



Mount Saint Mary College Journal of Psychology Research Proposals
<http://brainwaves.msmc.edu>

The Effects of Cortisol on a Psychopathic Brain

Stephanie Hines

Mount Saint Mary College, Newburgh, New York

Criminal activity has significantly increased worldwide in the past decades; research suggests that psychopathic individuals are often the masterminds behind these malicious activities. Reduced cortisol and increased testosterone levels have been a common find among psychopathic individuals. However, the hormones have not been studied concurrently. I propose to experimentally examine the neuropsychology of psychopaths on a molecular level by manually manipulating cortisol levels. My experimental study will use the Triarchic Psychopathy Measure and Hostility Questionnaire to assess the expressed antisocial behaviors.

Pages: 17-21

Nearly 50% of crimes yearly are committed by individuals with psychopathy (O'Toole, 2012). The Diagnostic and Statistical Manual of Mental Disorders Edition 4 (DSM-IV-TR), labels psychopathy as a subdivision of antisocial personality disorder with certain commonalities in each individual diagnosed. Antisocial personality disorder is a disorder characterized by a pervasive pattern of disregard and amorality towards others and capable of violent acts without guilt (Myers, 2007). Common characteristics of psychopathic antisocial disorder include interpersonal-affective and antisocial features. Some traits noted are superficial charm, lack of remorse, manipulateness, impulsive, and obstructive behavior (Gao, Glenn, Schug, Yang, & Raine, 2009; Pujol et al., 2011). Determining the motives of these individuals has become a popular theme for psychologists and criminologists to identify because of the accumulating antisocial population. Studies suggest that psychopaths are the masterminds behind recent tragedies of mass shootings and murders. The Federal Bureau of Investigation states that psychopathy is the single most important diagnosis of the United States justice system to comprehend (O'Toole, 2012). Every psychopath differs based on the severity and longevity of the condition; this complicates the diagnosis process.

Stephanie Hines (shin4863@my.msmc.edu) is a student at Mount Saint Mary College majoring in psychology. She plans to pursue a career with the Federal Bureau of Investigation/United States Secret Service.

The Hare Psychopathy Checklist – Revised (PCL-R) is a measure used by clinicians and psychologists to aid in diagnosis by comparing a subject to the prototypical psychopath (Vitale & Newman, 2000). The assessment consists of a series of tests, interviews, and examinations of developmental history to discover background information, intellectual capabilities, and reaction responses of the individual (Vitale & Newman, 2000). Psychologists and clinicians use this checklist to better understand the client for treatment and legal purposes. The checklist specifically measures features of typical psychopaths including; emotional responses, environmental influences, and neurological deficiencies (Dolan, 2004; Frick, 2009).

Additionally, there is accumulating research on the distinct personal features of an individual diagnosed with an antisocial disorder (Dolan, 2004; Frick, 2009). Researchers have suggested that psychopaths tend to have disorientated emotions and thought process paradigms (Gao et al., 2009). Callous-unemotional traits (CU traits) are hallmarks of the disorder, composed of minimal distorted emotional expressions, difficult temperament, and narcissistic tendencies (Dolan, 2004; Bayliss et al., 2010). Psychopaths tend to be expressionless, egocentric, and unrealistic, due to their impulsive and impenitent nature (Dolan, 2004; Frick, 2009; Bayliss, 2010). Research on CU traits suggests that high levels of delinquency, aggression, and an absence of control are common tendencies of psychopaths (Frick, 2009). Additional behavioral conduct problems are key predisposes for

chaotic behavior, shown in early development prompting future problems. However, researchers have considered conduct problems to be typical developmental stages of transient youths as suggested in Cleckley's research (1988): "Transient developmental behaviors and attributes that arise in childhood and adolescence resemble psychopathic traits but attenuate with normal development" (Cleckley, 1988, p.245). Furthermore, researchers are using this concept to discover what other probable factors aid to psychopathy besides behavior (Ruttle, Lisa, Fisher, Stack, & Schwartzman, 2011).

Kimonis et al., (2008) suggested that callous unemotional traits may potentially be developed due to environmental and biological features (Kimonis et al., 2008; Dolan, 2004). Specifically one study on identical twins has revealed a strong genetic contribution to CU traits, implying that identical twins with heritable antisocial disorders are more likely to express similar disorders, than identical twins without heritable disorders (Viding, Blair, Moffitt, & Plomin, 2005). Researchers suggest that the environment could contribute to the development of antisocial behaviors in identical psychopathic twins without genetic predisposition (Viding et al., 2005).

Similarly, specific genes are also being examined to determine their contribution to abnormal functions of psychopaths (Szalavitz, 2012). One case suggested that a reduced MAO-A gene commonly causes abnormal brain development. The MAO-A gene is responsible for the response to fear and pain in a normal person, yet reduced levels causes inaction to other's distress (Szalavitz, 2012). This gene specifically affects the part of the brain responsible for emotions and learning; the amygdala. The violence-inhibition mechanism is located in the amygdala, which triggers a response of anxiety in normal individuals. However, in antisocial individuals little to no reaction occurs due to decreased levels of the MAO-A gene (Szalavitz, 2012). This supports research suggesting that psychopaths lack the response to express remorse, in turn, creating mental disability (Szalavitz, 2012).

Evidence has implied that abnormal brain deficiencies may also play a role in psychopathic persons, including brain injury (Frick, 2009; Dolan, 2004). Different areas of the brain are specifically implicated in psychopathy such as the frontal lobe of the cerebral cortex; which is responsible for motor skills, decision making, problem solving, and planning. Further evidence from Brower (2001) suggests an association between frontal lobe dysfunction and increased aggression as well as CU traits (Gao et al., 2009).

The case of Phineas Gage, who became psychology's number one most famous case, demonstrates how frontal lobe injury can drastically change a person. Gage was a railway construction worker, who suffered from brain damage after being impaled with tampering iron through his cerebral cortex (Gao et al., 2009, Raitu &

Talos, 2004). Researchers noted that his personality and actions were recreated from his natural state (Gao et al., 2009). Prior to this accident, Gage was recognized as a determined, reasonable, and well-liked person; however after the incident, his coworkers and family members suggested Gage's neurological damage sparked a radical change in his personality. Records describe Gage's altered personality as "fitful, irrelevant, and indulging in the grossest profanity" (Gao et al., 2009). Neurologists consider that the damage resulted in complete loss of moral decision-making and led to his actions of inappropriate behavior. Individuals with frontal lobe damage are also known to be deficient in judgment, planning for the future, reasoning, and morals. Research has linked frontal lobe dysfunctions to aggression, alcoholism, and psychopathic criminality disorders prompting deviant behavior (Gao et al., 2009).

Evidence further implies lesions or brain injuries found in the specific regions of the brain frequently cause abnormal behaviors (Myers, 2007). Dramatic findings have compelled researchers to focus on brain abnormalities and underlying components as the indicator of antisocial personality disorders. The limbic system in psychopathic persons has also been investigated. The limbic system includes the hippocampus, amygdala, and hypothalamus; responsible for, respectively, memory, regulation of maintenance activities, and emotions. Studies tend to examine the amygdala and hypothalamus frequently, because of the role they have as emotion regulators (Myers, 2007).

Brain functions are affected by hormones, two of which have been implicated as contributors to antisocial behavior: testosterone and cortisol (Van Goozen, Fairchild, Snoek, & Harold, 2007; Alink, Cicchetti, Kim, & Rogosch, 2011). Hormones are chemical messengers that are made by the endocrine system by one gland to send to another gland. The secretion of hormones affects the functioning of major brain regions, therefore studying these hormones may be of importance in understanding underlying factors producing psychopathic tendencies. The most recent hormones being tested are testosterone and cortisol

Testosterone has been linked to aggressive behavior and high levels of this hormone are prominent in psychopaths (Gao et al., 2009). Testosterone is a hormone produced in the sex organs of both males and females promoting the production of secondary sex characteristics. This sex hormone is involved in growth, maintenance, and repair of reproductive tissues in both males and females. Testosterone and estrogen is present in both males and females however, males have more testosterone than estrogen and females have more estrogen than testosterone (Glenn, Gao, Schug, & Granger, 2011). Researchers have considered that elevated levels of testosterone are often associated with sensation-seeking and risky behaviors, which are common characteristics

among psychopaths (Gao et al., 2009; Van Goozen et al., 2007).

Synthetic forms of testosterone known as anabolic steroids have reported to be the reason for the increase of antisocial behaviors in both males and females. The municipal purpose of this drug is to promote excessive growth of skeletal muscles and male sexual characteristics; however it has been suggested to be the dangerous and harmful promoter for severe mental disorders (Occhipinti, 2010). Researchers have considered that after the longevity of use, individuals tend to express lack of judgment, mood swings, and aggression causing permanent mental deficiencies (Occhipinti, 2010). However, researchers have expressed different outcomes for females due to the larger influence of testosterone in males (Poustka et al., 2010). Evidence from Poustka (2010) considers women to be less likely to have psychopathic tendencies because their hormonal composition contains less testosterone (Poustka et al., 2010). Therefore, researchers question if a certain level of testosterone promotes the development of psychopathy and aggressive behaviors (Gao et al., 2009). Aggression is also a prominent outcome of reduced plasma cortisol levels.

Moreover, researchers are investigating whether reduced cortisol levels are correlated with minimal normal emotional responses (Van Goozen et al., 2007; Fairchild et al., 2008.) Reduced plasma cortisol levels and irregular responses to stress are typical characteristics found in psychopaths (Poustka et al., 2010; Shi, Bureau, Easterbrooks, Zhao, & Lyons-Ruth, 2012). Cortisol is a naturally produced steroid hormone secreted by the adrenal gland, when an individual is under stress. The adrenal gland produces this hormone to reduce stress, while the sympathetic and parasympathetic nervous systems control the response (Budhani & Blair, 2005; Desjardins, 2011). Cortisol is additionally responsible for balancing chemical responses from other hormones (Desjardins, 2011). Data depicts that lower basal cortisol correlates to higher production of aggressive and violent behavior (Fairchild et al., 2008; Desjardins, 2011). However, other researchers stated that although cortisol levels are supposed to rise during stressful circumstances, levels decline if individuals experience the event for an extended period of time (Ruttle et al., 2011; Fairchild et al., 2008). Longitudinal studies have supported the relationship between hyper secretion of cortisol and aggressive behavior (McBurnett, Lahey, Rathouz, & Loeber, 2000). McBurnett (2000) stated that individuals with reduced cortisol levels are three times more likely to express aggressive behavior than increased levels of cortisol (McBurnett et al., 2000). Thirty-two percent of the boys with low cortisol levels exhibited 5.2 characteristics of conduct problems, compared to the 1.5 symptoms of boys with higher concentrations of cortisol (McBurnett et al., 2000). Cortisol responses have also

been reported to be reduced in individuals diagnosed with oppositional defiant disorder and conduct disorder, both distinguished by aggressive behavior and impersonal-affective traits (McBurnett et al., 2000; Ramsland, n.d.). Behaviors of reduced stress response include impulsiveness, no remorse, and apathetic (Ramsland, n.d.). These two disorders are aspects of psychopathic antisocial behaviors. Reduced levels of cortisol may correspond to an inefficient stress response (Fairchild et al., 2008; Shi et al., 2012).

Recent data about the nature, stability, and consequences of juvenile psychopathy are still limited within this present time (Dolan, 2004). Ideally, by identifying these common characteristics, society can intervene early in the individual's developmental process to reduce future offenses preventing recidivism (Bayliss, Miller, & Henderson, 2010). The investigation of cortisol is a promising biological measure because it promotes further scientific knowledge surrounding the effects the hormone has on behaviors. Researchers have commonly studied the contribution of brain abnormalities and genetics on the psychopathic brain, but little to no research has been completed on the effect of reduced cortisol levels (Bayliss, Miller, & Henderson, 2010). Any research that has been done is correlational in nature; an experiment where levels of cortisol are manipulated is needed to determine if cortisol might have a casual role in antisocial behavior.

By investigating these components, psychological interventions and alterations can be administered to diminish the development of these individuals' behaviors. Estimates suggest that four million psychopaths make up the population nationwide (McBurnett et al., 2000). The aim of this current study is to examine the influence of cortisol on the development of psychopathic antisocial disorder. I will conduct an experimental study on pubescent males diagnosed with psychopathic antisocial disorder to evaluate the contributions of cortisol. I hypothesize that increasing the hormone of cortisol manually in diagnosed psychopaths will decrease their antisocial tendencies.

Much of the research surrounding credibility of eyewitness testimonies are conducted on college students, adults, and older adults. Little research has been conducted on the accuracy of a child's testimony. Previous attempts to assess the accuracy of a child fail to take into consideration the demands of children of different ages. Researchers have previously examined the impact that children have on jurors and the outcome of the trial, while few studies investigate the credibility of the testimony of children. Several factors can influence the accuracy of the testimony presented in court when dealing with adults that testify. Children have a different cognitive level than adults. They have less life experience, and in general are less mature. These factors may influence the way a child perceives a crime and how it is remembered. I hypothesize

the accuracy of a child's testimony could be compromised by the lack of maturity.

PROPOSED METHOD

Participants

I plan to study 100 recent pubescent males diagnosed with psychopathic antisocial personality disorder. I will seek to collect a sample of racially and geographically diverse psychopaths. Fifty males will be randomly placed into each group. To assess behavior problems in the adolescents, the PCL-R will be used to identify the scale of psychopathic tendencies. Every eligible and complying participant will have to undergo a series of evaluations, observations, and controlled manipulations.

Materials

The Psychopathy Checklist Revised (PCL-R) will be used to screen for psychopathic antisocial disorder (Vitale et al., 2000). The Triarchic Psychopathy Measure (TriPM) will be used to assess the three major constructs of psychopathy including; boldness, meanness, and inhibition (Patrick, 2010). Each construct is examined in a series of scales by measuring specific components of the characteristics involved such as; lack of empathy, narcissism, and thrill seeking, found in the boldness scale (Patrick, 2010). The source of items used to analyze the disinhibition and meanness constructs are exhibited in the Externalizing Spectrum Inventory. This scale comprehensively assesses problem behaviors and callous-unemotional traits (Patrick, 2010). The Hostility Questionnaire will also be used to accurately profile the participant's attitudes and behaviors towards hostile situations (Williams, 1994). A series of 45 descriptions will be presented and must be answered by one of the two responses given. This exam is used to evaluate spontaneous responses to affective situations (Williams, 1994).

Procedure

The study will begin by collecting demographic information including sex, race, and age. Each of the adolescent males will be measured for their present cortisol levels using saliva samples before completing any evaluations or tests. There will be an experimental group that will receive an injection of cortisol and a control group that will receive an injection of saline solution. From the completion of Psychopathy Checklist-Revised (PCL-R), diagnosis of psychopathic antisocial disorder will be identified. During the first session, participants with psychopathy will be randomly assigned and separated equally between the two groups. The Triarchic

psychopathy measure will be administered prior to each injection. All participants will then be asked to fill in the Hostility Questionnaire to evaluate their potential emotional state. Participants will be randomly assigned to receive a cortisol injection, dosage will be determined upon consultation and collaboration with a medical physician. Participants will be asked to return to the laboratory biweekly for three months to receive injections of cortisol or saline based on their initial group. The parents and teachers of the participants will be asked to monitor and record the participant's mood alterations and antisocial behaviors. After all subsequent sessions have been confirmed, the Hostility Questionnaire will be used to screen the participant's final emotional state.

CONCLUDING REMARKS

Limitations

There are some limitations in the design of this study that need to be considered. The first limitation is that participants may not be accurately diagnosed by the Psychopathy Checklist-Revised (PCL-R). An additional limitation is that the Hostility Questionnaire may also inaccurately evaluate a person's immediate responses to specific situations. Finally, the last limitation would be that the amount of injections and sessions may be too limited to cause a drastic change to antisocial behavior.

Significance

This research will make three major contributions to enhance the understanding of psychopathic individuals. First, this study will contribute to further research on knowledge about the direct role of cortisol on psychopaths. By gaining this knowledge, the criminal justice system and psychologists can intervene in the development of adolescents with psychopathic tendencies to deter future crimes. Approximately 15-20 % of incarcerated individuals are known to be "psychopaths" and these injections may prevent recidivism in these individuals (O'Toole, 2012). Second, this study is the first to use only recently pubescent males rather than all aged males. By focusing on pubescent males in particular, I can gain a better understanding on the effect of cortisol and testosterone concurrently on antisocial behaviors. Finally, this study is using youths from diverse geographic locations rather than one. I think it is important not to just analyze one location, because I want to get a better understanding of all boys diagnosed with psychopathy.

REFERENCES

- Alink, L. A., Cicchetti, D., Kim, J., & Rogosch, F. A. (2011) Longitudinal associations among child maltreatment, social functioning, and cortisol regulation. *Developmental Psychology*. doi: 10.1037/a0024892

Bayliss, C. M., Miller, A. K., & Henderson, C. E. (2010). Psychopathy development and implications for early intervention. *Journal of Cognitive Psychotherapy*, 24(2), 71-80. doi: 10.1891/0889-8391.24.2.71

Budhani, S., & Blair, R. R. (2005). Response reversal and children with psychopathic tendencies: Success is a function of salience of contingency change. *Association for Child Psychology and Psychiatry*, 46(9), 972-981. doi: 10.1111/j.1469-7610.2004.00398.x

Cleckley, H. M. (1988). *Mask of Sanity* (5th ed.) (E. Cleckley, Ed.). Retrieved February 18, 2013, from http://www.cassiopea.org/cass/sanity_1.Pdf

Desjardins, S. (2011). Behavioral problems linked to cortisol levels. *Concordia University*, 1-3. Retrieved February 6, 2013, from www.concordia.ca/now/media-relations/news-releases/2011/0209/behavioral-problems-linked-to-cortisol-levels

Dolan, M. (2004). Psychopathic personality in young people. *Advances in Psychiatric Treatment*, 10, 466-473. doi: 10.1192/apt.10.6.466

Fairchild, G., Van Goozen, S. H., Stollery, S. J., Brown, J., Gardiner, J., Herbert, J., & Goodyer, I. M. (2008). Cortisol Diurnal Rhythm and Stress Reactivity in Male Adolescents with Early-Onset or Adolescence-Onset Conduct Disorder. *Biological Psychiatry*, 64(7), 599-606. doi: 10.1016/j.biopsych.2008.05.022

Frick, P. J. (2009). Extending the construct of psychopathy to youth: implications for understanding, diagnosing, and treating antisocial children and adolescents. *The Canadian Journal of Psychiatry*, 54(12), 803-812. doi: 10.1037/0021-843X.109.2.335

Gao, Y., Glenn, A. L., Schug, R. A., Yang, Y., & Raine, A. (2009). The neurobiology of psychopathy: A neurodevelopmental perspective. *The Canadian Journal of Psychiatry*, 54(12), 813-823. Retrieved January 30, 2013, from <http://connection.ebscohost.com/c/articles/47795214/neurobiology-psychopathy-neurodevelopmental-perspective>

Garbarino, J. (n.d.). Lost boys: Why our sons turn to violence and how we can save them. *CYC-Online*. Retrieved February 6, 2013, from <http://www.cyc-net.org/cyc-online/cycol-0207-garbarino.html>

Glenn, A. L., Gao, Y., Schug, R. A., & Granger, D. A. (2011). Increased testosterone to cortisol ratio in psychopathy. *Journal of Abnormal Psychology*, 120(2), 389-399. doi:10.1037/a0021407

Kimonis, E. R., Frick, P. J., Skeem, J. L., Marsee, M. A., Cruise, K., Munoz, L. C., ... Morris, A. S. (2008). Assessing callous-unemotional traits in adolescent offenders: Validation of the inventory of callous-unemotional traits. *International Journal of Law and Psychiatry*, 31, 241-252. doi: 10.1016/j.ijlp.2008.04.002

Kirschbaum, C., Pirke, K., & Hellhammer, D. H. (1993). The 'trier social stress test' - A tool for investigating psychobiological stress responses in a laboratory setting. *Neuropsychobiology*, 28(1-2), 76-81. doi: 10.1159/00019004

McBurnett, K., Lahey, B., Rathouz, P., & Loeber, R. (2000). Low salivary cortisol and persistent aggression in boys referred for disruptive behavior. *Low Salivary Cortisol and Persistent Aggression in Boys Referred for Disruptive Behavior*, 57(1), 38-43. Retrieved by <http://www.ncbi.nlm.nih.gov/pubmed/10632231>

Myers, D. G. (2007). Neuroscience and behavior. In *Psychology* (8th ed., pp. 53-93). New York: Worth Publishing.

Occhipinti, M. J., Dr. (2010). Anabolic steroids and the depression connection. *American Fitness Professionals & Associates*. Retrieved from <http://www.afpfitness.com/articles/articles-and-new-letters/research-articles-index/anabolic-steroids-and-the-depression-connection/>.

O'Toole, M. E. (2012). *Looking behind the mask: Implications for interviewing psychopaths*. Retrieved from Federal Bureau of Investigation: <http://www.fbi.gov/stats-services/publications/law-enforcement-bulletin/july-2012/looking-behind-the-mask>

Patrick, C. J. (2010). Operationalizing the triarchic conceptualization of psychopathy: Preliminary description of brief scales for assessment of boldness, meanness, and disinhibition. *PhenXToolkit*. Retrieved from https://www.phenxtoolkit.org/toolkit_content/supplemental_info/psychiatric/measures/Triarchic_Psychopathy_Measure_Manual.pdf.

Poustka, L., Maras, A., Hohm, E., Fellingner, J., Holtmann, M., Banaschewski, T., ... Laucht, M. (2010). Negative association between plasma cortisol levels and aggression in a high-risk community sample of adolescents. *Journal of Neural Transmission*, 117(5), 621-627. doi:10.1007/s00702-010-0386-7

Pujol, J., Batalla, I., Contreras-Rodriguez, O., Harrison, B. J., Pera, V., Hernandez-Ribas, R., Cardoner, N. (2011). Breaking in the brain network subserving moral judgment in criminal psychopathy. *Oxford University Press*, 25-29. doi: 10.1093/scan/nsr075

Ramsland, K. (n.d.). The childhood psychopath: Bad seed or bad parents: *The Fledgling Psychopath on Crime Library on TruTV.com*. Retrieved from http://www.trutv.com/library/crime/criminal_mind/psychology/psychopath/1.html

Ratiu, P., & Talos, I. (2004). The Tale of Phineas Gage, Digitally Remastered. *New England Journal of Medicine*, 351(23), E21. doi: 10.1056/NEJMicm031024

Ruttle, P. L., Lisa, S. A., Fisher, D. B., Stack, D. M., & Schwartzman, A. E. (2011). Disentangling psychobiological mechanisms underlying internalizing and externalizing behaviors in youth: Longitudinal and concurrent associations with cortisol. *Concordia University*, 59(1), 123-132. doi: <http://dx.doi.org/10.1016/j.jhbeh.2010.10.015>

Shi, Z., Bureau, J., Easterbrooks, M., Zhao, X., & Lyons-Ruth, K. (2012). Childhood maltreatment and prospectively observed quality of early care as predictors of antisocial personality disorder features. *Infant Mental Health Journal*, 33(1), 55-69. doi: 10.1002/imhj.20295

Szalavitz, M. (2012, August 17). My brain made me do it: Psychopaths and free will. *Times Magazine*. Retrieved February 26, 2013, from <http://healthland.time.com/2012/08/17/my-brain-made-me-do-it-psychopaths-and-free-will/>

Van Goozen, S. M., Fairchild, G., Snoek, H., & Harold, G. T. (2007). The evidence for a neurobiological model of childhood antisocial behavior. *Psychological Bulletin*, 133(1), 149-182. doi: 10.1037/0033-2909.133.1.149

Viding, E., Blair, R. R., Moffitt, T. E., & Plomin, R. (2005). Evidence for substantial genetic risk for psychopathy in 7-year-olds. *Journal of Child Psychology and Psychiatry*, 46(6), 592-597. doi: 10.1111/j.1469-7610.2004.00393.x

Vitale, J. E., & Newman, J. P. (2000). Using the psychopathy checklist-revised with female samples: Reliability, validity, and implications for clinical utility. *American Psychological Association*, 117-131. Retrieved February 18, 2013, from <http://psych.wisc.edu/newman/SecurePDF/p01JVJNwomenPCLr.pdf>

Wang, M., & Green, J. (2009). The impact of maternal psychopathology on child-mother attachment. *Arch Womens Mental Health*, 12, 123-134. doi: 10.1007/s00737-009-0066-5

Whitbourne, S. K. (2012, December 18). Can we predict who kills from knowing the criminal mind. Retrieved February 6, 2013, from www.psychologytoday.com/blog/fulfillment-any-age/201212/can-we-predict-who-kills-knowing-the-criminal-mind

Williams, R. (1994). *StressAndEros. The Hostility Questionnaire*. Retrieved April 11, 2013, from <http://www.stressanderos.org/hostility-questionnaire.htm>

ACKNOWLEDGEMENTS

I would like to thank Dr. Yasmine Kalkstein for her help and contributions in developing my research proposal. I



would also like to thank my parents and my best friend, Arianna, for all of their support.
