on individuals as well as society, especially when we don't understand how genes are interconnected with other behaviors. There have been many scientific projects supporting this notion of how complex the relationships are between individual genes, behaviors and traits (Stock, 2003, p. x). Conversely, what if the use of such technologies allowed individuals with a predisposition for violence to be targeted with therapies and prevent them from committing future violent acts?

Specifically discussing the MAOA-L gene variant research, Breakefield, a researcher in the field of behavioral genetics, notes that "this is something that could be a positive thing for society," and points out that there could be a relatively simple way to address the point mutation, the low expression of the MAOA gene. However, there is also the risk that "If it gets seen in the wrong way, people won't even be allowed to do research on this... If people jump to conclusions before we get the data, we may never get the data" (Wingerson, 1998, p. 293). The way the media depicts research findings can have a lasting effect on not just the public but the future of research. It is important to evaluate how the media depicts scientific findings because the act of educating the



public about genetic research is both powerful and necessary. However, the dissemination process is difficult. Behavioral genetic research is intertwined with controversy due to the nature of its implications, especially when discussing research focused on crime and aggression. In the following chapter I discuss how the “warrior” gene evolved to what it is known as today, through the collision of a research and medical ethos with a popular media ethos. Chapter two also provides an overview of the genetic science used and how findings were disseminated through the use of scholarly and popular media.

## **Chapter 2: Academic and Scholarly Coverage of the Warrior Gene**

### *Academic and Popular Media*

Quantifying the amount of influence that media has over our population presents an impossible task, due to several insuperable limitations. Primary among these is the fact that our society is not an isolated system, but is rather affected by many variables besides media, such as social and familial relationships, cultural preferences and practices, and many others. While the amount of influence media sources has over our population is not necessarily quantifiable, however, this does not mean that it is insignificant; in fact, the truth is quite the opposite. When specifically quantifying and discussing the realm of popular media and its potential influence, it is important to include all of its possible outlets. These outlets include but are not limited to radio, print media, internet, social media, and television.

This multi-faceted realm of popular media allows for the amplified dissemination of information to the general public. When scientific information is disseminated through popular media outlets, its influence can be seen in specific consumer behaviors that affect the development of research policies and the allocation of funding towards research projects. For example, when the news media covered the discovery of the genetic mutation that predisposed individuals to breast cancer, women began demanding genetic testing and preventative mastectomies from their physicians (Nelkin, 1996, p. 1603). While this information had been made available through scientific journals and academic media, there wasn't a significant demand by the consumer, the patient, until local media began covering the story. Also, the popular presence and commercial priority of breast cancer and "the pink ribbon" have raised a record amount of research funds, despite the disease not being the number one cause of death in women (which

position is held by heart disease). The public exposure breast cancer awareness has achieved due to marketing and social media is an example of strategic publicity and how it can affect policy and research funding. The coverage of this genetic mutation in local news, compared to its coverage in medical journals, created a vastly different impact through the utilization of a different ethos, a popular media ethos, in comparison to its counterpart, the scientific ethos.

The popular media differs from the scientific media realm in several ways; however, both create a unique and special ethos, a place of understanding, each with a specific communication goal. Within each ethos there are specific members, rules and expectations (Hyde, 2011). Through delicately structured dialogue, each ethos develops into a world of meaning for the audience to immerse themselves in. Each ethos has a specific target population that leads to the development and intricacies of the dialogue structure; the target audience effectively directs the dialogue. However, as separate as these media realms may appear, they are in fact inextricably linked, as becomes obvious when analyzing the overall use of popular media outlets to disseminate scientific findings to the general population.

The realms of popular and scientific media overlap in several ways: they to some extent share an audience and cover much of the same informational material, albeit in different ways. However, while the scientific realm consists of academics, students, and specialized professionals, the popular realm encompasses everyone, including the scientific realm. The two fields also differ in authorship. Academic media consists of scholarly journals and writers who are both involved in the scientific community and may be the researchers themselves, and for the most part the articles are peer reviewed by

other scholars, adding credibility to the piece. In contrast, the popular media sphere sometimes involves scientific journalists who may or may not have any experience with the science on which they are reporting. Ultimately, the editor has control over the piece and may change the title, structure or placement of the article.

Nevertheless, the two fields feed off of one another, specifically in the case of new scientific developments; without the scientific media sphere, the popular media would be unlikely to have access to information to share with the lay public. The scientific community needs the lay public to be able to apply this new knowledge and, through the recognition on the part of public made possible by the popular media, it can also lead to increased funding. The popular media sphere has the tools to aid in the communication of the new scientific information to the general public. The coverage of scientific news also lends itself well to the popular media sector. The popular media community wants headlines that convey information about “breaking” scientific news, and are also partial to controversy. It has been shown that audiences are deeply interested in this field of knowledge (Radford, 1996), which means that it is lucrative for the popular media to cover these stories. It is nearly impossible to isolate an audience from the impact of popular media. As communicative technologies have developed through the use of social media, increased communication between academic and social institutions, scientific information has come to permeate the popular media sphere. The collision of these two spheres can lead to miscommunication and increased tensions, as can be seen in the conflict surrounding media coverage of cancer research in 1998 (Shaw, 2000).

Dorothy Nelkin discusses the tensions between the two communication spheres extensively in her article “An Uneasy Relationship: the Tensions between Medicine and the Media,” featured in *The Lancet* in 1996. Nelkin breaks down the reasons behind these rising tensions as largely due to: 1) differences in defining news and what is considered *newsworthy*; 2) different perceptions of the role of the media and its responsibilities; and 3) conflicts over styles of scientific reporting/communicating, primarily due to different target audiences.

*The Difference between Academic and Popular Coverage*

*NEWSWORTHINESS*

The first cause of tension worth analyzing is the element of *newsworthiness*. When determining what is newsworthy, these two media sources focus on different factors. The academic sphere considers newsworthy research that is reliable and endorsed by professional colleagues through peer reviewed research: until research findings have been confirmed or certified by peers “to fit into the existing framework of knowledge,” the information is unlikely to be deemed “newsworthy” (Nelkin, 1996, p. 1600); once they have been, they can then be applied to the existing framework of the scientific community. In comparison, popular media spheres focus on information that is “new,” not necessarily reaffirming or confirming previous studies. Popular communication spheres seek to entertain as well as inform, and are not as interested by older news as they are in something that will catch the eye of the audience and that is fresh and dramatic. The popular media sphere is attracted to disputes, realizing that conflict sells better than everyday routine science (Nelkin, 1996). This is precisely why

stories about the MAOA-L gene variant and its research made headlines: it spoke of conflict, aggression and fear, sparked curiosity, and thus grabbed headlines.

In Brunner's initial study of 1993, it was incidentally found that a single rare genetic mutation was associated with the antisocial behavior exhibited in a large Dutch family (Brunner et al., 1993). The family in this study exhibited a multigenerational phenotype of persistent and extreme reactive aggression in the male population. On further analysis it was determined that in all of the affected individuals there was a mutation in their DNA that produced a stop codon before the MAOA gene, creating an MAOA knockout. The mutation of this MAOA gene can result in an MAO-A deficiency, which leaves individuals with borderline mental retardation and antisocial behavior (Brunner, 1993). This study provided the first compelling evidence for the identification of a susceptibility gene of human aggression. It also provided the framework for other genetic aggression studies, particularly to determine the extent to which the MAOA gene, in combination with the environment, contributed to aggression and violent behavior (Moffitt, 2005; Rhee, 2002). This study did not make major headlines until it was further analyzed in another article in *Discover* magazine in 1993.

*A Violence in the Blood*, which was published in the October 1, 1993 issue of *Discover* Magazine, covered the findings of Brunner's 1993 study (Richardson, 1993). This article was based on scandal: Richardson begins the article with a brief synopsis of how a member of the Dutch family approached the University Hospital in Nijmegen, in 1978, in the hopes of determining why the men in her family seemed to have mental disability and antisocial behavior. A medical history of the family revealed that aggressive behavior and mild mental retardation could be traced back as far as 1870

(Richardson, 1993). Richardson then brings up how the MAOA gene was being seen as a point of contention, and then mentions how the National Institutes of Health (NIH) had withdrawn its funding of Wasserman's conference (Richardson, 1993). Richardson's article highlights all the points of contention surrounding this new breakthrough, and the eye-catching title was sure to snag readers' attention and introduce them to this developing field of science.

In 2002, Caspi conducted a research study which led to the linking of the MAOA-L gene and maltreatment during childhood. The combination of the gene variant, MAOA-L, with early maltreatment was associated with an increased risk in displaying aggressive behavior. The study began to explain why not all victims of maltreatment in their childhood grew up to victimize others. The study began to pinpoint how a child's genetic predisposition could leave him or her more sensitive to environmental insults, perhaps leading to aggressive outbursts. Caspi's study addressed the potential for the MAOA-L gene variant to be evolutionary favorable, in agreement with the way Gibbons concluded that the same gene variant could have been evolutionarily favorable in specific monkey populations. Caspi and Gibbons' favorable conclusions about the gene variant were in distinct contrast to other studies that looked negatively upon the shortened gene, the MAOA-L gene variant. The study points out that if children were exposed to maltreatment the MAOA-L variant may have developed to serve as protection, that it may protect the gene carrier as a way of protection against environmental insult. In conclusion, the study calls for replication studies but more importantly begins to tackle the possible use of pharmacology to treat the genetic defect (Caspi, 2002).

The first use of the term “warrior gene” occurred in 2004 when Ann Gibbons’ piece, “Tracking the Evolutionary History of a “Warrior” Gene” (Gibbons, 2004), appeared in *Science* magazine and provided a historical basis for the necessity of the MAOA gene and its specific variants. Citing its presence in Old World Monkeys, before the divergence into separate groups of New and Old World Monkeys, the article provided insight into how the MAOA gene’s presence could be a reproductive payoff for some males. Gibbons went further into the work of Tim Newman, a biological anthropologist at the National Institute on Alcohol Abuse and Alcoholism (NIAAA), who believes that what we perceive as violent and inappropriate behavior today could be “simply out of context” (Gibbons, 2004, p. 1). “Bold, aggressive males might have been quicker to catch prey or detect threats,” says Newman (Gibbons, 2004, p. 1). Gibbons concludes the article with a brief account of the concept of maintaining balanced genetic selection. This article provided a different perspective of the MAOA gene than other articles had, supporting the need for increased genetic variation of the MAOA gene from an evolutionary standpoint. Gibbons argued that the gene does not simply and exclusively create the potential for violent behavior, but that there may have been a time when it was needed to protect oneself in dangerous situations and that it may therefore have been evolutionarily favorable. As influential and insightful as this article was, it seemed that many readers only took away the new term “warrior gene,” rather than the underlying message of the biological meaning and importance of this gene.

A more recent study released in 2009 by McDermott and associates concluded that MAOA affects aggression in high provocation situations. The experiment focused on subjects who could pay to punish other individuals that the subjects believed had taken



money from them. The punishment was the addition of varying amounts of hot sauce to the thieves' food. In the experimental situation it was shown that the more money that was stolen the more money the subjects would be willing to pay for increased amounts of hot sauce added to the food. This study differed from previous studies (Caspi, 2002) in that it measured actual behaviors rather than self-reported behaviors. McDermott and associates conclude with hypotheses of why this genetic mutation has persisted across populations if it promotes aggressive behavior. These hypotheses included the necessity of gene variation to show the distinction between gene types (low or high expression) because without the variation the effects would be undistinguishable; genetic variation is preserved because it is linked to other genes or has a variation of positive and negative effects; and lastly, the differences in aggression could be an example of "the adaptive logic of 'moralistic aggression' in promoting effective reciprocal bargaining or cooperative relationships" (McDermott, 2009, p. 2123). As research surrounding the MAOA gene continues, readers can see the increased focus of researchers to determine how the gene specifically affects individuals and their aggression. However, the way in which this research has been portrayed has led readers to focus on the new term "warrior gene", rather than the underlying message of the biological meaning and importance of this gene.

Violence captures the attention and imagination of readers; therefore, popular media naturally gravitated towards the "warrior" label and the "violent" aspect of the gene. Soon, headlines like "A Violence in the Blood," (Richardson, 1993); "Can your Genes Make You Murder?" (Hagerty, 2010); "Dangerous DNA," (Yong, 2010); and "Man's Genes Made Him Kill, His Lawyers Claim" (Pinker, 2003); began to appear in

media sources and have continued to do so. In contrast, the scientific community covered the developing discovery through articles entitled, “Selective Enhancement of Emotional, but not Motor, Learning in Monoamine Oxidase A-Deficient Mice,” (Kim, 1997); “Genes for Susceptibility to Violence Lurk in the Brain,” (Viding, 2006); “Monoamine Oxidase A Gene (MAOA) Predicts Behavioral Aggression Following Provocation,” (McDermott, 2009); “Role of Genotype in the Cycle of Violence in Maltreated Children,” (Caspi, 2002); and “Abnormal Behavior Associated With a Point Mutation in the Structural Gene for Monoamine Oxidase A,” (Brunner et. al., 1993). Academic media focused on reporting the reproduction of results and introducing the incorporation of new fields of research such as neuroimaging (“MAOA and the Neurogenetic Architecture of Human Aggression”). The question of what makes headline material is contingent on the target audience, which also dictates the style of communication and reporting. Stories need to be tailored to the audience by determining what they want to read and the form in which they want their information.

In an article in the *Los Angeles Times*, “A Case Study in How a Story Can Set Off a Frenzy,” David Shaw also highlighted how story selection based upon “newsworthiness” can have long reaching effects and can elicit a strong response from communities. Shaw states that news organizations cover stories not because editors or news directors feel that they are inherently newsworthy but rather that other news organizations are also covering them. The pressure to cover a story becomes impossible to ignore, an example being the Lewinsky affair with President Bill Clinton. However, while there is difficulty in ignoring such titillating stories as the Monica Lewinsky

scandal, the coverage of a research study in 1998 involving a possible cancer treatment set off what Shaw called a “feeding frenzy” (Shaw, 2000).

The initiation of the frenzy began with medical reporter, Gina Kolata, covering a story about Dr. Judah Folkman’s research at Children’ Hospital in Boston, which focused on 2 drugs, angiostatin and endostatin, and eradicating cancer in mice. While Folkman’s research had been covered in media previously, it had never been on page 1 of the *New York Times* Sunday edition with such high visibility. The story even included a quote from a Nobel Prize winning scientist, Dr. James D. Watson; “Judah is going to cure cancer in two years” (Shaw, 2000). With such a remarkable statement the story soon set off a frenzy in not just media but especially in the population of cancer patients and their families.

Cancer centers nationwide were overwhelmed with phone calls and requests for the drugs mentioned in the *New York Times* article, even though the drugs had yet to be tested on humans. From a financial perspective with coverage in the *New York Times*, Entremed, the financier of the drug research saw a price increase in their stock from \$12.06 to \$85.00 a share in less than 24 hours. The following week the story was covered virtually in all media spheres, although not all sources wanted to cover the story. Phillip Elmer- Dewitt, an assistant managing editor at *TIME*, didn’t think that they should have been covering the story, but the magazine’s top editors insisted on a cover story. Why did they feel the need to cover the story? A *Newsweek* editor, Geoff Cowley, weighs in on the newsworthiness and pressure to cover such stories, “Within hours of that [*New York Times*] story hitting the newsstands, it created such a furor that it was all anyone was talking about... It creates an obligation for us to weigh in with whatever

perspective we can bring to it” (Shaw, 2000). This story not only shows problems when determining how stories are covered, but problems and misunderstanding between writers and field experts.

After the frenzy began, Watson’s quote about Folkman curing cancer within two years was soon scrutinized. Watson and Dr. Richard Klausner, another scientist, both said that they were misquoted. While they maintained that they were indeed excited about where Folkman’s research was going, they felt that the article misrepresented their excitement. Kolata maintained that her quotes were correct. In fact, other experienced reporters, knowing Watson, noted that it was not usual for him to make outlandish claims, stating that he was a bit of a “verbal loose cannon.” While the argument of “he-said vs. she-said” is not necessarily uncommon in the media sphere, the question of responsibility for how one should convey this information is indeed important.

Ron Kotulak, medical reporter for *The Chicago Tribune*, feels that at times it is the author’s responsibility to bring “balance to the story when researchers get carried away” (Shaw, 2000). He goes on to state that reporters should fight the temptation to quote statements that are “outlandish [or] misleading because you’re making some kind of promise that even in a crystal ball would be hard to find” (Shaw, 2000). Contrasting Koulak’s view is Kolata’s response, as the igniter of the frenzy. When met with negativity about her article and how the quotations may be seen or interpreted as misleading, she responded “it’s not my job to say this [quotation] is too strong” (Shaw, 2000). This contention between censorship and a personal judgment call is a strong point of contention between the media sphere and academic researchers. In this case, Kolata’s critics state that she gave false hope to numerous cancer patients given the way the story

was written and Watson was quoted. Kolata responded to the accusation of ‘false hope’ with “it’s not for us to say what people are entitled to know” (Shaw, 2000). Other science editors supported her sentiments. A *New York Times* science editor, Cornelia Dean, said “It would be very dangerous if we started making news judgments according to what we think the emotional capacity of our reader is” (Shaw, 2000). Medical journalism, however, differs greatly from other media outlets. Even if a story is written accurately and without any embellishments, it can still raise the hopes of readers. Do authors have a responsibility to prevent raising hope in readers? Do scientists have a responsibility to monitor how their findings are presented to the public? These questions of responsibility lead us into the principal area of disagreement between the media and researchers; the disagreement about the role of media.

#### *ROLE OF THE MEDIA*

The role of the media and their social responsibility is a significant issue in the developing strain between the spheres of academic and popular media (Nelkin, 1996). Scientists view the media “as a conduit or pipeline, responsible for transmitting science to the public in a way that can be easily understood” (Nelkin, 1996, p. 1602). Scientists also believe that they should have the same sort of control over what information is shared with the general public as they have within their own academic sphere, through peer review and the ability to contact other scientists in response to concerns. In the grand scheme of communication there lies a gap between the two spheres; on one side academia wants their findings shown accurately without embellishment, because this is what leads to miscommunication. On the other side of this gap is popular media who want to cover the story as they see fit, even if the researcher doesn’t agree with the context. At times

this can be a conflict between selling the story and telling an accurate story. However, the responsibility to tell an accurate story does not lie solely with the authors; it can involve the researchers and how they portray their science as well. In 2007, Dr. Lea and associates published about the indigenous population of New Zealand, the Māori. In the events that followed, inaccurate findings, incorrect reporting, and questions of what responsibilities researchers have to ensure that their findings are portrayed correctly were brought to light (Lea, 2007).

In an isolated study involving the Māori, who were historically known for their fearless warriors, and the MAOA-L gene, controversy erupted over the overt use of stereotypes and incorrect population analysis. The study led to the stereotyping of this native ethnic group of New Zealand. The media immediately picked on this study and targeted the Māori population with articles such as “Māori Violence Blamed on Gene” (Wellington, 2006). This study was quickly attacked for not being clear and implying inaccurate findings (Crampton & Parkin, 2007).

One team member, of the initial research group, went as far as to say “Obviously, [higher rates of the monoamine oxidase gene] means they are going to be more aggressive and violent and more likely to get involved in risk-taking behavior like gambling” (Wensley, 2008, p. 507). This previous statement was in regards to problems that then plagued the Māori population: alcoholism and gambling (Wensley, 2008). Later attempts to clean up such statements in the media were futile. The research was understandably surrounded by controversy, and the team was accused of hiding behind a “vener of supposedly ‘objective’ western science to perpetuate ‘racist and oppressive discourses’” (Hokowhitu, 2006). The research team blamed the media for misquoting

them and misrepresenting their research, but this accusation was unsuccessful in fixing the reputation of the study. This problem of misrepresenting researchers and their associated findings brings to light an underlying problem of responsibility. Do researchers have a responsibility to directly address reporters and audiences when their research is being conveyed incorrectly? Wensley and King believe that researchers have to accept the responsibility to ensure the accuracy of their reported findings and the dissemination of their findings. Furthermore, they state that “researchers reporting findings in the area of behavioral genetics have a duty to ensure that their findings are placed ‘in context’ especially when reported to a wider audience” (Wensley, 2008, p. 509). By “in context” they mean that evidence of genetic influences on certain behavioral characteristics is not reported in isolation, but rather presented alongside other environmental factors that could also influence such behavior. Wensley and King emphasize that rather than just bad science, there are deeper ethical problems outlined by their case study. They develop a framework of internal and external responsibilities of scientists.

Internal responsibilities are thought to include considerations surrounding the choice of research topics, funding of research, the design of experiments, and the analysis and presentation of results within our society. Conversely, external responsibilities center on the application of scientific knowledge within society. The tension between internal and external responsibilities has been seen in the past. The science and knowledge itself is not inherently unethical, but rather its application itself is considered unethical. The knowledge surrounding the atomic theory, scientists have argued that the knowledge surrounding its discovery has led to other beneficial sciences; this would be

an internal responsibility of scientists. However, its application as a weapon in the atomic bomb is obviously most deemed as unethical, this being an external responsibility, how the information is used. These responsibilities are in contrast, can society blame physicists for the atomic bomb and the lives it destroyed; or rather does responsibility reside in other hands in how they applied the science? How much of a responsibility do scientists have in the way in which their science is applied? How plausible is it to hold the physicist responsible for atomic theory responsible for the use of the atomic bomb? However, is it appropriate to absolve them complete of responsibility for how their science may be applied? After all, shouldn't there be some realization from the scientists' perspective of how their science may affect society? I will return to the discussion of internal and external responsibilities in the final chapter.

The *New Zealand Medical Journal* published an article by Peter Crampton and Chris Parkin in the March 2, 2007 edition. This article, "Warrior Genes and Risk-taking Science," which was a response to Dr. Lea's study, provided a summary of the authors' ethical concerns regarding the "warrior gene." The authors express concern about the "extravagant speculation" regarding the causality of complex social issues either afflicting or associated with the Māori (Crampton & Parkin, 2007). The authors also deem the explanation of how empirical data regarding the small sample group could be extrapolated to the whole Māori population as "risky in the extreme" (Crampton & Parkin, 2007). Crampton and Parkin made very strong claims about Dr. Lea's conclusions, arguing that "To make the causal claim on the evidence of association alone is naïve. In this case, the naïveté is masked by the positive public stereotype of the cutting edge scientist reporting a breakthrough" (Crampton and Parkin, 2007).



While Crampton and Parkin criticize Lea for shoddy reporting, they make a final key point on the role of the scientist and the media. They conclude that scientists are responsible for the way in which their results are disseminated to the public and for ensuring a clear understanding of the limitation of their work. The job of a good researcher is not to simply discover new information; the scientific responsibility extends to enlightening others in an informative and honest way. The dissemination of scientific outcomes is a concern for all types of research, but due to the controversial nature of the MAOA gene, the dissemination of behavioral findings needs to occur very methodically. Crampton and Parkin are correct in stating that the role of scientists extends to the dissemination process of their findings. While there are many restrictions in controlling how the media portrays scientific research, and this shows no sign of changing in the near future, Crampton and Parkin realize this. They state that it is the duty of the scientists to try and address the misrepresentations of their research. Crampton and Parkin make a recommendation warning against scientists making extravagant claims that can be misinterpreted by authors and audiences.

Popular media has an important impact on research. The rhetoric and style used for the introduction of new scientific findings or technology can lead to a polarized perception of the finding in question on the part of the public. Specific uses of language and style can determine how an individual might see the human genome project, for example, as either providing the ability to prevent or cure diseases or as paving the way for totalitarian social control such as in *A Brave New World*. This is aptly exemplified by the protests at the conference in 1992. The role of the academic media is primarily to report previous research, while that of the popular media is to attract audiences with a

primary goal of increasing overall revenue via advertisements and sales and a secondary goal of, educating the audience.

However, the role of the media has begun to shift, as journalists are beginning to question the implications and the effects of these new sciences, which is another contributor to the tension that has begun to build between them. A significant portion of the academic sphere believes that the popular media sphere should promote science in a positive light rather than in a negative, questioning way. As previously mentioned, the public can have an effect on funding and legislation, and what the popular media transmits is essential to the success of further research.

### *CONFLICT OF STYLE*

In the academic and science population there is a pre-established community. This means that this audience has predominately had previous exposure to the subject matter, for the purpose of this thesis, genetic and behavioral science. This shared knowledge provides a foundation for authors to build on to introduce the new science. With this pre-established academic audience it is safe to conclude that the audience is already familiar with a large amount of the language and style of scientific writing. This familiarity is the preexisting framework in which the audience is able to apply the information, the lack of which is what can make the general population struggle in understanding new scientific information. Similarly, the audience/readers of the academic sphere know that the research was most likely replicated, and that this makes it more creditworthy. In contrast, if it is a new study, that there could be errors and the findings should not weigh it as heavily in comparison to a replicated study. Also in contrast, the general American population has only a basic understanding of science or

the complex relationship between genetic and environmental factors. This lay population has a very limited working knowledge and vocabulary of development in the realm of behavioral genetics, which is typically determined by what the media deems newsworthy. The target audience, in addition to dictating which stories are deemed newsworthy, largely dictates what type of style and language is used throughout a piece.

According to Dorothy Nelkin, the source of most of the contention and accusations of inaccurate reporting between academic and popular media sources is the selection of language and style of communication (Nelkin, 1996; Dunwoody, 1982). When popular media sources attempted to cover the quickly developing story of the MAOA gene, with the rush to break headlines, *Time* printed an incorrect description of the MAOA gene and its function. In *Time*'s piece, "Children and Violence: The Search for a Murder Gene," the effect of the defective MAOA gene is described as that of making "too much of an enzyme, called monoamine oxidase A, resulting in excessive destruction of neurotransmitters that help keep us calm and happy" (Lemonick, 2003). While this may seem like a minor error, this form of miscommunication is what so many scientists find frustrating about the popular media sphere, as such a description of the science can lead to misunderstandings about the gene and its effect on the part of the public. The language in the academic sector in general is very precise, which allows for the replication of research findings, which in turn increases the validity and utility of the findings. Lay audiences, however, struggle to understand MRI scans or to interpret scientific jargon, leading to inaccurate interpretations or outright confusion.

Popular media sources use simplified language to allow readers to comprehend concepts, rather than scientific terminology. This readability allows the audience to

apply findings to their limited pre-existing framework of science, which may or may not be extensive or detailed. Popular media may simplify scientific findings for any number of reasons; readability and comprehension are part of it, but another is time constraint. Television networks writing a segment about emerging fields of science may not have the time to delve very deeply into the details to explain how the science works. This simplification can lead to the omission of important scientific details, precautionary qualifications and nuanced positions that scientists believe are essential in the presentation of their work (Nelkin, 1996, p. 1601).

Brunner's findings were the first incidence of a single gene being linked to human aggression, but as research continued to reinforce Brunner's findings, the MAOA variant gained the moniker "warrior gene" as a result of Gibbons' article (Gibbons, 2004; Yong, 2010). This branding increased the profile of the gene by making it accessible to readers and head line friendly. It has, however, also led to misconceptions about the gene. Much of the current discourse associated with the MAOA-L gene variant, as seen in the articles previously mentioned, is based on fear and violence. The current literature is not very accurate when discussing the MAOA-L gene variant with regards to its counterpart, the normal MAOA gene; this leads to confusion of what specific variant scientific findings are disclosing information about. Also, with language like "violence," "blame," "dark secret," "aggression" and "risk taking," it is easy to see why a negative stigma is being associated with the MAOA-L gene variant even without the component of childhood abuse attached (Crampton & Parkin, 2007; Hagerty, 2010; Wellington, 2006).

The article that appeared in *Discover*, after Brunner's initial study, provided a short and comprehensible summary of Brunner's study, including methods and findings,

but with little interpretation of possible social implications. Compared to Brunner's report on the study, the piece provides more personal narrative about the Dutch family and less scientific terminology. Brunner's initial publication of the study provided strictly experimental information with little emphasis on possible implications of the research or its findings. Richardson's use of the personal narrative story allows for scientific information to become embedded in the story, allowing the reader to become lost in the story and potentially not even be aware of when they are being given information. Popular media sources use personal narrative and metaphors to relate scientific information in terms the general public can comprehend. This means that there does not have to be a pre-existing knowledge base to understand the piece of literature. When comparing the pieces of literature between the two spheres, there is a distinct difference in the vocabulary in the titles and the actual article. The use of personal stories and the creation of a human interest angle are very much outside the scientific norm in the academic sphere, where, for example, patients have double-blinded subject codes rather than a personal story. The use of such stories in the popular media can sometimes lead to an exaggeration of findings.

#### *How These Differences Transfer into the Medium of Television*

Tim Radford's "Influence and Power of the Media" describes the press as a living beast, which, in order to survive as a news source, must leave the reader wanting more. He defines the distinct difference between popular media and academic media as being connected to the art of entertainment. In popular media, the overall message of the author can be imbedded in stories, with its primary goal being entertainment and its secondary goal being the transfer of information. The way media outlets entertain their

audience varies, but the underlying information may be the same. Radford describes this as media outlets singing the same song (underlying information), but the verses might be out of synch. When they do match up, though, people and politicians listen (an indication of the great influence the media can have). Radford focuses primarily on the medium of newspapers and states that, while the readers are happy to be entertained, they are “mostly capable of discerning important patterns in the flood of competing signals, and unlikely to be misled about the things that really will alter his or her life, or their way of looking at it” (Radford, 1996, p. 1535). While this statement may hold true in regards to the newspaper media, I do not believe this is also the case with television audiences.

While many new media outlets have recently emerged, such as social media outlets, the various fields remain quite distinct. This division becomes especially apparent when analyzing television media and its role in the communication of scientific findings through the use of specific programming. As Radford mentions, the use of stories is essential in keeping an audience, and television is able to make use of these extensively to communicate information to the viewers. The utilization of images also closes the gap between difficult sciences and the preexisting knowledge of the general audiences: television is also able to use visuals to explain complex scientific procedures and concepts, and these make the sciences appealing to general audiences. This in turn allows for identification between the audience and the television programming providing the information; the visual aids create a bridge between the science and the viewer. Also, television reaches a very large audience, and its impact spans generations. Growing television network budgets and the increasing number of television programs is evidence of this expanding growth of not just television providers but also audiences. In our time,

technology is developing rapidly, and while some populations may not have access or understand the new technologies, there is an average of 2.86 TV sets per home (The Nielsen Company, 2009).

Television and its many facets allows for the construction of a framework of meaning defined by the producers and writers. The producers and writers control the language and therefore the discourse. Television can be a very passive form of media. In comparison to newspapers or other forms, the act of sitting in front of the television and being bombarded by many messages does not create an obvious opportunity for the audience to participate. There can be subliminal messages as well as very blatant messages in many different forms -- visual, audio, and expert testimonies. When one reads one is actively engaging with a piece of literature and pursuing the knowledge rather than it being shown and told to you, such as with television. The primary dimension of television, attracting audiences with hopes of increasing overall revenue, then secondly, educating the audience through entertainment, creates a host of problems when trying to communicate scientific studies and findings. This form of infotainment, informing while entertaining the audience, is precisely what *National Geographic* achieved in their episode *Born to Rage*, and because of this primary goal much of the science behind the story becomes clouded.

### **Chapter 3: Case Study: *Born to Rage?***

*National Geographic's* slogan boasts: "Inspiring people to care about the planet since 1888." *National Geographic* supports global exploration, conservation of natural resources, and a variety of research projects. *National Geographic* states that it has funded more than 10,000 of these research, conservation and exploration projects and also claims to be one of the world's largest nonprofit scientific and educational organizations with a primary mission of increasing and diffusing geographic knowledge. To say that *National Geographic* has had an impact on scientific information dissemination would be a vast understatement: it has brought scientific information to viewers at home in an educational and, more importantly, entertaining format through magazines and television shows, one of these being "Born to Rage."

*National Geographic* aired "Born to Rage," an episode of the show *Explorer*, on December 14, 2010. The television series *Explorer* covered a broad range of subjects: *Electronic Armageddon* investigated what would happen if an electromagnetic pulse (EMP) struck the earth; *Albino Murders* investigated the murders of albinos in Tanzania; and *Mega Piranha* explored the fossils of an ancient piranha that was seven times the size of today's species of piranha. The episode exploring the MAOA gene received notable coverage through commercials and online press. The show was further mentioned in blogs and in online forums after it aired. The *Dr. Phil* show aired a show named "Born to Rage?" on July 26<sup>th</sup>, 2011. The episode went as far as to test participants for the gene, interview experts such as Rose McDermott on their research and thoughts on the gene, and show clips of *National Geographic's* show. While this show was not the first to



analyze the MAOA gene, it was the first to focus solely on the MAOA-L gene variant and its possible association with violence and aggression.

The show highlights themes of personal identity, free will, genetics, and the struggle to understand the relationship between genetics and the environment. In analyzing this show I will assess how it uses characters, field experts, vivid visuals, and specific language, and how it addresses key within the field of behavioral genetic science. From this analysis I develop recommendations about the disseminations and use of this framework, which will be covered in the fourth and final chapter.

### Summary of the Case Study

The first part of the show introduces the viewer to its characters and the science behind the “warrior gene.” The show begins with an introduction of the main character Henry Rollins, former lead singer of the punk band *Anti-Flag*, and how he has struggled with anger and aggression his entire life. He expresses curiosity as to why he has felt this underlying rage and wonders if it is something within him or rather an effect of his environment. We are then introduced to the other characters of the show, or rather groups of individuals who undergo testing to determine if they have the warrior gene. The “experiment,” as *National Geographic* calls it, involves the interviewing of a group of individuals and testing them for the warrior gene. Before they are given the results, the group is asked to guess who may have the gene, and the host, Henry Rollins, provides his own prediction as to whether or not the individuals may be carriers of the warrior gene. The show follows a similar format for each of the groups; the viewer is introduced to the group, there is an explanation of the individuals’ childhood, detailing whether it was traumatic or not, and the individuals express their views regarding who will test

positive or negative for the warrior gene. Throughout the show, historical and scientific anecdotes are provided by the narrator and expert scientists in the field. The second part of the show revolves around disclosing the test results, through a genetic counselor, and the individuals' reactions to these results. The second half of the show also begins to touch on the possible implications of this type of behavioral genetic science. The show concludes with the dramatic result of the host's genetic test, and his personal reflection on his test result.

### *Analysis of Characters*

On watching the case study, it is clear that there are distinct characters with a clear story line, that of self-discovery. It is through Henry Rollins that *National Geographic* is able to develop a story of self-discovery that catches the attention of viewers. Rollins is not a typical protagonist: he is neither hero nor villain, but rather a man with a traumatic past trying to determine why he is the way that he is. Rollins is introduced as the poster boy of the punk revolution of the 1980's. Viewers are shown videos of him at concerts that show him beating an audience member and violently yelling into the microphone. Rollins is portrayed as overly aggressive and impulsive, but as the show progresses the audience is introduced to another side of him, an analytical side.

A glimpse into Rollins' childhood in Washington, DC, exposes viewers to a startling past. Rollins describes his relationship with his parents as a main source of general anxiety at all times, saying "I was a very nervous kid" (6:07)<sup>1</sup>. The narrator states that in addition to his general anxiety, being bullied "compounded his alienation"

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<sup>1</sup> Time stamp of citation within show. For transcript of show see Appendix

(6:15). Rollins endured racist taunts and remarks and was exposed to violence.

Eventually, he says, “I became what I feared. I turned into the problem” (0:07). Rollins himself, once the victim, became the aggressor. Rollins explains the internal struggle with his aggression: “Think of a stove where the pilot light is always on, always ready to light all four burners. That is me all the time. I’m always ready to go there. This is this thing that obsesses me. Why am I the way I am? Because to be almost 50 years of age and to be fairly furious all the time is not always the funnest state to be in” (2:07).

When asked about his feelings of being tested for the warrior gene, he claimed initially to want to test positive: “I would be disappointed if I didn’t have the gene” (0:02). Rollins acts as a link to the audience when interviewing other groups. He asks questions and probes the individuals to see if they have also felt such underlying rage within themselves. However, after determining which individuals test positive for the gene, he feels uncertain whether or not he has it. When finding out that he does not have the gene, he states: “When I found out that I did not have the warrior gene, I was kinda happy about that. I would rather me be me because of what I’ve been through rather than something that is in me. I paid for all the scars and bumps on my body. I earned those; I would like to think that it was me and not the *gene*” (44:58). Rollins’ character thus also provides the majority of the subjective reflection about genetics and personal identity.

Overall, Rollins acts as host. He talks with other individuals undergoing testing for the warrior gene and provides insight into whether or not they may have the gene. However, a shift occurs within Rollins as the show progresses. Rather than wanting to have the warrior gene, as he claims at the beginning, he states in his final reflection that he is glad that he does not have it. The fact that he has "earned" the bumps and scars on

his body provides him with a sense of responsibility and accomplishment; *he* earned them, rather than a genetic predisposition. While this seems like an astounding reflection, it leaves me wondering how the revelation would have gone had he tested positive for the gene. This journey of self-reflection is the story line around which the rest of the episode is built. By creating this story line at the beginning, leading up to the dramatic revelation of whether or not he has the gene, the audience remains engaged in the program.

The first set of individuals tested for the warrior gene is the Verdugo brothers, Hector and Gilbert. Rollins meets the brothers in Los Angeles at what looks like a backyard barbeque. As the interview progresses, the audience learns of the brothers' background, which is fraught with gangs and violence. The brothers tell the story of the first murder they witnessed, and footage of an event that matches the story is shown. The video shows two young boys watching a murder take place, and then staring at the body. The images alone tell a story, but hearing it directly from the brothers' point of view is even more evocative. The clip elicits feelings of helplessness: the boys were brought up in an environment in which they seem to have been exposed to violence on a daily basis, which leaves the audience feeling that the boys had no choice but to engage in such aggressive and violent behavior. Hector says, "When you're from the neighborhood, you're deep in gang culture and violence is the absolute truth of who you are" (08:57). Rollins shares a similar thought: "Their back story is very very violent and their youth, their upbringing was very very intense, but what I don't understand is if there is something inherent in them that made them violent in their very violent surroundings" (11:49). It is perhaps not surprising that, on being tested, it was found that both of the

brothers have the shortened allele, MAOA-L gene variant. Their responses to this, however, are very encouraging. When faced with the results, Hector provided the following personal reflection: "Just because I know I have this warrior gene in me there's no excuse. I'm going to push 100% to go forward to lead a loving and peaceful lifestyle. Peace is beautiful, you know?" (24:43). Hector does not see his predisposition as a sentence to a life of violent behavior; in fact, it fills him with determination not to use it as an excuse.

The next set of individuals tested for the warrior gene is a group of five mixed martial art (MMA) fighters from Hollywood, CA. The narrator describes the sport of MMA as being ultra-violent, and claims that if the warrior gene exists, it must be in one of the fighters. In the initial interview, all of the fighters indicate that they want the gene, with one even going so far as to say that he has the gene: "Seems like a natural progression: warrior gene – maybe the fighters will have it" (18:30), "If the gene's gonna make me more athletic then I'll take all of it that I can get..." (18:36), and "Yea, I mean being called the warrior gene is pretty cool" (19:32). However, Henry's observations provide some insight into whether or not these fighters will test positive or negative: "They're pretty aggressive, pretty intense in what they do but no one got really mad at the other and tried to knock his jaw out of the building. That seems to me that we are in a very controlled atmosphere" (18:52). However, on receiving the results, the fighters change their mind about wanting the gene. Being told that none of them have the gene, the fighters express a sense of relief that they don't have it. "As a fighter you'd think you want to be more calm and collected and not too quick to act" (36:09) and "People who are overly aggressive don't make it in this sport because they don't have the necessary

qualities of control" (36:11). This change in response is similar to Rollins'. The name "warrior gene" can lead to a misconception regarding what the effect the gene really has, and this misunderstanding no doubt plays a part in the initial desire to have the gene, as people imagine it will provide them with the title of a warrior.

The third set of individuals tested for the warrior gene is a group of six bikers from the Hollywood Harley Davidson dealership. The interview with the bikers indicates that some of them share the same constant struggle with anger that Henry does. They say, for example, "Oh yeah. It's like right now it's a seething pool underneath the surface, like at any given moment, like if you cross me, and I feel like I got disrespected I tend to snap", and, "I have to check myself on a daily basis to not be pissed off or shoot off on someone cause you never know. I feel it now, it's kinda like, 'Let's get this done', kinda you know. But you just gotta learn how to [moves hands down in a leveling motion] to take it back down" (20:59). When the bikers are asked if they have had any violent episodes they would like to share, the audience is introduced to Paul/Biker 3. Paul has a shaved head, with tattoos of horns on it, and has a deep, intimidating voice; as one of the fellow bikers says, "he has the look" (29:25). Paul shares a story of how he walked in on his wife in bed with his best friend, and how he was then shot after kicking the door in. Paul describes the experience as "probably the most exciting event of my life" (22:09). The way Paul is portrayed leads the audience to believe that he is highly likely to have the warrior gene. He even at one point says that he enjoys the violent way he responds to violent situations (22:32). Rollins agrees; "Those are some very heavy guys. Paul in particular, there's no way that guy doesn't have the warrior gene" (22:49). Test results revealed that half of the group was positive and the other half negative for the shortened

allele. Much to the audience's surprise, Paul is found to be negative. When those who tested negative for the gene are asked if they are disappointed, they reply, "Very, very disappointed. You want to be the warrior; you want to be the man, you know?" (30:30). Paul calls his significant other on the phone who goes so far as to reassure him that he is still their warrior. These scenes with the biker group support the stereotype of people wanting to have the warrior gene in order to be seen as "the man" and the belief that people who are violent or dangerous must have the gene, even though this is contradicted by Paul's test result.

The next set of individuals tested for the gene are three monks at a Buddhist temple in California. In their introduction it is indicated that they endured hardship and adversity during their childhood. Ong Min and Way High were bullied during their childhood years and Viet Tong experienced the hardships of war in Vietnam. On being tested, the audience is surprised to find that all three test positive for the shortened allele. While Way High finds it amusing that three monks have the so-called warrior gene, Viet Tong provides deep insight into the subjective reality of being a carrier of the gene: "Everyone is born with good and bad traits, that's what makes us human. But everything in life is not set in stone, our future is constantly changing, it's what we do now that will affect our future tomorrow" (38:09). While the bikers and monks occupy opposite ends of the spectrum, both groups serve to indicate that one cannot tell a gene carrier by his or her appearance. However brief their interview is, the monks provide a change of pace for the film, insofar as they present not the stereotype of the typical "warrior" but rather the opposite. Their interview footage is calm and serene, with relaxing music playing in the

background, in comparison to the heavy rock music playing in most of the scenes featuring Rollins and the bikers.

The last individual tested for the MAOA-L gene is a former Navy Seal, Randy Hetrick. While we meet Hetrick after he has been tested, we are introduced to him as the test results are revealed. Hetrick tests positive for the warrior gene, but he did not have a troubled childhood – in fact, he remembers his childhood very fondly. Hetrick's background includes thirteen years as a NAVY Seal and, more recently, as CEO of a fitness equipment company. However, during the interview we are told that there were some red flags that would lead him not to be surprised by the result. "If I look back over my background, there's a number of flags that indicate that I would be one of the carriers of this gene. When I was in school I had a few scraps here and there, a bit of a temper, it makes sense to me" (33:03). Hetrick's life story provides the viewer with an example of a positive outcome for a gene carrier, a successful entrepreneur and someone who even prevailed as a NAVY Seal. During the introduction of this character the question as to what would happen if gene carriers were militarily trained is raised. However, this is not expounded on extensively. With the introduction of this "real-life warrior" there is a contrast from the earlier twin brothers who were in a lethal gang; using an "American hero" brings a different face to a gene carrier, one less hostile face to which viewers can relate.

Finally, another important character worth mentioning is the narrator. While the narrator may not initially seem like a character, the presence of and the information imparted to the audience by the narrator is critical. The narrator shapes the show with an ominous tone and asks questions, prompting a specific frame of mind before introducing



the next scene. The narrator specifically builds tension and suspense during the explanation of the Waldroup case:

The evidence seems to be clear cut and most think that Waldroup is facing first degree murder conviction and the death penalty. Then his lawyers try a new line of argument. Waldroup has the shortened MAOA gene. Forensic psychiatrist Bill Bernet testifies in court that Waldroup's genetic makeup combined with his explosive personality diminished his ability to premeditate murder. Much to the anger of the victim's family and observers alike, the jurors agree and convict Waldroup of the lesser crime of voluntary manslaughter (41:16).

The narrator also builds suspense when revealing test results by using phrases such as "Now at last, the moment of truth" (43:29), "Which ones carry the warrior gene? The results are finally in" (25:40), and "Does that suggest that they too are carriers? Or does the warrior gene work in more mysterious ways?" (34:59). While it is important for a television show to be entertaining, this requirement can cause conflict when the character responsible for entertainment and suspense is also responsible for explaining important science that is detail oriented. In addition to having scientists on the show, the narrator also explains the science behind gene testing and the MAOA gene. The narrator in this show has two very different roles: ensuring an entertaining show that keeps the viewer interested and the successful explanation of science. As previously discussed in chapter two, when these roles are fulfilled by one media source tensions and errors can evolve.

#### *Analysis of Field Experts*

The first science expert the viewers meet is Rose McDermott. She has published studies on the MAOA-L gene variant and provocation. The study, which was published

in 2009, supported the link between MAOA-L and an increased chance of reacting aggressively to provocation. One study is not mentioned explicitly, nor is McDermott's background. Rather, her role throughout the show seems to be to discuss the contention between the roles of nature and nurture, the nature of those with the shortened gene and the ability of humans to overcome personal limits. For example, she is quoted as saying, "for a long time there were a lot of central debates about nature versus nurture, everything is caused by the environment in which we grow up or everything is caused by your biological predisposition" (04:25), and, following the introduction of Hetrick, the entrepreneur who tests positive for the gene, "I think the majority of people who have the short version of the gene are totally functional, contributing members of society, they're not relegated to a life of violence and gang warfare. I would suspect that there's lots of them among level CEOs, they're just risk takers, they channel it in a particular way" (39:05). Towards the conclusion of the show, McDermott presents a hopeful outlook on those with the shortened gene: "What's interesting about humans, we're the only species that actually has the power to overcome our own evolutionary impulse. We can change our outcomes" (44:23). Had McDermott's background or a brief introduction to her research been provided, her statements may have seemed more profound and significant to the viewers. Nevertheless, concluding the show with a statement of hope such as this allows the viewer to maintain an optimistic view of MAOA research and what its implications could possibly mean, as well as serving to remind the audience that having the gene is not an absolute sentence and that we are still in power of our own destinies.

While the audience is given footage of interviews of Bill Bernet early on in the show, his importance and the significance of his role regarding the MAOA gene is not

indicated until later on in the show when Bradley Waldroup's care is discussed. Bernet's initial statements are brief and focus on how current research shows that early maltreatment in combination with the shortened gene increase a person's risk of violence later in life and that having the gene alone does not "make things happen. It doesn't make people behave in a certain way, but it does influence people" (05:12 & 38:31). Bernet provides a vital reference to the evolution of the warrior gene in regards to the criminal justice system: his involvement in the Waldroup case provides a first-hand account of how the MAOA-L gene variant can have a strong impact on the criminal justice system, an issue that did not receive enough screen time in this film. It is important to note that the film shows two opposing views of the warrior gene. As previously mentioned, the Verdugo twins did not see their genetic make-up as an absolute verdict but rather they still had complete control over their lives and actions. Conversely, the sheer fact that Waldroup tested positive for the MAOA-L gene variant decreased his culpability and led to a lesser sentence in a murder trial, which will be discussed further in the final chapter. However, Bernet does not discuss the case in detail, but provides a divergent view of the gene in comparison to what the outcome of the case was: "Human behavior is not just the warrior gene. There are thousands of genes that might have some influence on the way the brain is organized" (42:57). While Bernet does not believe that the warrior gene is solely involved in human behavior and that other genes are at play, the court room seemed to latch onto the possibility of its influence on Waldroup's behavior. How genetic evidence is portrayed in the court room and its implications are an important topic that will be discussed in the fourth chapter.

The field expert/scientist who receives the most coverage in the show is Han Brunner, and rightfully so, since it is he who pinpointed the MAOA gene knockout, leading to no MAOA activity, in the Dutch family, the study that initiated research into the warrior gene. In the show, Brunner describes how the family came to him with concerns of a deeper problem in the men of their family, something possibly genetic. Brunner describes his findings: "This was the first evidence of a behavioral effect caused by an underlying genetic abnormality that would stand up in the terms of science" (15:10). He goes further to state that it changed the scientific debate surrounding the impact that genes have on human behavior (15:32). The program does not pose any questions regarding the possible implications that this type of research could have on populations, just a brief description is offered of what prompted the initial study and what the general findings were. During Brunner's interview, the narrator provides more information about the regulation of behavior and the use of hormones and notes that when these are not regulated properly abnormal behavior can occur (13:29). This section of the film (12:31 - 17:20) is science intensive, and is where visuals are of particular use in describing the science concepts.

### *Analysis of Visuals*

From the start of the film the audience is exposed to a multitude of "science visuals." Some are computer generated, such as mock synapses and genetic structures, while others show the inside of a DNA lab. Scattered throughout the show are brief illustrations of synapses (2:56) and a rotating DNA structure with portions highlighted for emphasis (3:01). These two illustrations are repeated throughout the show at random intervals. The most insightful science visual is during Brunner's interview, where the

science behind the MAOA gene variant is explained. While explaining how various chemicals affect the brain, such as, for example, serotonin, an image of a synapse releasing a chemical is displayed (14:14). This image cements what the audience is being told, giving them a visual to apply the knowledge being provided by the narrator. As this image progresses, the chemical being released from the synapse is accompanied by the visual with shaking and flashes of lightning, symbolizing that when there is excess serotonin a good mood can turn bad (14:28).

The DNA lab shown is the Family Tree DNA lab in Houston, Texas, a for-profit lab that sells DNA tests online that users can then send to the facility to be tested for a host of different genes. Scenes of a scientist using a pipette to remove a sample and then removing another sample from a centrifuge portray what the audience is likely to envision as a “typical DNA lab” (25:45). The lab portrayed shows individuals in lab coats looking at screens on which graphs are displayed, analyzing specimens under a microscope and checking centrifuges. The final lab scene shows a monitor with repeating DNA sequences of “AGTACC.....” and a scientist interpreting these. Viewers without a background in genetics may not be familiar with what this coding represents (26:13), but the addition of the narration – “The results are finally in” – allows the audience to connect the image with reading the DNA to look for a specific code (26:14).

Other images used in the course of the show include images of gangs, riots, and fighting with and without weapons. The use of such images tends to promote the stereotypes associated with the warrior gene; while the test results represent a contradicting message: that one cannot judge someone's gene carrier status on the sole basis of violent behavior. Footage of shirtless men with tattoos screaming at the camera,

with low lighting and smoke swirling around them, creates a very dark prevailing atmosphere in which the information being disseminated by the show is interpreted. In addition, footage of the Los Angeles Riots also portrays a largely homogenous population group, as most of the rioters are either Latino or African Americans in Lakers jerseys charging at police officers. There is also footage of people shooting at other people, and disturbing footage taken from store security cameras of people being shot. Such material, in combination with the character selection of the show, does not facilitate an unbiased portrayal of the science associated with the warrior gene. Furthermore, these biases are not stated overtly, but rather are presented to the audience in a more subtle manner. While the viewer may previously have been exposed to images of gang members, tattoos, riots and fights, they may not have been exposed to the science surrounding the warrior gene or possess the necessary knowledge framework in which to apply the science. This combination can lead to the incorrect application of knowledge, which, as in this case, leads to the propagation and support of stereotypes.

### *Analysis of Language*

The science connected to the warrior gene is described throughout the film with terms such as “in recent years” and “in its infancy.” The fact that these terms are used over and over through the film suggests a need to defend the science, in that, while it is new, it does provide significant influence. In addition, the vocabulary used in connection with the science implies violence, using terms such as “aggressive,” “impulsive,” “alienation,” “scars,” “flying off the handle,” “killers,” and most notably, “warrior.” The term “warrior” itself elicits a certain image, unique to each viewer. It conjures images of tribal warriors, military warriors and, the image that the show does most to support, street

warriors such as a gang member or biker. As previously explained in the second chapter, the warrior gene was named by anthropologist Anne Gibbons. Gibbons centered her article on the need for genetic variation amongst an ape population and claimed that this is provided by MAOA gene variants. Describing such “warrior” apes, she claims that “Bold, aggressive males might have been quicker to catch prey or detect threats” and that, taken out of context, these behaviors could be seen as violent (Gibbons, 2004, p. 1). Today, the term is likely to be taken as implying a proud, strong fighter; the absence of further information can thus make it seem desirable.

Throughout the film, language implying strong determinism predominates. Terms such as “directly associated,” “absolute,” “products,” “inherent,” “influence,” “predisposition,” and “linkage” are used throughout the film to describe the relationship between the MAOA-L gene variant and violence. This terminology can lead the audience to believe that the behavioral outcomes of the genetic variation are an exact science rather than a matter of probabilities. While many genes are associated with human behavior, especially violent or aggressive behavior, the only gene focused on in this film was the MAOA gene. And while it was stated that genes other than just the MAOA gene are at work in such behavior, this point is not made with sufficient strength or often enough.

#### *Analysis of Issues Covered*

The film touches on some of the ethical issues that may arise with further research on the warrior gene. However, it does not go into any depth on the topics nor provide much detail about them. In essence, it states a specific issue and how it relates to the warrior gene and then moves on to the next topic without going into depth on the topic

and its implications. For example, when discussing how the warrior gene could be used to deter crime, criminologist Kevin Beaver and a brief background of his study at Florida State University (FSU) is cited, but no attention is paid to the consequences of the criminal justice system using the warrior gene. “Once we identify with certainty that these genes are associated with different types of antisocial behaviors we can begin to create different types of intervention and prevention programs. It’s not unforeseeable to imagine the criminal justice system genotyping offenders as a way to tailor rehabilitation programs towards the individual” (28:31). While Beaver discusses possible therapeutic uses, he doesn’t carefully examine what form of preventative measures the criminal justice system could utilize. In fact, the suggestive use of preventative measures, such as pre implantation selection against the warrior gene, has caused concerns over the possibility of eugenic policies to arise.

Critics have also raised concerns of genetic selection surrounding the warrior gene. There have been other shows that have focused on developing the ideal warrior such as *Explorer: Science of Evil* (Gerber, 2008). The idea of screening embryos for or against the warrior gene has plagued scientists since the initial Brunner study (DeCamp, 2004). What if the gene was used to screen for soldiers? What if the military started to develop therapies in which they optimize the ideal warrior with the additional warrior gene? These are questions that may initially seem farfetched, but further research makes it understandable to see why they are being asked. If the medical field is to use this genetic information to develop therapies for individuals, who is to say if they are actually creating therapies? Is this another form of controlling the human race? Is this a eugenic



path, trying to create a master race by altering genetics? Surely not all therapies will be genetic therapies.

Another issue that the film showcases, albeit indirectly, is the struggle between individuality, genes, and free will, or in other words, how one's genetic makeup affects how one perceives oneself and one's past actions. We are exposed to this mostly through the reflections after determining the individuals' warrior gene carrier status. For example, at the end of the film, when Rollins is discussing earning his scars and bumps, there is a sense of pride in his voice that he, as an individual, lived the life that he lived rather than living a life that his genes predisposed him to (45:18). Overcoming genetic predispositions is supported throughout the film via individual character storylines, e.g. Verdugo brothers overcoming earlier gang involvement and Hetrick's overall success, but also through field expert McDermott (44:23). Understanding and exploring this relationship between personal accountability and genetics, specifically the MAOA gene, created an opportunity for the film to showcase personal growth within the characters; this is where the storyline really developed. By the end of the film Rollins has a personal realization and understanding in regards to his genetic makeup, he is responsible for his past actions and future actions, not his genes. Owning one's future and understanding one's past mistakes is echoed through the Verdugo brothers, how they perceive their past gang life and how they wish to live their future, peacefully. This topic of individuality is never explicitly stated, but the theme is present throughout the show.

### *Final Thoughts*

A striking feature is the absence of footage connecting the violent stories and backgrounds of the monks who were interviewed when the violent backgrounds of the

individual groups are discussed. In comparison to the other characters within the film, whose interviews include dramatizations with outside actors, there is no footage of the monks' troubled history. This lack of footage is unclear and slightly mysterious. One possibility is that it has to do with violence towards a religious individual being too controversial for the expected audience. The Buddhist individuals note that they too were bullied in their childhood, but more notably the head Monk, Viet Tong, escaped his homeland during the Vietnam War.

The show spends approximately five and half minutes discussing the actual science behind the MAOA gene, roughly 12% of the total 45 minutes and 45 second long show. Given the fact that the show boasts that it will go "Inside the warrior gene," it should have showed more of the science behind the gene. By doing this I believe it would have avoided stereotypes and may have provided the audience with a clearer understanding of where *current* science is and where it could be going next. By showing the integration of this science with other disciplines, such anthropology, viewers would be given a broader understanding of the actual science behind the warrior gene. The show focused too much on creating stereotypical characters (though the program showed that not all of the characters carry the gene) rather than on the actual science surrounding the gene.

While deterministic language dominates popular discourse (Stone, 2003; Parens, 2004; Nelkin, 1995), this show does a decent job of rejecting this frame of thought. The Verdugo brothers do not see their genetic predisposition as an absolute, with Hector even stating that there is now no excuse. The contrasting side of this is the Waldroup case; highlighting this case and how the jury lessened his sentence, the film portrays a

contradictory example. My initial understanding of the gene led me to believe that perhaps having the gene could lead individuals to be predisposed to violence and that it is therefore something for which they are not fully accountable and that they should thus receive a lesser sentence. However, Nita Farahany presented at the ELSI Conference in spring 2011, on a contradicting perspective (Farahany, 2011). Farahany described the predisposition as more of a double-edged sword in that, while the individual may not have control over his or her genetic predisposition, it may leave them at an increased risk of exhibiting aggressive or violent behavior. I will discuss this double-edged nature in further detail in the fourth chapter. I do not believe that the film represented the other side of this so-called double edged sword, the side in which individuals could be at an increased risk of committing a violent again and that it is an important piece of information that should be heavily evaluated as this field of science continues to grow. This holds true when evaluating the reasons behind Waldroup's decreased conviction. One juror said, "A diagnosis is a diagnosis, it's there. A bad gene is a bad gene" (Hagerty, 2010, p. 4). The vocabulary connected to the term "warrior gene" is also very deterministic, and often leads to a glorification of the gene. A large percentage of men want to be seen as a modern day warrior, protecting their family and prevailing over obstacles. This type of deterministic language can lead to inner turmoil when discussing genes, free will, and determinism. How much free will do we have if our genes determine our personality?

A critical piece of communication is identification with the speaker, or in this case, the host. The audience is encouraged to identify with Rollins, especially since he was portrayed as a victim early on, with childhood bullying. But identification with

Rollins goes further than identifying him as a victim. Rollins asks the individual questions that one believes the audience would have liked to have asked themselves. He also offers reflections and observations that connect with the audience, such as the idea of earning bruises and scars, which relates to earning one's accomplishments and status in life.

Discussing this subject of behavioral genetics through the medium of television opened the case study to several downfalls. While visuals add another level of proximity to the audience to identify with the information and with the characters, the audience may not always make an accurate interpretation. What I mean by this is that rather than focusing on the information at hand they may be applying the information to an incorrect preexisting frame of knowledge. For example, the film displays much footage of tattoos and graffiti art, which enforces stereotypes that the film is trying to prove to be incorrect. These same non verbal cues are not possible in print media. This film builds an ethos around its storyline, one filled with scary stereotypes, fighters, bikers and gang members. By establishing a dark, brooding aesthetic such as this, the film leads the audience to be immersed in a dark ethos while being exposed to information about the warrior gene that again reinforces an incorrect and contradictory stereotype.

The show ends with a strong conclusion: "the lengths between our genes and our behavior makes it clear that debate is no longer nature versus nurture, it's nature and nurture that makes us who we are. And whether we like it or not, the journey inside the warrior gene has only just begun." This is a very strong statement, and one that reminds the viewer that having the gene is not an absolute determination. The fact that you have the gene does not mean you will be violent. My concern is this non-absolute message is

stressed too late in the film, and not enough *during* the show. While this point is implied in many ways: such as with field experts and varying genetic test results amongst the characters or in other individuals' reflections, this statement should have been made more clear throughout the film. The struggle between free will and determinism enters the spotlight within the criminal justice system, primarily when introducing behavioral genetic information into the mitigation process to attempt to explain violent behavior.

## **Chapter 4: The Criminal Justice System and Final Recommendations**

My thesis my final chapter discusses the intersection of the warrior gene and the criminal justice system, as well as my final recommendations. The chapter begins with a discussion of how the MAOA gene is infiltrating the criminal justice system and, by doing so, has a strong impact on sentence mitigation due to, as Nita Farahany called it, the “double edged sword.” The second part outlines my final recommendations which include medical journalists seeking further education, including epidemiology and statistics, as a possible solution to the aforementioned communication problems within the medical communication sector. I conclude with final reflections on this field of science and the overall thesis process.

### *The Criminal Justice System*

When discussing the interaction between the warrior gene and the criminal justice system it is important to note two distinct areas: 1) understanding criminal behavior and 2) mitigation of criminal sentences. The contention between free will and determinism can be seen in both of these areas. When trying to understand criminal behavior genetic information can enlighten individuals to why they may act a certain way or are more susceptible; however, this does not absolve them of their behavior, individuals have free will. However depending on an individual’s genetic makeup, it can limit an individual’s ability to utilize their free will therefore mitigating their self control. In regards to criminal behavior understanding why criminals act violently can involve two ideas, they are genetically predisposed to it, or they wish to act that way out of free will. Understanding how these concepts interact and overlap has been a controversial topic.

Over a period of three days in 2010, National Public Radio (NPR) aired a special series called *Inside the Criminal Brain*. This three part series, written by Barbara Bradley Hagerty, covered issues ranging from a neuroscientist discovering that he had the MAOA-L gene variant, to the neuroimaging of psychopaths, to the use of genetic behavioral evidence in criminal court cases (Hagerty, 2010). Of primary interest is the second part of the series, *Inside a Psychopath's Brain: The Sentencing Debate*. In this segment readers are introduced to Kent Kiehl, one of the world's leading investigators of psychopathy (Hagerty, 2010). Readers are introduced to how the warrior gene affects the overall structure of the brain and therefore affects criminal behavior.

Kiehl describes his interactions with criminal psychopaths and their struggle to feel and act with empathy. An interview with Brian Dugan, a man serving two life sentences for rape and murder, reveals the inmate's thoughts on empathy. "I have empathy, too – but it's like it just stops. I mean, I start to feel, but something just blocks it. I don't know what it is" (Hagerty, 2010, p. 2). This is where Kiehl's research comes in to play; using a mobile MRI machine, Kiehl has scanned the brains of over 1,100 inmates of whom 20% are psychopaths (Hagerty, 2010). His research has shown that psychopaths process information differently from the general public. In describing how the emotional circuit differs in psychopaths, he compares the psychopaths to vehicles having "brakes that don't work": "the emotional circuit may be what stops a person from breaking into that house or killing that girl. But in psychopaths like Dugan, the brakes don't work" (Hagerty, 2010, p. 3). This line of research is focused on how pre-determined genetics may alter an individual's free will therefore affecting how courts should mitigate crimes.

Kiehl's findings have strong implications for deciding how to punish criminals. When the courts are deciding how to punish low IQ individuals the death penalty is not always an option, on the grounds that these individuals lack complete culpability. However, in the case of Brian Dugan, whose lawyers argued he was incapable of making the right choices, he was still sentenced to death. Kiehl's research is beginning to address the culpability of psychopaths, which could ultimately influence how sentencing decisions are carried out. Hagerty closes the article with a quote from Kiehl: "Neuroscience and neuroimaging is going to change the whole philosophy about how we punish and how we decide who to incapacitate and how we decide how to deal with people" (Hagerty, 2010, p. 4).

In keeping with the theme of culpability and genetics, the final part of the series, *Can Your Genes Make You Murder?*, Hagerty discusses the case of Bradley Waldroup. In what seemed like a straightforward case of felony murder and attempted first-degree murder, the addition of genetic evidence from Waldroup himself changed everything (Hagerty, 2010). Waldroup's defense attorney recalled, "It wasn't a *who* done it? It was a *why* done it?" (Hagerty, 2010, p. 1). Waldroup underwent a psychiatric evaluation, and then his DNA was analyzed by William Bernet of Vanderbilt University, who determined that Waldroup carried the MAOA-L gene variant. Bernet explained, "His genetic makeup, combined with his history of child abuse, together created a vulnerability that he would be a violent adult" (Hagerty, 2010, p. 2). Bernet testified that the MAOA-L gene variant and an abusive childhood can explain why Waldroup attacked his wife and killed her friend. Bernet included in his testimony that he thought these factors should be considered when determining criminal responsibility (Hagerty, 2010). Upon deliberation,



the jurors concluded that Waldroup's actions were not indicative of premeditation, agreeing with the defenses' argument that he just exploded. With all of this taken into account, they found Waldroup guilty of voluntary manslaughter – not murder – and attempted second-degree murder (Hagerty, 2010). The judge sentenced Waldroup to 32 years in prison. While the jury in the Waldroup case used neural science to help determine the seriousness of Waldroup's crime, not all jurors may be as willing to consider this evidence.

How receptive the jury is to this new type of neural science can depend on how violent the crime was. The heinousness of a crime can dictate a jury's receptiveness to neural science as evidence, especially while jurors grapple with understanding *how* and *why* a violent crime occurs, the more horrific the crime the more receptive the jurors become to neural evidence. Some individuals could see this genetic research as a means to fill a void of understanding. Genetic information preys upon the gaps of *how* and *why* violent behavior occurs. In the grand scheme of things this makes sense. People are always searching for *why* something happens. Given that many violent acts seem unwarranted, this form of neural evidence may provide a way for jury members to understand *why* a person committed such a heinous act. But the *why* should not always completely mitigate the sentencing which is where behavioral genetic evidence currently shows an influence.

In what Nita Farahany called the “double edged sword” two contradicting philosophies may influence the use of behavioral genetic evidence in the sentencing stage of the criminal justice process. On one side, is the argument reflected in the Waldroup case; that an individual with a predisposition for violent behavior should have diminished

culpability for a crime and therefore have a lessened punishment. On the other side is the argument that an individual who is predisposed to violent behavior presents an increased risk of committing the violent behavior again and should therefore be punished the same amount, if not more, than an individual without the violent predisposition in the interest of deterring future violent behavior. While it is important to note the role that punishment plays in deterring future behavior, I will not discuss it further in my thesis, and I will instead focus on the use of this behavioral genetic evidence in the criminal justice system.

What I find particularly troubling, besides the fact that this novel genetic information whose meaning and significance is uncertain is being used in the court room is that there is currently no consistency to how this evidence is used in the court room, and how it is presented to the jury (Farahany, 2009). The way evidence is presented to the jury can determine how sentencing mitigation will proceed. Farahany released an anthology in 2009, The Impact of Behavioral Science on Criminal Law, which discussed how in recent years behavioral science is having a greater impact on the criminal justice system. “The frequency and application of this [behavioral] evidence in the criminal justice system is increasing, although its use continues to be haphazard, ad hoc, and often ill conceived. Defense attorneys have introduced biological and neurological predisposition evidence to exculpate defendants, to bolster preexisting legal defense, and to mitigate a defendant’s culpability and punishment” (Farahany, 2009, p. xi). While the anthology goes on to discuss the science of criminal conduct, behavioral genetics in a broader context, criminal responsibility, and implications for criminal justice and society, all of these topics underscore an underlying need for increased regulation. Consistent

regulation would follow after further research since currently there are conflicting studies regarding the exact cause of violent behavior and altered serotonin levels (Crocket, 2010). Behavioral genetic information may prove to provide further insight into criminal behavior, but this knowledge could prove to be more effective in other areas. In 1992, the National Research Council released a report based on the panel focused on "Understanding and Preventing Violence." The report came to numerous conclusions about current and past research regarding violence. Importantly, the report recognized the need for increased prevention of violent behavior, particularly targeted at youth. (Butterfield, 1992; Reiss & Roth, 1994). Behavioral genetic research, particularly in regards to the MAOA-L gene variant, could have lasting positive effects within the child welfare system in identifying children who may need mental health therapy but only once the science surrounding the MAOA gene has developed.

#### *Final Recommendations and Reflections*

As someone who personally struggles with understanding violent acts, I found the process of writing this thesis to be rather cathartic. During my freshman year on April 16<sup>th</sup> 2007, while attending Virginia Tech, a student killed 32 people and wounded 17 others on campus. I would later discover that I knew the first two victims, Emily and Ryan. I was left with a sense of frustration: How could something like this happen? Furthermore, how can similar acts continue to happen across the world? Trying to understand why someone acts in such a merciless and violent manner became an internal struggle for me, something I still grapple with today. Learning that research was being conducted to evaluate individuals with a predisposition for violence created a place of understanding *why* and *how* such atrocious acts occur. But my previous knowledge of

genetics and environment allowed me to apply this knowledge selectively and cautiously. Even with this pre-existing understanding, it is difficult not to look at this new age of science with a sense of hope and trepidation. Hope, in that perhaps implementing genetic knowledge correctly and cautiously could lead to a decrease in violent acts; perhaps preventing another school shooting such as the one that occurred at Virginia Tech; and trepidation in that if used incorrectly lives could be permanently damaged and research could be set back decades due to the associated stigmatization of similar eugenic programs.

So I find myself asking: Where does this leave me? How do I feel about the current research? I feel optimistic in that the discourse is no longer “nature versus nurture” but rather “nature and nurture.” In order to use genetic research findings most effectively this inclusive discourse is needed. Genetic research alone will not decrease violent acts, but rather the effective use of this information in conjunction with community programs will allow this type of research to have its most effective implementation. This effective use will only come after replicated studies and further research focused on neurotransmitters and their overall involvement with behavior.

Information regarding the MAOA-L gene variant should not be used within the criminal justice system. Currently there are conflicting studies regarding whether excess neurotransmitters (serotonin) create anti-social behavior, such as aggression, or conversely, pro-social behavior, enhancing harm aversion (Crockett et. al, 2010). This field of science is clearly within its infancy and contradicting findings show that this topic of research is not easily understood, therefore there needs to be further studies and increased consensus before such science should be presented in the criminal justice

system or in any other system. Implementation of this science should also be withheld from other fields, such as the child welfare system, until there is further consensus.

In 2003, *Vanderbilt Law Review* published an article by Robert Stone entitled “The Cloudy Crystal Ball: Genetics, Child Abuse, and the Perils of Predicting....” which outlined the hypothetical use of such genetic information as testing for the MAOA-L gene variant and its use in the medical field and state child welfare department (Stone, 2003). While the piece generally disapproves of using genetic markers as a direct way of predicting behavior, Stone outlines the use of genetic tests in determining the genetic variant (MAOA-L or MAOA-H) of children who become a victim in an active child abuse or neglect investigation. Stone states that in addition to accumulating evidence of abuse, the physician may determine the victim’s MAOA genotype. Due to the nature of the child welfare system and their overarching goal of protecting and not stigmatizing children, it provides a large target population in which to begin to analyze how this information can be applied to practical situations with a strong positive outcome. The child welfare system target population involves youth exposed to early maltreatment, including those with and without the MAOA-L gene variant, while providing the resources necessary to observe the children over time. The child welfare system could use this type of information to focus on the victim’s past, in that if a child with a genetic predisposition for violence was in a particularly violent household, the system should strongly weigh this factor when deciding the best outcome for the child and what steps the state should take in response. While upon first glance this hypothetical plan seems attractive, primarily because its approach is more therapeutic rather than punitive, and

could be very preventative, it is premature to introduce this type of research into the child welfare system due to the infancy of the science.

The child welfare system provides a unique environment in which to analyze the use of genetic tests for violent predispositions, especially because the system is focused on the child's best interest, rather than the state's interest in things such as predicting future violent behavior. I agree that this potential area could allow for these genetic tests to develop deeper understanding of past abuses however, further research needs to occur within the child welfare system as well as concerning the MAOA-L gene variant, before such actions, as Stone outlined, should occur.

The problems involving the dissemination of research findings are not new problems, but the media in which research is being distributed are changing. Research is no longer distributed solely through print media, but also electronic and social media including blogs, Facebook, Twitter, and television. In this thesis, I have examined problems of information dissemination and responsibility within the media sector. Should the media sector be held responsible for embellishing scientific findings or getting readers' hopes up when it comes to cancer treatments or in this case developing therapies to prevent violent and aggressive behaviors?

Problems exist with the sole dissemination of medical breakthroughs coming from non-academic or medical journalists. As discussed earlier, problems surrounding "newsworthiness" begin to embargo scientific information from the public. The process in which newspapers and other media cover the stories are restricted, with these sources receiving tip sheets, or article summaries, from medical journals and then choosing their stories based on what studies will be published in the journal. Thomas Maugh, a science

writer for the *New York Times*, admits that “95% of my stories come from the journals. We’re spoon fed. They manipulate us. But it benefits us as well as them, so I don’t see the harm” (Shaw, 2000, p. 2).

For the most part, the major journals set the journalistic agenda in mainstream press coverage of medical news. They have what amounts to ‘a stranglehold over information about biomedical research,’ in the words of Natalie Angier, a medical writer for the *New York Times*. That often means that mainstream news organizations – and, more important, the public—are potential victims of the growing pursuit of publicity, individual and institutional acclaim, research grants and commercial profiteering that often drive the announcement of medical breakthroughs in the journals (Shaw, 2000, p. 1).

Some authors have said that they don’t feel comfortable evaluating studies on their own, which is why they turn to the tip sheets provided by the journals; “We don’t feel competent to make a judgment,” said Cornelia Dean, a medical journalist of the *New York Times* (Shaw, 2000, p. 3). By choosing to write stories based on tip sheets rather than reading and evaluating the merits of the studies for themselves, a breach in an internal responsibility is created, and in turn, a breach in an external responsibility of a journalist. The internal responsibility, in this case, is story content, which is given to writers rather than chosen exclusively by the writers. The topic is usually dictated by what is considered newsworthy at the time, as previously outlined in chapter 2. This breach in internal responsibility carries across into the external responsibilities of writers, how the writers and readers interpret the story. If the story is written with an emphasis on the novelty of the science and its newsworthiness, a skewed message can be presented to

the audience. Medical journalists/authors should be held accountable for internal and external responsibilities, to a certain extent. Journalists/authors cannot be held exclusively accountable for the way the public interprets their stories, in the same way the scientists behind the development of the atomic theory cannot be held accountable for the deaths associated with the atomic bomb. These internal responsibilities play in to external responsibilities, so by strengthening authors/journalists internal responsibilities we can begin to address their external responsibilities. These internal responsibilities could be addressed through further education. These problems in determining what stories are told and how could be addressed through further education for medical journalists.

Having knowledge regarding population based studies and statistics would allow medical reporters to analyze science from an independent and knowledgeable point of view and provide them with the necessary knowledge to critique studies. Writers who know how to analyze data tables are able to write more cohesive and accurate stories compared with writers who merely rearticulate the introduction and conclusion of a study. “I go straight to the data tables first. If the data tables are not pretty convincing, I’m not wasting my time with [the researchers’]... yammering at the conclusion or their hypothesizing at the opening. If I find the data tables sway me... then I really scrutinize who was in the study, what was the context of the study, who was the control group, was this a well-designed study. Then, your last thing is what do they make of the data” (Shaw, 2000, p. 3). Michael S. Wilkes also recommends this solution in his piece “The Public Dissemination of Medical Research: Problems and Solutions” (Wilkes, 1997).



Wilkes highlights the need for medical journalists to achieve a higher level of education in research methods to better serve their readers. One way of doing this is by understanding the limitations of research. This understanding can be developed by studying epidemiology and statistics so that writers can present the research findings in an accurate way. Wilkes also calls for increased direct communication between medical journalists and researchers. Group research involving researchers, editors, journalists, government, and consumers, focused on communication needs to occur in order to evaluate shortcomings inherent to dissemination. This research could begin to develop guidelines for the dissemination of medical research and the timeliness of journal reviews (Wilkes, 1997). Moreover, this collaboration could bring together all participants involved in information dissemination to work together in addressing key problem areas for all of the groups.

Further research needs to focus on how audience's baseline science knowledge is changing. Because the general public's science understanding is changing, journalists, writers, and producers can begin to change the way they present scientific information. Learning how the public perceives science research will determine how effective communicative media will be. Upon further reflection there are several things that I wish I would have done differently in this thesis. Primarily, I wish I would have developed a survey to give to individuals before and after watching the case study. This survey would allow me to analyze what they took away from the show and how they understood the science explained throughout the show. Secondly, I wish I would have contacted the field experts in the case study to ask their opinion on how they felt the show turned out. I am curious as to how they think the science was presented and if the show portrayed the

field experts properly, or if any vital aspects of the individual interviews were changed. Next, I wish I would have had time to thoroughly analyze blogs focused on the case study and read the audience's reviews of the show. Finally, I would have liked to analyze the follow-up press surrounding the show; including press releases and commentary after the show aired.

As research continues to evolve within the field of behavioral genetics, the field of health communication needs to also excel. Collaboration between medical journalists, writers, producers, and scientists needs to occur. This collaborative team needs to determine which communication media work best for varying demographic group and scientific fields. Scientific findings are having increasingly lasting effects within the global community. In order to ensure that these effects are warranted and based on correct scientific findings, rather than incorrect interpretations due to poor communication skills, medical journalists and other individuals within the media sector need to carefully analyze how they present information to the public. The public also needs to also become increasingly cautious when presented with stories that seem "too good to be true."

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## Appendix

Transcript: *Born to Rage*

00:00 N: "Are some people born to be violent? An extraordinary discovery suggests they are. A single gene has been directly associated with violent behavior. This controversial science has ignited debate over genetic screening and eugenics. Now for the first time *Explorer* takes you inside the warrior gene."

01:10 N: "In the 1980's a youth rebellion was brewing. The American punk rock revolution was shocking; not just for the angry music but also for the violence it inspired. As front man for the California band "Black-Flag," Henry Rollins, became the poster boy of the rebellion."

01:45 Rollins: "During shows I have been burned by cigar and cigarettes, butane lighters, keys have been stabbed in to me. Uh I have been hit with ashtrays, fists, feet, uh whatever. "

2:04 Rollins: At a club *Molly Malones* "And then he says 'well what are you?' I said Well I guess I'm just a psycho, man. And he was like 'Oh well you should get that looked at'."

N: Henry Rollins is a Grammy winner, radio and television broadcaster, a successful author, and he's still performing all over the world. But today he's telling stories about his anger rather than singing about it.

Rollins: "If you can think of a stove where the pilot light is always on, always ready to light all four burners, that is me *all* the time, where I'm always ready to go there.

This is this thing that obsesses me. Why am I the way I am? Because to be almost 50 years of age and to be fairly furious all the time is not always the funest state to be in. "

02:53 N: "But a new scientific discovery may finally have some answers for Henry and others like him. A common gene mutation has been identified with impulsive and violent behavior. It's become known as the warrior gene. And it has already changed the outcome of a high profile murder trial. Henry has agreed to be tested for the gene in a unique experiment"

03:36 Rollins: "If I find out that I have the warrior gene that would be interesting, if I find out I don't, I must say I would feel a bit of disappointment."

03:40 N: "Henry will meet a diverse range of people and they too will be tested for the warrior gene. Some of those tested will be from violent backgrounds, others were privileged. But for many the results of the test will come as a shock."

04:07 N: "For well over a century a debate has raged over whether humans are shaped by their environment or by their genes. Are we products of the world in which we are born in to or does mother nature make us who we are."

04:25 McDermott: "For a long time there were a lot of central debates about nature versus nurture, everything is caused by the environment in which we grow up or everything is caused by your biological predisposition."

04:36 N: "Until recently, the scientific consensus leaned toward nurture, it's our upbringing and environment that determines our behavior, and as society its something we can try to put right. But in recent years a new breed of genetic scientists is challenging

that conventional wisdom like never before. The discovery of the warrior gene suggests that nature has a far bigger influence on our behavior than we'd ever imagine. "

05:12 Bernet: "The research that's been done indicates that this genetic makeup combined with maltreatment increases a person's risk of being a violent adult. "

05:30 N: "What about Henry Rollins, will his early childhood offer clues for whether he has the warrior gene or not. "

05:50 N: "Henry was brought up in Washington, DC. His parents separated at an early age.

Rollins: "The basic relationship with my parents cause me a great amount of just general anxiety at all times, I was a very nervous kid."

N: "Henry's school days compounded his sense of alienation."

Scene: Old Schoolyard of Henry Rollin's

06:20 Rollins: "I remember at one point I was surrounded by kids right here, and my back's against the wall and they're all putting their fists in my face to see if they could make me freak out or cry or urinate my pants, which I did and the stripe of urine goes down your leg and everyone laughs and then the chant would start 'Fight Fight big and white, beat 'em beat 'em beat 'em cause a white can't fight, that's right, that's right, that's right.' I endured stuff like that in this school yard on a very very regular basis"

06:50 N: "Eventually Henry's fear turned to anger, which turned to violence."



06:59 Rollins: "I just went kinda hyper psycho on him, I was just like (flailing arms in a punching motion) I beat the hell out of that kid. And then after that, people left me alone. I became eventually what I feared, and so by mastering my fear I turned in to part of the problem."

07:29 N: "Henry had a tough childhood and still admits to aggressive behavior today. But the next people who test for the warrior gene had much worse to contend with."

07:52 N: "Los Angeles California, one of the gang capitols of America. L.A. is home to more than 250 gangs, totaling over 26,000 members."

Scene: Backyard BBQ in LA

08:14 N: "Growing up in East Los Angeles twin brothers Hector and Gilbert Verdugo were the toughest kids on the block, foot soldiers in one of the most violent street gangs in the city, Big Hazard. (Exchange pleasantries between the twins and Henry) Henry has come to meet the twins to find out more about their violent past. Now in their 30's the Verdugo twins have left the gang world behind, but they still carry the scars of their former life."

08:57 H. Verdugo: "When you're from the neighborhood you're deep in gang culture and violence is the absolute truth of who you are."

G. Verdugo: "I have a 9mm [bullet] in the middle of the vision and speech part of the brain its lodged, the doctor told me if we attempt to even take it out you probably will die instantly."

09:19 Rollins: "So you're much different than you were when you were younger. (The twins nod in agreement) You're a full grown man now but in your youth you were a bit more of a hardhead and, you know, you would answer any kind of problem with violence. (The twins also agree with this statement).

09:34 H. Verdugo: "I think aggression and violence it's a learned behavior and in the house I was raised in the gang life was around us all the time. I remember the first time we seen someone get shot and killed in front of one of us. You know two guys arguing, a gun gets pulled out and boom boom boom the guy gets shot. I remember the blood was just running down the side walk.

G. Verdugo: "At first my reaction was like man, check him out, boom that's fresh, ya know what I mean, freshly shot . I remember the fly going around the wound cause he a perfect shot in the forehead and then after that I know it was for twenty bucks, dude died for twenty bucks."

10:17 N: " At age ten, the Verdugo brothers were initiated in to their first gang."

G. Verdugo: "So when we went out and we went and ganged banged I was always the first one, the smallest one is always the scrappiest one, so I would go over there and fire on some fools and then alright get out of the way it's my turn. Boom! Head's split and I remember just saying like 'Damn I'm glad I'm on this team!' Because I would hate for me be on the enemy side you know what I mean."

10:53 N:" As teenagers, they became two of the most feared enforcers in the city.

H. Verdugo: "When dealing with other people from other neighborhoods, there was really no way of settling a dispute though words or whatever, well it was kinda like let's see who's tougher."

G. Verdugo: "I ran with a bunch of aggressive killers, straight up. And I remember we'd seen these guys in enemy territory and we started chasing them and I remember them like oh my god running for their lives, you know what I mean. And they were yelling out 'Hazard's here! Hazard's here!'"

11:36 N: "It's tempting to label Hector and Gilbert as products of their earlier exposure to violence. But did their genes also play a role?"

11:49 Rollins: "Their back story's very very violent and their youth, their upbringing was very very intense, but what I don't understand is if there is something inherent in them that made them violent in their very violent surroundings"

12:03 N: "The Verdugo twins and Henry all had disturbed childhoods and the three of them turned to violence at times in their lives. Are they just products of their upbringing or did nature also play a part? And if they carry the warrior gene what influence has it had on them?"

Scene: A Laboratory

12:31 N: "A scientific study by Dutch geneticist Dr. Han Brunner in the late 1980's added startling new evidence to the nature versus nurture debate. "

Brunner: "A lady was referred to my clinic because of a family problem."

N: "For several generations the men in the women's extended family had displayed patterns of extreme physical aggression. Even committing rape, assaults and arson."

Brunner: "There's a lot of impulsive aggressive behaviors, they also were more prone to flying off the handle if provoked. The family strongly felt that it was not about the way they were bringing up these boys, it was something in them, something genetic. "

13:29 N: "Brunner carries out extensive tests, he eventually discovers that the male members of the family have a rare genetic dysfunction. One single gene known as MAOA, has almost zero activity. As his investigation continued he recognized that this particular gene was crucial in managing our anger. It's well known that when someone's attacked the body releases adrenaline. But there are other chemicals that flow in to our brains that also dramatically change our mood, one of them is serotonin. Serotonin is associated with feeling good but some scientists believe that if it's not broken down after being released a good mood can quickly turn bad. The MAOA gene acts like a mop after a spill, helping to clean up excess serotonin and to return us to feeling normal. Brunner theorized that the non-functioning MAOA gene was unable to control serotonin levels and so was responsible for the Dutch family's outbursts. Up until Brunner's discovery no one had ever made a direct connection between behavior and any single gene."

15:10 Brunner: "This was the first evidence of a behavioral effect caused by an underlying genetic abnormality that would stand up in terms of the science.

15:22 N: "Brunner's revolutionary findings suggest that genes play a much bigger role in shaping human behavior than ever imagined.

15:32 Brunner: "So it did change the scientific debate I think."

15:37 N:" The past decade has seen an explosion in genetic research built on Dr. Brunner's findings. Instances of a totally non-functioning MAOA gene, like the Dutch family, remain rare. But researchers have discovered that as many as 1 in 3 men in Western populations carry a low-functioning, or shortened version, of the gene."

16:07 Brunner: "The MAOA gene is there in all of us two thirds of the male population have a highly-active MAOA gene but one third has a less-active, shortened version, of MAOA.

16:20 N:" Studies suggest there's a link between violent behavior and the less active version in men, but not women. The gene is found on the X chromosome, which means men have one copy, women have two. Scientists believe that the second copy women carry may counter act the effect of the mutation.

16:47 Brunner:" If this neurotransmitivity does not function properly, it does put you at quite high risk of having abnormal behavior at least, at some point in your life.

17:00 N: "It's this low-functioning, shortened, MAOA gene that has become known as the warrior gene. So who has the warrior gene? Could you pick them out of a crowd? How do they behave? Can society do anything to stop them from being violent? And do all violent people have the warrior gene?"

Scene: MMA Training Gym

17:39 N:" At Legends Gym in Hollywood toughness is everything. Each day these young men push themselves and each other to their physical limits, as they try to break

into the ultra violent sport of mixed martial arts. If the warrior gene exists surely some of these guys have it. "

18:17 MMA Fighter 1 (African American): "I believe I have it."

18:19 MMA Fighter 2 (shorter Caucasian in front of MMA fighter 1): "Same here, I think Matt has it too."

18:23 MMA Fighter 3 (head fighter): "My guess will be that everyone is the same result. You know, I feel like I'm a warrior."

18:30 MMA fighter 4 (shorter MMA fighter on left side): "Seems like a natural progression: warrior gene maybe the fighters will have it."

18:36 MMA fighter 5 (Tall Caucasian in the back): "If the gene's gonna make me more athletic then I'll take all of it that I can get, but it depends on what kind of things the gene's are going to produce."

18:47 N: "Henry remains undecided about what their results will reveal."

18:52 Rollins: "They're pretty aggressive, pretty intense in what they do but no one got really mad at the other and tried to knock his jaw out of the building. That seems to me that we are in a very controlled atmosphere."

19:05 N: "The five MMA fighters take the DNA test. It's a simple cheek swab that produces samples of DNA, which can then be tested for the shortened MAOA gene. Right now they all want the test positive."

19:26 MMA Fighter 1-5: "Yea, I mean being called the warrior gene is pretty cool."

19:32 N: " But this is a brand new test for the DNA lab and it will be at least ten days before the results are in.

19:52 N: "Henry's next stop is to meet a group of guys whose world is often associated with outlaws and violence.

Scene: Motor Cycle Shop

20:40 N: "In the repair shop of this Los Angeles Harley Davidson dealership, it's business as usual. These six bikers have led tough and sometimes violent lives. It's a world that Henry can relate to."

20:59 Rollins: "Does anyone relate to that constant anger coursing through their veins

Biker 1 (Beanie and Glasses): "Oh yeah. It's like right now its a seething pool underneath the surface, like at any given moment, like if you cross me, and I feel like I got disrespected I tend to snap."

Biker 2 (Latino): "I have to check myself on a daily basis to not be pissed off or shoot off on someone cause you never know. I feel it a little bit right now, it's kinda like let's get this done, kinda you know. But you just gotta learn how to (moves hands down in a leveling motion) to take it back down.

21:32 Rollins: "So has anyone here ever had any violent episodes they would like to recount?"

Paul/Biker 3 (Bald head tattoo): "I was involved in an episode in my life where I came home from work one day and found my best friend in bed with my wife. And I kicked the door in and I got shot several times.

22:04 Rollins: "You took slugs in to your own body."

Paul/Biker 3: "Five"

Rollins: "Five bullets"

Paul/Biker 3: "40 Caliber"

Rollins: "Wow"

22:09 Paul/Biker 3:" It was exciting, probably the most exciting event of my life.

22:15 N:" Paul also bears a massive scar from being shot with a holo point bullet."

22:21 Paul/Biker 3: "My whole arm just exploded, and my hand was just hanging here just a couple of piece of skin hold it on."

22:29 Rollins: "Would you consider yourself a violent person?"

22:32 Paul/Biker 3: "I react violently to violent situations. And I like it"

22:42 N:"Henry has his suspicions bout who has the warrior gene in this group."

22:49 Rollins: "Those are some very heavy guys. Paul in particular, there's no way that guy doesn't have the warrior gene.

N: "But there's only one way to be certain. The six bikers have agreed to be tested for the warrior gene."

(Paul and another biker cheers their DNA samples saying "Warrior bro!!!")



23:12 N:" In search of warrior gene carriers Henry has already met men who have experienced violence. But what men who live in peace?"

Scene: Buddhist Temple

23:30 N:" Near the foothills of California's San Gabriel Mountains, far from the bustle of the city, a temple is at prayer. These Buddhist monks have taken a vow to dedicate their lives to peace and enlightenment.

24:02 Ong Min/Monk 1(Younger Asian): "Our goal in life is to become a better person. That's basically the definition of Buddhism. "

24:11 N:" But these men's lives weren't always this tranquil. Viet Tong experienced the violence of war in his native Vietnam in the 1960's before coming to the U.S. Ong Min and Way High both suffered their share of childhood adversity.

24:36 Way High/Monk 2 (Younger Caucasian): "I got picked on a lot when I was a kid."

Ong Min/Monk 1: "Oh me too. Ever since I was in school I was always bullied, left and right, one cause I was Asian, two cause I was Buddhist."

Way High/Monk 2: "I couldn't see any reason why I would be the one picked out of the crowd to get picked on but, it made me start asking some questions and then I started doing some reading and came to Buddhism that way."

25:04 N: "Research has shown that men who carry the shortened MAOA gene who were mistreated when young are more likely to be violent. Despite difficulties in their childhoods the three monks choose a peaceful life. But if they are carriers how could they live as monks? There's only one way to know if they have the gene.

Scene: DNA Lab

25:40 N: "The samples are sent here to Family Tree DNA in Houston Texas. Each sample will be tested to see who carries the warrior gene. In this unique experiment *Explorer* tested men from diverse and sometimes violent backgrounds. Which ones carry the warrior gene? The results are finally in."

Scene a room with the Verdugo Twins and Genetic Counselor Steven Kyls

26:16 Pleasantries exchanged between Verdugo twins and the Genetic Counselor

26:20 N: "The Verdugo twins meet with genetic counselor Steven Kyls."

26:25 Kyls: "So, I don't want to keep you guys in suspense but we have the results, both the results are the same, and you both carry the shortened version of the gene, the warrior gene."

G.Verdugo: "I didn't expect us to but

H. Verdugo: "Yea me either, I didn't think that we would have it. I'm surprised I carry it. I wouldn't be surprised if he carried it. (Nodding to his brother)"

Kyls: "Why is that?"

H. Verdugo: "Cause he acts like an ass sometimes" (Both brothers turn to each other and laugh)

26:53 Kyls: "Well that may not be related to the gene" (The three men share a laugh)  
"So do you think this result will change how you view anything?"

H. Verdugo: "Now that I have the results I'm going to go back and I'll think of it and wonder if it affected my young decisions or was it just my environment. So, it's interesting to know that we got the warrior gene. (Turns to his brother) I'm a warrior dog. (His brother smiles and laughs).

G. Verdugo: (While laughing from his brother's previous statement) "The ultimate warrior."

27:23 N: "Like many warrior gene carriers who were exposed to violence in their childhoods Hector and Gilbert turned violent themselves. But today Hector helps run Homeboy Industries, providing job opportunities to ex-gang members."

27:43 H. Verdugo: "Just because I know I have this warrior gene in me there's no excuse. I'm going to push 100% to go forward to lead a loving and peaceful lifestyle. Peace is beautiful, you know?"

28:01 N: "So what if Hector and Gilbert had known earlier in life that they both carried the warrior gene. Could a single gene really influence their behavior? Florida State University criminologist, Kevin Beaver, authored a study that found that warrior gene carriers are more likely to join a gang and once in a gang are more likely to commit violent acts."

28:31 Beaver: "Once we identify with certainty that these genes are associated with different types of antisocial behaviors we can begin to create different types of intervention and prevention programs. It's not unforeseeable to image the criminal justice system genotyping offenders as a way to tailor rehabilitation programs towards the individual."

Scene: Back at the Harley Davidson Bike Shop

29:04 N: "Back at the Harley garage Henry returns with the test results."

29:11 Rollins: "Alright gentlemen, all of you took the DNA test. Do any one of you have a suspicion as to who might have the warrior of who might not have the warrior gene."

29:25 Biker 3 (Young Caucasian): "I would say Paul most likely. I mean he's got horns on his head and he's been through a lot you know, he's got the look."

29:33 Biker 2: "I would figure Erick does."

Rollins: "Yeah, why?"

Biker 2: "Something about him, it's the quiet guys you have to be worried about, you know what I mean."

29:43 N: "These three men (Biker 3, Paul/Biker 2, and Biker 4) do not have the warrior gene. These three (Biker 1, Biker 2 and Erick) do."

29:51 Rollins: "I don't know whether to say congratulations or heaven help you! It's pretty interesting that you (pointing to Biker 2) having the warrior gene saw it in him (point to Erick) and you're the one who said in an interview that you had difficulty with your anger all of your life."

30:06 Biker 2: "It's kinda a mixed blessing in a sense because you're battling, in a sense, a demon or something."

30:14 N: "But Paul who has the most violent experience of all of them is not a warrior gene carrier"

30:20 Rollins: "So you three (looking at the non-warrior gene carriers) any disappointment at all about not having the warrior gene? Any sense of failure (in a laughing, teasing manner)?"

30:30 Biker 3: "Very Very disappointed. You want to be the warrior, you want to be the man, you know?"

Rollins: "At least it's nothing you can help."

Biker 3: "Yea absolutely"

30:37 Paul/Biker 2(on the phone): "It turns out I'm not a warrior. I'm still your warrior? All right (laughs)"

30:43 Rollins: "Three of the six bikers had the warrior gene. Statistically it should have been two of the six. I'm very surprised that not all six had the warrior gene."

30:57 N: "Of the eight tested so far five of them are warrior gene carriers. And they all admit to impulsive, aggressive behavior. Without much structure or discipline in their upbringing the effects of the gene may have gone unchecked. But what would happen if you took a carrier and of the mutant gene and trained him to become the ultimate warrior? "

Footage of NAVY Seals/Military Training

31:33 N: "The NAVY Seals are some of the world's elite soldiers. Intensely trained in virtually every technique of combat, these men are among the finest real life warriors in the world. So how does the impulsive aggressive nature of the warrior gene affect the soldier?"

Scene: Rollins meeting with Hetrick

32:05 Pleasantries are exchanged between Rollins and Randy

32:12 N: "Randy Hetrick was a NAVY Seal for 13 years. And was deployed on missions that spanned the globe. (Randy names Asia, Africa, South America, Europe, most of the world) Henry has come to deliver Randy's test results.

32:32 Rollins: "Randy, you have the warrior gene."

Hetrick: "Well you can imagine how thrilled my mother will be to know that so, that's interesting. "

32:42 N: "Today Randy is a successful entrepreneur, with a multimillion dollar fitness equipment business. Yet Randy was born with the same genetic mutation as the Verdugo twins and the three bikers. Does he recognize any of the same traits?"

33:03 Hetrick: "If I look back over my background there's a number of flags that indicate that I would be one of the carriers of this gene. When I was in school I had a few scraps here and there, a bit of a temper, it makes sense to me."

33:20 N: "Randy's success indicates that he overcame the negative effects of the shortened gene. But how? Unlike Henry, Randy fondly remembers his childhood."

33:33 Hetrick: "Great mom, great dad, great supportive parents the whole time, so yea I got no complaints."

33:41 N: "Randy had a supportive family, and a good education, but like others with the warrior gene he too joined a gang of sorts, the NAVY Seals."

33:55 Hetrick: "It was kind of the ultimate man test, and I had to have a kind of internal aggression to be able to live amongst the wolf pack. You know those are some type A characters but the military definitely trains you to control and your fuse, your anger, you can't just fly off the handle and be a loose cannon."

34:15 N: "Randy's training and his upbringing have helped him overcome his internal aggression."

Hetrick: "You channel that rage, that anger. I prefer to call it focus, in to a productive use and that's what I do all the time as an entrepreneur."

34:32 Rollins: "Randy seems to be, to me, a guy who is incredibly focused, incredibly disciplined. I don't denote violence or aggression but I'm no doctor; but in his years of athletic training, college and certainly 14 years as a NAVY Seal makes him a very very hard person to stop."

34:59 N: "The MMA fighters are also highly trained and aim to be impossible to stop. Does that suggest that they too are carriers? Or does the warrior gene work in more mysterious ways?"

Scene: MMA Gym

35:30 N: " In such a brutal sport as mixed martial arts, you might expect to find a high percentage with the warrior gene... but the results turn assumptions upside down. Of the five fighters, not one tests positive for the warrior gene."

MMA Fighter 1: "Wow" (While MMA Fighter 3 nods his head)

N: "On reflection however, it comes as no great surprise to the fighters."

36:09 MMA Fighter 5: "As a fighter you'd think you want to be more calm and collected and not too quick to act."

MMA Fighter 3: "People who are overly aggressive don't make it in this sport because they don't have the necessary qualities of control."

MMA Fighter 1: "Honestly it doesn't change anything. I'm still gonna go in there and beat people up. "

36:35 N: "The MMA fighters are essentially trained athletes. So not finding a low-activity carrier among them isn't as surprising as it first sounds. It's further evidence that determining who has the warrior gene is difficult from appearances alone."

Scene: Buddhist Temple

37:11 N: "In their tranquil temple the Buddhist monks are at peace. Genetic Counselor Steven Kyls has come to give them their results

37:29 Kyls: "The interesting thing about the results is that all the results are the same, and that all three of you carry the short allele of the gene which is basically the warrior gene. You're smiling, why's that (Turning to Way High/Monk 2)?"



37:46 Way High/Monk 2: "I think it's funny that Buddhist monks have the warrior gene."

Kyls: "Clearly not everyone who has tested this way has exhibited violent behavior and people have exhibited violent behavior and carry the so-called normal copy. This is an association, it's not an absolute."

38:09 Viet Tong/Monk 3: "Everyone is born with good and bad traits, that's what makes us human. But, everything in life is not set in stone, our future is constantly changing, it's what we do now that will affect our future tomorrow."

Kyls: "That's a good way to approach it."

38:31 Bernet: "Just having the gene all by itself doesn't make things happen. It doesn't make people behave in a certain way but, it does influence people."

38:44 N: "Research in to the genetic influences on our behavior is still in its infancy but, patterns are emerging. The MAOA gene is not only associated with violence some studies connect it with taking financial risks."

39:05 McDermott: "I think the majority of people who have the short version of the gene are totally functional, contributing members of society, they're not relegated to a life of violence and gang warfare. I would suspect that there's lots of them among top level CEOs, they're just risk takers they channel it in a particular way."

39:25 N: "CEO Randy Hetrick recognizes this trait in himself."

39:32 Hetrick: "You know boot strapping this company. I probably had 50,000 bucks on my credit card but my appetite runs toward risk that you can shape that you can focus to some extent and use to your benefit

39:48 N: "Henry's life has been filled with risk taking and violence. Does he think he'll test positive for the gene?"

39:59 Rollins: "When I find out the Buddhist monks prove positive for the warrior gene, MMA fighters prove negative for the warrior gene, the most intense of all the bikers, Paul, tests negative for the warrior gene, I have no idea what to think as to who has the warrior gene. Do I have the warrior gene? I have not a clue."

40:26 N: "Our understanding of the influence of genetics on human behavior is still in its infancy. But how might the knowledge be used in the future? One day soon psychiatrists might be able to tailor therapies based on the patient's genetic makeup. But how far down this road should we go as a society? And when does behavioral genetics cross the line in to eugenics and sinister Nazi ideology of a master race? But the march of warrior gene science is gathering pace and has already entered the criminal justice system.

41:14 N: "2006 East Tennessee, Bradley Waldroup is charged with murdering a family friend and attempting to kill his wife. "

Footage of trial - Waldroup: "I killed Leslie Bradshaw, I attacked my wife. I'm not proud of none of it."

N: "The evidence seems to be clear cut and most think that Waldroup is facing first degree murder conviction and the death penalty. Then his lawyers try a new line of argument. Waldroup has the shortened MAOA gene. Forensic psychiatrist Bill Bernet testifies in court that Waldroup's genetic makeup combined with his explosive personality diminished his ability to premeditate murder."

42:09 Bernet: "This was the first time that a really big trial was influenced by the testimony regarding this gene."

N: "Much to the anger of the victim's family and observers alike, the jurors agree and convict Waldroup the lesser crime of voluntary manslaughter. The case has created strong public opinion."

42:35 Rollins: "As that person's lawyer, what do I know about the law but, I wouldn't have gone within a 100 miles of that expecting it to work. It's a hell of a thing that that worked. "

42:49 N: "But Bernet also cautions that the warrior gene is unlikely to be alone as a cause of violent tendencies."

42:57 Bernet : "Human behavior is not just the warrior gene. There are thousands of genes that might have some influence on the way the brain is organized."

43:10 N: "The debate about genetics is just beginning but for Henry Rollins questions about the anger inside him have been going on much of his life."

Molly Malones Stand up Club scene: Rollins: "I keep coming back to this was this the way I was raise or was it this thing I was born with."

43:29 N: "Has Henry's journey this last week helped him decide if he has the warrior gene or not. Now at last, the moment of truth."

Scene: What looks like a classroom with genetic Counselor Kyls, enters Rollins

Pleasantries exchanged between Rollins and Kyls.

43:49 Rollins: "So, I have been told that you have some results for me (smiling at Kyls)."

Kyls: "I do. I imagine you can be curious through this whole journey."

Rollins: "I have been very curious. On some days I think I must have it, the warrior gene. And other days, not so sure. On some days I was to have the warrior gene, on other days I hope I don't. "

Kyls: "You ready?"

Rollins: "I am ready for the reveal"

Kyls: "So Henry, you do *not* have the warrior gene."

Rollins: "Alright"

44:23 McDermott: "What's interesting about humans we're the only species that actually has the power to overcome our own evolutionary impulse. We can change our outcomes."

44:34 N: "Many of the warrior gene carriers of this film have decided on a better path for themselves, largely rising above the genetic tendency with which they were born. As for Henry, he is taking the news in his stride."

44:57 Rollins: "When I found out that I did not have the warrior gene, I was kinda happy about that. Cause I would rather me be me because of what I've been through rather *than* something that's in me. I paid for all the scars and bumps on my body. I earned those. I would like to think that that was me and not the *gene*. "

45:20 N: "The lengths between our genes and our behavior makes it clear that debate is no longer nature versus nurture, it's nature and nurture that makes us who we are. And whether we like it or not, the journey inside the warrior gene has only just begun."

## Curriculum Vitae

### EDUCATION

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#### **Wake Forest University; Winston-Salem, North Carolina**

MA in Bioethics, May 2012

Awarded a partial academic scholarship based on under graduate studies

Thesis: Born to Rage? A Case Study of the Warrior Gene

Advisor: Michael Hyde, PhD

#### **Virginia Polytechnic Institute and State University; Blacksburg, Virginia**

BS in Human, Nutrition, Food, and Exercise, May 2010

Double Minor: Chemistry; Medicine and Society

Cum Laude

Alpha Epsilon Delta

Awards: Arlington Community Foundation Scholarship for academic excellence and community service in 2007, 2008, and 2009; Arlington Police Beneficiary

Association Scholarship in 2007, 2008, and 2009

### COURSEWORK

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Excelled in the following undergraduate courses:

- |                          |                       |                        |
|--------------------------|-----------------------|------------------------|
| ▫ Anatomy and Physiology | ▫ Drug Chemistry      | ▫ Medicine and Culture |
| ▫ Athletic Injuries      | ▫ Exercise Physiology | ▫ Medical Geography    |
| ▫ Biomedical Ethics      | ▫ Kinesiology         | ▫ Psychology           |

Excelled in the following graduate courses:

- |                            |   |                                       |
|----------------------------|---|---------------------------------------|
| ▫ Bioethics Seminar        | ▫ Current Topics in Clinical and Biomedical Research Ethics | ▫ History of Contemporary Bioethics   |
| ▫ Bioethics Theory         | ▫ Ethics of Health Communication                            | ▫ Public Policy, Medicine and Justice |
| ▫ Biotechnology and Ethics |   |                                       |
| ▫ Clinical Ethics          |   |                                       |

## RESEARCH INTEREST

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### **USDA Summer Scholars Program**

**June – August 2009**

*Virginia Polytechnic Institute and State University; Blacksburg, Virginia*

1 of 10 undergraduates selected

Conducted undergraduate research focusing on the impact of exercise on urban populations

Prepared research paper and present research at Multi-disciplinary Symposium at the University of Pennsylvania in August of 2009

## LEADERSHIP & SERVICE

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**Volunteer with the Arlington Country SWAT Team**, Aid in simulation training

**August 2004 - Present**

**Leadership Tech (LT)**, Program that engages student leaders; Participant, Facilitator

**August 2006 – May 2010**

**Health & Wellness Team Leader**, Second Year Team of LT

**September 2007 – May 2008**

**Member of National Residence Hall Honorary (NRHH)**,

Top 1% of on-campus leaders **March 3, 2007**

**VT-Appalachia Service Project**, Service trip in Jonesville, VA

**November 8 – 11, 2007**

**Alpha Epsilon Delta**, Pre-Med Honor Society; Relay for Life Event Chair

**August 2008 – May 2010**

## CONFERENCES ATTENDED

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**Form & Function: The Architecture of Campus Leadership**, Blacksburg, VA

**February 16 - 17, 2007**

**VASPA Student Leadership Conference**, Christopher Newport University

**April 14, 2007**

**2011 ELSI Congress – Exploring the ELSI Universe**, Chapel Hill, NC

**April 12 – 14, 2011**

**American Society for Bioethics and Humanities (ASBH)**, Member, Minneapolis, MN

**October 13 - 16<sup>th</sup> 2011**

**2011 Annual Meeting of the International Neuroethics Society**, Washington, D.C.

**November 10 – 11, 2011**

## SEMINARS ATTENDED

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### *Wake Forest University; Winston-Salem, North Carolina*

- Advanced Planning for End-of-Life Care: A Practical Introduction. **January 20<sup>th</sup>, 2011**
  - With Dr. John Moskop & Mr. Dee Leahman
- Palliative Care: Transforming the Case or Serious Illness **January 27<sup>th</sup>, 2011**
  - With Diane E. Meier, MD, FACP
- What Does Health Care Reform Mean For You? **November 4<sup>th</sup>, 2011**
  - With Mark A. Hall, JD
- Muses from the MacLean Center: Reflections by a Clinical Ethics Fellow **March 3<sup>rd</sup>, 2011**
  - With Roger D. Cole, MD, FACS
- Panel Discussion: Advocacy on Health & Healthcare Policy at Wake Forest University School of Medicine **February 22, 2011**
  - With William B. Applegate, MD, MPH, MACP; Mark Hall, JD; Jon Abramson, MD; and David C. Goff, MD, PhD, FACP, FAHA
- Ethical, Legal, & Social Implications(ELSI) Research Program, Congress 2011 **April 12<sup>th</sup>-14<sup>th</sup>, 2011**
- Race, Health and Health Care Symposium **March 16<sup>th</sup>, 2011**
  - With Barry Freedman, MD; Pilar Ossorio, JD, PhD; Charmaine Royal, PhD; and Joseph Betancourt, MD, MPH

### *Center for Bioethics Seminar Series, Wake Forest University, Winston-Salem, NC:*

- WFU Public Health Science **January 19<sup>th</sup>, 2011**
  - With Sally Shumaker, PhD
- Methodological Perils of Querying Research Participants' Understanding of Benefit: The Case of Phase 1 Oncology Trials **January 26<sup>th</sup>, 2011**
  - With Kevin Weinfurt, PhD
- Developing Flourishing Research Practices in Tissue Engineering: A Proposal for a New Kind of Ethics Initiative **February 9<sup>th</sup>, 2011**
  - With Dr. George Khushf
- "It is My Duty to Resist Your Needles": Moral Challenges of Global Disease Eradication **February 17, 2011**
  - With Maria Merritt, PhD
- The Havaupai Medical Genetics Study: Cultural Perspectives and Clinical Trials **March 2<sup>nd</sup>, 2011**
  - With Michael "Buzz" Waitzkin, JD
- Loyalty and Morality: **April 6<sup>th</sup>, 2011**
  - With Bernard Gert, PhD