An Evolutionary Model of Depression and Anxiety in Medical Students

by

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Abstract

The quality of the healthcare system partly depends on the health and wellness of its individual members. Physicians play a critical role in any healthcare system and make up one of its largest memberships. Physician wellness has been linked to a high quality of patient care, empathy, and lower rates of medical errors. Therefore, physician wellness and mental health should be considered an important public health issue with significant implications for patients and healthcare systems. Psychological distress in physicians typically begins early on during medical school. Several studies have explored various contributing factors to medical student distress. These include a culture of mistreatment and cynicism, taxing workload, viewing self as inferior in skills and abilities compared to peers (also known as imposter syndrome), and personality traits such as perfectionism, competitiveness, workaholism, and Type A personality. Despite the recent literature emphasizing the importance of addressing medical student distress, a cohesive, empirically supported, and comprehensive model of medical student distress has been lacking. In order to adequately and effectively address medical student distress, an empirically supported model of medical student distress is needed that will enhance our understanding of the specific causes of distress in the culture of medical training. This model can then lead to testable hypotheses and it can form the theoretical foundation for evidence-based intervention and prevention recommendations. This dissertation is divided into three papers. Initially, it aims to introduce a new model of medical student distress based on empirically supported evolutionary theories of psychopathology. The second paper will test the hypotheses arising from the new proposed model. Finally, the

third paper will offer practical and empirically supported prevention and intervention strategies based on the result of the second paper.

Preface

This thesis is an original work by Jaleh Shahin. The research project, of which this thesis is a part, received research ethics approval from the University of Alberta Ethics Board, Project Name “Impact of relationships and the social environment on medical student wellbeing”, No. Pro00040200, September 20, 2013.

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Introduction

Evolutionary psychology has been described as a marriage between the fields of evolutionary biology and modern psychology (Buss, 2012). Evolutionary psychology is the study of human behavior, motivation, and emotion through an evolutionary lens (Cosmides & Tooby, 1997). A wide array of empirical studies from various disciplines including sociobiology, anthropology, and ethology have provided substantial scientific evidence supporting the notion that human behavior and psychological processes are a product of evolutionary mechanisms (Buss, 2012; Darwin, 1859; Darwin, Glick, & Kohn, 1996; Seligman, 1975; Wilson, 1975). Evolutionary psychology highlights the interaction between the organism and its environment (Barkow, Cosmides, & Tooby, 1992). It also views human behavior as adaptive strategies in response to the challenges humans faced in their ancestral environment (Barkow et al., 1992; Buss, 2012). From this perspective, psychopathology is also viewed as adaptive responses that contributed to increased survival and reproductive success of humans in their prehistoric environments (Almeida, 2011; Cosmides & Tooby, 1997; Nesse & Ellsworth, 2009).

In his foundational textbook on evolutionary psychology, Buss (2012) explains that environmental input plays a crucial role in development and activation of evolved adaptive responses. There are many examples highlighting the interplay of organism's genetic makeup and its environment. Epigenetics, a growing and well-established branch of biology, has been dedicated to the study of changes in the expression of genes based on non-genetic factors such as the environmental context (Moore, 2015). One well-known example of this is known as "maternal buffering". Animal studies in primates and rodents have shown that early relationships of an offspring with its mother can moderate

the expression of the offspring's genotype (genetic makeup; Conti et al., 2012; Fulker, 1970; Suomi, 2011). Consequently, offspring reared under suboptimal conditions (where the mother-child relationship was disrupted) exhibited more deficits in their behavioral functioning and neuroendocrine responses (Ellis, Essex, & Boyce, 2005; Fulker, 1970; Suomi, 1997).

Depression and anxiety are two of the most commonly occurring psychological disorders across cultures (Nesse, Bateson, Nettle, & Roberts; 2006; Sloman, Allen, & Badcock, 2006; Sloman, Gilbert, & Hasey, 2003). Both depression and anxiety are clinical syndromes characterized by a specific set of cognitive, behavioral, and physiological symptoms (Almeida, 2011; American Psychological Association [APA], 2013). Therefore, evolutionary models view these illnesses as phenotypes that have been subjected to evolutionary processes and are triggered by specific contexts (for example, trauma and stress; Allen & Badcock, 2006; Almeida, 2011; Beaulieu & Bugental, 2008). As a result, these "mental illnesses" are considered adaptive responses to prehistoric environments at least at mild to moderate levels (Allen & Badcock, 2003; Gilbert, 2001, 2006; Nesse, 2000, 2011). Meanwhile, these disorders are considered paralyzing and disabling especially at more severe levels (Nettle, 2004; Sloman, 2008). A commonly held misconception about evolutionary theories is that evolutionary adaptations operate optimally and cannot change (Buss, 2012). This is simply not true (Buss, 2012; Dawkins, 1976)! In essence, evolutionary understanding of depression and anxiety contends that these phenotypes have been advantageous responses throughout the humans' evolutionary past based on the challenges that our ancestors faced (Almeida, 2011; Freeman, Herron, & Payton, 2004). The environment does not hold constant however,

and it changes constantly while evolutionary changes occur slowly and over many generations (Buss, 2012). This has led to an "evolutionary time lag", also known as phylogenetic inertia, that challenges optimal functioning of evolved strategies (Buss, 2012; Williams, 2008). It should be noted that some evolutionary scientists challenge the notion that evolution is a gradual and slow process (Eldredge & Gould, 1972). Punctuated equilibrium describes species as relatively stable and unchanging for long periods of time (Eldredge & Gould, 1972). This stability is then "punctuated" by rapid geological changes that results in a new species (Eldredge & Gould, 1972). This theory remains controversial and research efforts are ongoing in order to establish its validity. In addition to the challenge of phylogenetic inertia, adaptive responses (evolutionary stable strategies) entail a number of consequences and costs. Therefore, heritable adaptations that are sufficient and efficient at solving a problem will remain and pass on to future generations even if they are not perfect (Buss, 2012; Williams, 2008).

Buss (2012) asserts that understanding our evolved adaptations, their underlying evolutionary mechanisms and environmental factors that can activate them will equip us with tremendous knowledge on how to bring about changes to these adaptive responses if a change is desired. For example, depression and anxiety may be undesirable adaptations that negatively impact the quality of one's life. Understanding these disorders' underlying evolutionary processes as well as environmental factors that can trigger their expression will provide us with powerful information on how to reduce its prevalence, severity and provide effective treatment strategies.

In this research project, we aim to use this well-known scientific theory of human behavior and emotion in order to enhance our understanding of psychopathology in

medical schools. Medical education is known to be an exciting yet stressful period for physicians in training. The literature has documented a high prevalence of depression and anxiety in physicians and medical trainees as well as a wide range of serious consequences of these untreated mental illnesses in this population (Dyrbye, Thomas, & Shanafelt, 2006; Dyrbye et al., 2011). These consequences include negative impact on the personal and professional lives of physicians and trainees as well as high rate of medical errors, lowered empathy and quality of patient care (Compton & Frank, 2011; Dyrbye, Massie, et al., 2010, Dyrbye, Thomas, et al., 2010; Dyrbye, Thomas, & Shanafelt, 2005; Thomas et al., 2007). Therefore, physician mental health can be considered a matter of public health as it has direct consequences for the health of the population and quality of healthcare provided.

Many national and provincial medical associations as well as researchers in the area of physician mental health have emphasized the importance of addressing mental health issues early on during medical schools (Dyrbye & Shanafelt, 2011). However, a comprehensive empirically supported model of medical student distress has been largely lacking. The overarching goal of this research project is to adopt evolutionary thinking in order to better understand and address depression and anxiety in medical training environments. There are two scientific strategies that have been recommended for generating and testing evolutionary hypotheses and predictions (Buss, 2012). These include theory-driven and observation-driven strategies. This project adopted the theory-driven strategy or a top-down approach to generate its hypotheses and predictions. We begin by deriving hypotheses from the general evolutionary theories of psychopathology,

test the predictions based on these hypotheses, empirically investigate the predictions, and evaluate whether the results confirm our predictions (Buss, 2012).

Within the purview of this overarching goal, this research project is organized so that three key objectives are addressed:

1. The hypothesis: To review the literature and establish a novel, evidence-based evolutionary model of depression and anxiety in medical schools. Consistent with evolutionary models, our new conceptual model of distress in medicine will highlight the role of both environmental context and individual vulnerabilities (for example, genetic predisposition and individual characteristics). A more in-depth explanation of the derivation of our hypothesis is outlined on page 27.
    - We hypothesize that in competitive and hostile environments where social hierarchies are more pronounced, medical students are more likely to manifest depressive and anxious symptomatology.

    This theoretical framework can then serve as a foundation for formulating a set of predictions that could be empirically investigated.
2. Testing the predictions: A set of predictions arising from the new model of medical student distress will be investigated. This study is to serve as a follow up investigation of our main hypothesis.
3. Implications: The evidence gathered from the second study will be synthesized and the implications of our new evolutionary understanding of psychopathology in medicine will be discussed. A number of targeted

prevention and intervention strategies will be provided to effectively address depression and anxiety in medical students.

Format of the Research Project

This dissertation is divided into five sections. We begin with an introduction of the dissertation. The introduction consists of a broad overview of evolutionary psychology, empirical evidence supporting its implications, and the objectives of the dissertation in order to apply evolutionary theories of psychopathology to the medical student population. Following the introduction, the first paper focuses on reviewing the literature especially evolutionary theories of depression and anxiety in more detail. It then presents a new model of understanding medical student distress using the evolutionary theories of psychopathology and provides a preliminary assessment of the model. The main premise of the new model suggests that medical student distress can be better understood if we improve our understanding of the medical training environment and its social milieu. The second paper is an empirical investigation of the predictions arising from the proposed model. The two main predictions assert that both environmental and individual factors are predictors of depression and anxiety in medical students. The third paper will serve as a policy and intervention paper. In this paper, using the model and empirical evidence gathered from the second study, a series of prevention and intervention strategies will be offered and discussed. Lastly, the fifth section of this dissertation will provide an overall summary of the research project, and discuss its main implications.

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PAPER 1: Survival of the Fittest in Medical Schools: A New Model for Understanding and Treating Depression and Anxiety in Medical Training

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Abstract

Research on physicians, medical residents, and medical students has demonstrated a higher prevalence of some types of psychological morbidity as compared to the general population. Several authors have attributed this to a number of personality characteristics that are commonly shared among medical professionals such as perfectionism, Type A personality, and high levels of competitiveness. Additional, externally modulated factors include a demanding workload, over-exhaustion, and the pressure of working with complex and difficult human experiences including death and suffering. Medical student distress has also been discussed in the context of a culture of cynicism and mistreatment in medical schools.

The current paper discusses a theoretical framework for understanding the high rate of psychological distress in medical students by incorporating evolutionary theories of psychopathology. Evolutionary theories of psychopathology emphasize the interaction between the individual and their environment and the role of adaptation to the environment in order to increase survival and fitness. The capacity for anxiety and depressed mood has been shaped by natural selection as it has provided an advantage for survival and reproduction of the human species. Based on this model, we argue that as in our prehistoric ancestral environments that consisted of more pronounced hierarchical social structures, when an individual feels threatened and inferior in their social milieu, they exhibit symptoms of depression and anxiety. These are painful responses that have been adaptive in more competitive and hostile environments. This model outlines a framework that hypothesizes that some factors within the medical school environment are

important contributors to increased manifestations of toxic levels of anxiety and depressed mood.

Introduction

The high prevalence of medical student distress and its devastating consequences has been the focus of much attention in the past two decades. Medical education systems, various national and provincial medical associations, and even regulatory bodies have emphasized the need to address physician mental health and wellbeing early on during medical training in order to produce competent and psychologically healthy physicians (Association of Faculties of Medicine of Canada [AFMC], 2013; Canadian Medical Association [CMA], 2010; Dyrbye, Thomas, & Shanafelt, 2005).

Higher prevalences of depression and anxiety have been documented in North American medical students as compared to their same-age peers and the general population (Compton, Carrera, & Frank, 2008; Dyrbye, Thomas, & Shanafelt, 2006; Schewenk, Davis, & Wimsatt, 2010). The increased frequencies of depression and anxiety are especially apparent in the later years of training, during the "clerkship or clinical years" (Dyrbye, Thomas, & Shanafelt, 2006; Schewenk, Davis, & Wimsatt, 2010). This pattern of increased prevalence of psychopathology during medical training raises an important issue: Are there aspects of medical training and medical culture that may contribute to medical student distress?

Possible causes of medical student depression and anxiety have been identified in the literature. These include a number of personality factors such as perfectionism, Type A personality, suppressed anger, a demanding academic workload, a culture of cynicism, financial debt, student mistreatment by faculty and staff, at times a hierarchical and disrespectful culture, facing complex and difficult human experiences such as illness and death, as well as transitioning to an environment of peers with similar intelligence and

skills (Dyrbye et al., 2005, Dyrbye, Thomas, Huntington et al., 2006; Fried, Vermillion, Parker, & Uijtdehaage, 2012; Kassebaum & Cutler, 1998;). Although the literature on the topic of medical trainee mental health has primarily focused on determining prevalence rates, consequences of mental health issues, and contributing factors to psychological distress in this population, an empirically supported and comprehensive model for understanding medical student distress has been lacking (Dyrbye, Harper, et al., 2011; Dyrbye, et al., 2005; Guthrie et al., 1998). Such a model could be invaluable in not only enhancing our understanding of causes of psychological morbidity in medical schools, but it could also act as an evidence-based theoretical framework for targeted and effective intervention and prevention strategies.

Prevention and intervention strategies are especially important in light of the tragic consequences of untreated depression and anxiety in medical students. Numerous studies have documented suboptimal patient care, lowered empathy and compassion, professionalism lapses, negative impact on job satisfaction, professional development, and academic performance connected with psychological distress in medical learners and physicians (Bailey & Jefferies, 2012; Dyrbye, Thomas, & Shanafelt, 2006; Pitt, Rosenthal, Gay, & Lewton, 2004; Shanafelt, Bradley, Wipf, & Back, 2002; Thomas et al., 2007). Additionally, distress was correlated with cynicism, academic dishonesty, and consideration of dropping out of medical school (Dyrbye, Harper, et al., 2011; Dyrbye, Massie, et al., 2010; Dyrbye, Thomas, et al., 2010). Distressed learners were also more likely to experience relationship breakups, substance abuse, poor physical health and self-care (Dyrbye, Thomas, Huntington, et al., 2006; Roberts, 2010).

In this paper, we aim to introduce a novel model for understanding psychological distress in medical schools using empirically supported evolutionary theories of psychopathology. A brief overview of evolutionary theories of psychopathology will first be presented. The new hypothesized model of medical student distress will then be introduced and the rationale for the model will be explained. Finally, the implications of this model, the hypotheses arising from it, and a need for follow up research will be discussed.

Evolutionary Theories of Psychopathology

Evolution by natural selection. Evolution or 'descent with modification' is the process of change in inherited characteristics across successive generations of populations (Almeida, 2011; Darwin, 1859; Darwin, Glick, & Kohn, 1996). In a world with limited natural resources, organisms continue to struggle to survive. Those organisms with characteristics that enable them to better adapt to their environments, are more likely to survive and reproduce (Freeman, Herron, & Payton, 2004). Natural selection is the process by which inherited traits that increase the survival and reproductive fitness of populations pass onto future generations while maladaptive traits are reduced in frequency and eventually eliminated (Buss, 2012; Cosmides & Tooby, 1997; Freeman et al., 2004).

Homo sapiens like any other organism is the product of Darwinian evolution by natural selection (Buss, 2012; Cosmides & Tooby, 1997). The human brain has been modified through this process to reduce behaviors that resulted in decreased fitness of individuals in ancestral environments (Buss, 2012; Cosmides & Tooby, 1997). Therefore, humans throughout their evolutionary history have adopted strategies that increase the

probability of the persistence of their genes to future generations (Barkow, Cosmides, & Tooby, 1992). Within the evolutionary lens, human behavior, motivation and emotional states are viewed as adaptive strategies to the problems that our ancestors faced within their environment (Cosmides & Tooby, 1997; Daly & Wilson, 1999; Nesse, 2006; Nesse & Ellsworth, 2009). This is the basis for evolutionary models of psychopathology which view psychiatric disorders as the product of evolved mechanisms that contributed to the increased fitness of humans in their ancestral environment (Allen & Badcock, 2006; Buss, 2012; Cosmides & Tooby, 1997). A number of theories and models have focused on various psychiatric disorders. The main focus of the present paper is on depression and anxiety. Therefore, we will briefly review relevant evolutionary models that explain the etiology of depression and anxiety.

Anxiety. Anxiety disorders are one of the most commonly occurring psychiatric illnesses, and are often associated with a number of physiological, cognitive and somatic symptoms (American Psychiatric Association [APA], 2000; Bateson, Brilot, & Nettle, 2011). These symptoms include apprehension, uncontrollable worry, shortness of breath, sweating, tingling in the extremities, hypervigilance, increased heart rate, and an exaggerated startle response (APA, 2000; Bateson et al., 2011).

Evolutionary models of anxiety document both an adaptive anxiety response that has been advantageous in our evolutionary history, and anxiety disorders, which are viewed as a malfunctioning of this adaptive response. Within an evolutionary framework, anxiety is described as an adaptive strategy that has helped individuals detect and respond to threats appropriately, which has helped with survival and reproductive fitness (Bateson et al., 2011; Marks & Nesse, 1994). This view of anxiety is consistent with a number of

epidemiological studies that have indicated a higher probability of long-term survival in individuals who were more prone to anxiety (Bateson et al., 2011). Furthermore, a review of anxiety-like responses (ALR) in other species demonstrated its function in detecting and dealing with threat in order to enhance survival (Bateson et al., 2011; Nesse, 2011).

Bateson et al. (2011) provided additional evidence for the adaptive function of anxiety by describing that anxiety-like responses in other species function as a way to identify and cope with threat. They explained that consistent with an anxiety response in humans, anxiety-like responses in non-human species consisted of increased heart rate, vigilance, restlessness, stress hormone secretion, and interpreting unfamiliar stimuli as unsafe and threatening. Therefore, these species were better able to notice dangerous situations or stimuli, and appropriately respond. For instance, in many species who exhibited anxiety-like responses in environments with many predators, they were more likely to detect the predators early (Bateson et al., 2011). The physiological changes of anxiety-like responses such as increased heart rate and secretion of stress hormone prepared the body to respond if confronted by the predator. For instance, anxiety-like responses increased the blood supply to the body's major organs, and induced hyperventilation which in turn increased blood oxygen levels (Bateson et al., 2011; Marks & Nesse, 1994).

Bateson et al. (2011) presented an explanatory framework in which an individual's threshold for exhibiting an anxiety response was partly dependent on the likelihood of a threat occurring in combination with the individual's vulnerability to the threat and their ability to cope with it. They argued that when the individual's vulnerability or the probability of threat increases, the individual's anxiety is more easily

triggered which will lead to a higher number of false alarms (an anxiety response that is prematurely triggered). For instance, they discussed the association between lower socioeconomic status and higher prevalence of clinical levels of anxiety among that population using their framework. They indicated that individuals with lower socioeconomic status are more likely to encounter threatening events (high probability) while they have less available resources to cope with the threats (higher vulnerability to threats). In conclusion, they indicated that this framework of anxiety helps further our understanding of anxiety disorders as a malfunctioning of an adaptive anxiety response in hostile and dangerous life circumstances.

In contrast to the general consensus in relation to evolutionary views of anxiety, there is more debate around evolutionary models of depression (Allen & Badcock, 2006; Gilbert, 2006). Depression and its correlates will be briefly introduced, and the most prominent and relevant evolutionary models of depression related to the present hypothesis will be reviewed and discussed.

Depression. Clinical depression or major depressive disorder commonly includes a number of symptoms such as crying spells, apathy, reduced motivation and interest in most activities, feelings of sadness, emptiness, hopelessness, anhedonia, fluctuations in weight, appetite, and sleep, fatigue and loss of energy, social withdrawal, difficulty concentrating and thinking, psychomotor agitation or retardation, feelings of worthlessness, excessive guilt and self-criticism, and at times recurrent suicidal ideation (APA, 2000; Price, Sloman, Gardner, Gilbert, & Rohde, 1994).

In addition to depressive symptoms, a number of factors often prompt depression. Depressed states can be triggered by experiencing interpersonal conflicts such as

bullying, abuse, and harassment, as well as social loss such as losing a loved one (Gilbert, 2006). Low self-esteem, self-criticism and perceiving self as inferior to others is highly linked to experiences of bullying and abuse as well as depression (Gilbert, 1992, 2006). Lower socioeconomic status, as well as poor early attachments and abusive or neglectful parenting also are associated with depression (Bowlby, 1982; Gilbert, 2006).

The ubiquitous nature of depression and its presence across all cultures suggests that mild to moderate depressive states may have provided increased fitness to those who experienced them (Allen & Badcock, 2006). A number of evolutionary models established hypotheses in an effort to explain the adaptive function of depressive symptoms in response to the problems that we faced within our ancestral environments (Allen & Badcock, 2006). Gilbert (2006) explained that evolutionary models of depression can be categorized into social and non-social theories. Allen and Badcock (2003) proposed an integrative model of depression that incorporated elements from both the social and non-social domains in order to provide a more comprehensive explanatory framework of depression.

Non-social evolutionary models of depression. The non-social evolutionary models of depression are primarily concerned with preserving energy and resources (Allen & Badcock, 2006). The incentive disengagement model views depression as an adaptive response when an individual is faced with incentives that are too difficult to obtain (Allen & Badcock, 2006; Gilbert, 2006; Klinger, Carpenter, & Just, 1975). Investing resources and energy in improbable incentives can be a waste of resources while those resources can be used in obtaining incentives that are more probable (Allen & Badcock, 2006; Gilbert, 2006; Klinger et al., 1975). Depression which is also viewed as a

down-regulation of the positive affect system lowers the motivation of the individual to continue to commit resources in situations with unreachable goals, hence, conserves energy that could be used later (Allen & Badcock, 2006; Gilbert, 2006; Klinger et al., 1975).

Similar to the incentive disengagement model, Nesse (2000) proposed the resource allocation model which focuses on depressed mood as an adaptive strategy in unpropitious circumstances. In low reward situations, the decrement in motivation resulting from depressed mood may prevent the individual from wastefully investing energy, and instead, this energy can be allocated to a higher reward situation at a later time (Allen & Badcock, 2006; Gilbert, 2006; Nesse, 2000). Another framework that focuses on investment of resources is Leahy's (2000) sunk costs theory. Leahy (2000) suggested that individuals can find themselves trapped in very difficult situations because they feel that they have already committed too much to the situation and leaving may be too costly for them.

The learned helplessness model of depression proposed by Seligman (1975) and colleagues is one of the most-researched evolutionary models of depression. Numerous animal studies have demonstrated that when confronted with a stressor, animals display an anxiety response in an attempt to cope with or avoid the unpleasant stressor (Gilbert, 2006; Seligman, 1975). With repeated exposure to uncontrollable stressors (for example, exposure to electric shock), the animal begins to exhibit helpless, apathetic behavior that resembles depression (Gilbert, 2006; Seligman, 1975). The learned helplessness theory of depression highlights the depressogenic impact of an individual's inability to control aversive events (Seligman, 1975).

A somewhat similar model proposed by Gilbert (1992, 2001) and colleagues is the arrested-defence model which also stresses the lack of control on stress. The arrested-defence model of depression highlights that when confronted with a stressor, the fight or flight response (also known as the acute stress response) is initiated as a defense mechanism against threat. The animal will either escape the dangerous situation, or act aggressively in an attempt to protect itself against danger. The acute stress response is designed to act in the short-term. Therefore, if the acute stress response is blocked or arrested, the stress response is chronically activated and can lead to a downregulation of the positive affect system which is characteristic of depression. This model views clinical depression as a dysregulation of an adaptive response system to stress, and focuses on blocked outputs of the defense system such as feeling trapped, or suppressed anger.

Social evolutionary models of depression. Given the social nature of human beings, and the central role that social relationships have played in our inclusive fitness, a number of evolutionary theories of depression have highlighted the significance of social stressors on adaptive responses (Buss, 2012; Gilbert, 2006).

Attachment theory proposed by Bowlby (1969, 1982) speaks to the evolutionary significance of the bond between a mother and its offspring. Bowlby (1982) explained that the relationship between the young child and its mother is crucial to the offspring's survival, as the mother not only provides important resources such as food and shelter, but also protects the young from danger and provides comfort. Therefore, animals (including humans) have a repertoire of behavioral, emotional, and motivational systems to maintain proximity between the child and its mother.

When small children are separated from their mothers, they engage in a protest-despair reaction (Bowlby, 1982; Gilbert, 2006). The protest often signals the child's distress and elicits help, urgent searching, or reunification with the mother, while despair is a secondary response when protesting proves to be ineffective (Bowlby, 1982; Gilbert, 2006). The despair response is an adaptation that protects the young by deactivating the behaviors that could put the child at risk of harm (Bowlby, 1982; Gilbert, 2006). This behavioral deactivation is beneficial because a small child who is alone and vulnerable can be an easy target for predators, or it may become easily exhausted and starved (Bowlby, 1982; Gilbert, 2006). Based on the attachment model, depression is viewed as a similar response to the protest-despair reaction instigated following a threat to significant attachments (Gilbert, 2006).

The Social Risk Hypothesis of depression proposed by Allen and Badcock (2003) views depression as an adaptive response when a person faces the threat of social exclusion from relationships that are important for his/her fitness. Depression is described as adaptive since it reduces the threat of social exclusion by activating a number of mechanisms. These mechanisms include increasing cognitive sensitivity to social risk factors, reducing the likelihood of engaging in socially risky behaviors, and eliciting support from close family members while reducing behaviors that can further disintegrate already existing social relationships. The social risk hypothesis integrates a number of the previously reviewed evolutionary models in an attempt to provide a more comprehensive view of depression.

The social competition theory (also referred to as social rank theory) proposed by Price (1967), highlights the adaptive role of depression in ritual agonistic behavior. Due

to limited natural resources, animals including humans are motivated to compete and fight with each other in order to gain access to the resources. These resources are crucial for survival, reproduction, as well as the upbringing of offspring (Gilbert, 2001; Price et al., 1994). Hence, access to resources by any means is a significant factor in increasing one's Darwinian fitness (Gilbert, 2001; Price et al., 1994). Since the competition for resources in most vertebrate species are ritualistic in nature, these social encounters are called ritual agonistic behavior (Price et al., 1994). In ritual agonistic behavior, depression is considered a deescalating strategy which includes withdrawal and subordinate behaviors by an inferior contestant (Price et al., 1994). These behaviors in turn signal to the dominant contestant that the inferior contestant is not a threat, and this will increase the inferior contestant's likelihood of survival and minimize the risk of injury by de-escalating the attacker's aggressive behaviors (Price et al., 1994).

In humans and other primates that rely on eliciting help and building and maintaining social relationships for protection and obtaining resources, competition through attraction has become a more common strategy compared to fighting and intimidation (Price et al., 1994). An individual's fitness depends on their ability to obtain social resources which can include approval, caring, supportive and/or sexual relationships. Those who hold higher social rank and prestige within their social group by making themselves attractive to others, tend to have increased fitness and access to resources. Within this model, depression is viewed as an involuntary defeat strategy as a way to cope with and adapt to loss of social rank when facing defeat in social competition (Price et al., 1994). The incapacity feature of depression is discussed as a ritual psychological replacement of the physical harm endured by the inferior contestant in a

lost competition, while negative views of the self, world, and others associated with depression is explained as de-escalation of the mind since a depressed individual is less likely to engage in social competition (Price et al., 1994).

The social competition theory of depression also highlights the significance of subjective experiences of defeat or failure in obtaining these social resources as an important factor in depression (Allen & Badcock, 2006; Gilbert, 2006). Additionally, this model of depression highlights the impact of social structures on an individual's sense of self, and wellbeing. As will be explained in the next section, social competition model of depression was selected as the primary guide in development of the new model of medical trainee distress.

Theoretical framework

In selecting a theoretical framework as a guide for our new model of understanding depression in medical students, the social competition theory was the superior choice over other evolutionary theories of depression for a number of reasons. First, humans are social animals; hence, human emotion, motivation and behavior have been influenced by its social context (Buss, 2012; Gilbert, 2006). The significant role that social relationships have played in our inclusive fitness combined with a need to better understand the impact of social milieu in medicine, makes social evolutionary models of depression especially appropriate. Second, medical training environments have a well-defined hierarchical structure which typically consists of senior staff and clinical supervisors considered to be at the top of the social hierarchy, followed by nurses, residents, senior and junior medical students respectively. Interestingly, research on medical student mistreatment has documented that those at the top of the social hierarchy

(clinical staff, nurses, and residents) are the most common perpetrators of mistreatment towards medical students (Frank, Carrera, Stratton, Bickel, & Nora, 2006; Mavis, Sousa, Lipscomb, & Rappley, 2014). The relationship between the most commonly identified perpetrators of mistreatment and their respective social rank in medical culture can perhaps reflect the role of social rank in ritual agonistic behavior as discussed in social competition theory. Additionally, medical culture is known as a competitive environment where students are among peers with similar drive and capabilities (Dyrbye, Thomas, & Shanafelt, 2006). Despite similarities in abilities and talents, students are often required to compete with each other in order to gain admission to their preferred residency training programs at their preferred locations. This competition can continue well beyond medical school as residents and staff continue to engage in ongoing competition for competitive and prestigious employment and opportunities. These factors can lead to a competitive and hostile training environment where medical student distress may at times represent an adaptive response similar to that described in evolutionary models of psychopathology. Finally, the social competition model has gathered significant empirical support and it has been used to identify various variables that contribute to increased risk for depression and anxiety (Gilbert et al., 2010; McEwan, Gilbert, & Duarte, 2012; Wyatt & Gilbert, 1998). For these reasons, the social competition theory is the primary framework adapted as a guide for our proposed model of medical student distress.

The Hypothesis

In developing a new model of medical student distress, empirically supported evolutionary models of anxiety and depression were used as the theoretical underpinnings of our proposed model. An evolutionary understanding of anxiety asserts that anxiety has

helped organisms detect and cope with various environmental threats while social competition model explains depression as an adaptive response to perceived or actual loss of social rank and social resources (Bateson et al., 2011; Gilbert, 2001; Price et al., 1994).

Based on these theories, we recommend a model of medical trainee distress that emphasizes the role of both the individuals' vulnerabilities (for example, genetic predisposition, temperament, and other personality characteristics) as well as the individuals' social context and the environment. This model contends that medical students must adapt to the pressures and demands of their training environment and of the social structure within medical school. Therefore, we hypothesize that in competitive and hostile environments where social hierarchies are more pronounced, the students are more likely to manifest depressive and anxious symptomatology. Based on social competition theory, these symptoms will be more apparent when students face social loss in a social competition and especially if they perceive themselves as inferior compared to their peers and/or preceptors. This is because such symptoms played an adaptive and even protective role in ancient evolutionary environments.

Based on this model of psychopathology in medical education, a number of testable hypotheses can be formulated and their validity investigated. One hypothesis is that environmental factors that signal the level of threat to social status of students will act as significant contributors to manifestations of anxiety and depression. Alternatively, environmental indicators of social safety and connectedness will act as a protective factor against depression and anxiety. Prevalence of mistreatment in medical schools could be used as a measure of perceived threat while the level of perceived social safety can be used to determine how safe and supported students feel in their training environment.

Additionally, subjective experiences of inferiority will act as a predictor to depressive and anxious symptoms.

Another hypothesis arising from this model is that if there is a high prevalence of mistreatment and high levels of subjective experiences of inferiority among medical students compared to other groups, these factors likely play a role in higher rates of depression and anxiety in medical learners as compared to the general population. In the next section of this paper, we present a preliminary evaluation of this model using the available literature.

Preliminary Evaluation of the New Model

Student mistreatment

In order to better understand the medical training environment from the proposed model of psychopathology, it is important to explore the source, frequency, and severity of mistreatment experienced by medical students. This is especially important since abuse and mistreatment often lead to feelings of inferiority and defeat while they establish power differentials between the perpetrators and victims. Understanding patterns of mistreatment of learners, can then be used as a way to investigate the social hierarchy in medicine, hostility in the environment, and the experiences of threat to a learner's perceived social standing or social rank.

High prevalence of mistreatment of medical students has been well documented (Frank et al., 2006; Fried et al., 2012). Mistreatment has been shown to negatively impact the students' confidence in their clinical abilities, overall satisfaction with their career, and their mental health (Frank et al., 2006; Fried et al., 2012; Kassebaum & Cutler, 1998).

The Association of American Medical Colleges (AAMC) administers national surveys annually to graduates from medical schools across the United States and Canada which include a number of questions regarding students' experiences of mistreatment throughout their training (Association of American Medical Colleges [AAMC], 2011). The Medical School Graduation Questionnaire explores experiences of public belittlement or humiliation, threats with physical harm or physical punishment (e.g. being hit, slapped, kicked), requirements to perform inappropriate personal services (e.g. shopping or babysitting), being subjected to offensive sexual remarks or advances, or being asked to exchange sexual favors for grades or rewards, or being subjected to offensive remarks or denied opportunities due to racial/ethnic background or sexual orientation (AAMC, 2011). Overall, the questionnaire addresses four broad categories of general mistreatment, sexual harassment, racial/ethnic and sexual orientation mistreatment (AAMC, 2011).

According to the 2012 AAMC American graduation survey, 47.1 % of American graduates identified that they had experienced at least one of the aforementioned abusive behaviors. The 2012 AAMC Canadian data followed a close pattern with 57.4 % of Canadian MD graduates reporting at least one incident of mistreatment. The most common form of mistreatment was public humiliation (AAMC, 2012). Approximately a third of American and Canadian students identified that they had also witnessed their peers be subjected to at least one of the identified behaviors (AAMC, 2012). The most common sources of mistreatment in both surveys were clinical faculty, followed by residents and nurses (AAMC, 2012). Based on data from the AAMC questionnaires from 2009 to 2011, the perpetrators of abusive behaviors have been consistently shown to

include clinical faculty, residents and nurses. This consistent pattern may be indicative of the social hierarchy in medical training with clinical faculty and staff at the top, residents and nurses in the middle, and medical students at the bottom. Interestingly, although this pattern of social rank in medicine has been colloquially acknowledged, it has not been thoroughly investigated and very little has been written about the topic. We argue that the literature on pattern of medical student mistreatment may provide some preliminary theoretical support for the present proposed model.

In addition to the prevalence of mistreatment, and the pronounced social hierarchy in medicine, medical students are known to struggle with fears of inferiority compared to their peers, and preceptors. Although there is little empirical literature on this, the "imposter syndrome" in medical culture is a commonly used term to describe the medical learner's experiences of anxiety as they perceive themselves as inferior compared to peers (Goldberg, 2014; Henning, Ey, & Shaw, 1998). The imposter syndrome has been such a large part of the medical culture that several medical student groups and their associated publications have written about how to survive the syndrome and overcome it (Oriel, Plane, Mundt, 2004; Survive Medicine, 2015). Feelings of inferiority have been strongly linked with social rank theory as it reflects on the individual's perception of their social rank within their social context (Price et. al, 1994). Therefore, pervasiveness of feeling like an imposter in medical education may also provide some preliminary support for our proposed model of medical student distress.

Discussion and Future Directions

Depression has been discussed as an evolutionary adaptive strategy that includes a number of symptoms that affect the individual's activity pattern, increases

submissiveness, and reduces risk-taking behaviors in social interactions (Gilbert, 2006; Hendrie & Pickles, 2008). This in turn serves as a signal that the individual is not a threat to the more dominant and higher social rank individual in ritual agonistic behavior, and thus, provides survival and reproductive advantage for the inferior contestant (Allen & Badcock, 2006; Gilbert, 2006). Similarly, anxiety has provided survival and reproductive advantage by increasing the individual's hypervigilance to threat in order to protect against it (Bateson et al., 2011; Nesse, 2011).

The present proposed model highlights the role of the environment in manifestations of psychopathology in the form of depression and anxiety. This model contends that similar to our prehistoric environments, in competitive, hierarchical, and hostile environments, depressive and anxious symptoms serve as an adaptive strategy to cope with threat to loss of social rank especially in social competition. We specifically applied this model to undergraduate medical training environments, where there is a pronounced social hierarchy with clinical faculty at the top of the social chain, while residents and nurses fall in the middle, and medical students are at the lower end. Interestingly, when exploring the pattern of mistreatment in medical training, the most common perpetrators of abusive behaviors are clinical faculty followed by residents and nurses (AAMC, 2012; Frank et al., 2006). Additionally, medical students who are surrounded by peers of similar talent, skill and intelligence, often experience imposter syndrome (Goldberg, 2014). Imposter syndrome is defined as fear and anxiety that one is not as adequate in their abilities as compared to their colleagues (Goldberg, 2014). This in combination with the competitive nature of medicine, and a system that encourages medical students to compete with each other to obtain admission to competitive residency

programs, can create an environment with complex social structures and a hierarchy of social rank and power. From this perspective, it is not entirely surprising that the prevalence of depression and anxiety has been cited as higher in medical students when compared to the general population, especially by the end of their medical training (Dyrbye et al., 2006).

This model raises a number of testable hypotheses as outlined. It would be beneficial to further investigate both the validity and implications of the model as it can be widely applied to various organizations, industries and workplaces that function with steep hierarchical social structures. Additionally, there are a number of practical implications that arise from this model. Most intervention programs for depression and anxiety primarily focus on offering the afflicted individual psychotherapy and pharmacotherapy. Although this focus on the individual is beneficial and necessary, it does not accurately address the larger context in which the pathology has developed. Therefore, it seems prudent to investigate and address the environmental factors particularly those related to the social structures, in order to provide more effective prevention and intervention programs that address both the individual and environmental factors that can contribute to the manifestation of psychopathology.

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PAPER 2: Personal and Environmental Risk Factors and Protective Factors for Depression and Anxiety in Medical Students

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Abstract

The high prevalence of psychological morbidity among medical students has been a source of concern for many years. Recent research that has linked distress in physicians and medical residents to lower quality of care and empathy for patients makes this especially troubling. Distress in physicians often starts during medical school. Distress in medical students can be manifested as psychopathology in the form of clinical depression and anxiety. Previous research has focused on individual characteristics and personality traits of medical students as risk factors to depression and anxiety. However, the medical students' training environment and social context has been largely ignored. Evolutionary models of psychopathology have deepened our understanding of the etiology of depression and anxiety highlighting the influence of the environment in interaction with individual characteristics. This study adopted evolutionary models in order to explore both environmental and personality factors in relation to depression and anxiety in medical students. Two hundred and nineteen medical students at the University of Alberta completed online questionnaires. Hierarchical multiple regressions were used to examine personality factors of perceived social rank, submissiveness, perfectionism, as well as environmental factors of perceived social safeness and support, and mistreatment as predictors of depression and anxiety. The findings provided support for the hypothesis that the environmental factors of mistreatment and social safeness significantly contributed to the prediction of depression even after accounting for all three personality variables. This did not hold true for anxiety, and only the personality variables were significant predictors for anxiety. These results suggest that the medical students' environment does in fact play a role in the manifestation of depression. Therefore,

intervention and prevention policies should target both the environment and the personality characteristics of medical trainees in order to appropriately address learner distress.

Introduction

Society relies on physicians to provide and promote healthcare and to treat the ill. Physicians have gained a high degree of prestige for their work in the prevention, diagnosis and treatment of diseases and disorders. This, along with more fundamental reasons (such as the importance of the work for human wellbeing), has put a very high demand on the medical education system to produce competent, knowledgeable and skillful physicians. The fundamental goal of medical education training is the production of altruistic, empathic, and competent physicians. However, medical training has a reputation for being an overwhelming, stressful, and at times exhausting experience that often results in students suffering from serious psychological symptoms (Roberts, 2010). Given the high social value of the medical profession, it is imperative that we understand and try to alleviate the stressors affecting future physicians. This study aims to enhance our understanding of personal and environmental factors affecting medical trainees' vulnerability to depression and anxiety using an evolutionary model of psychopathology. It is through a more comprehensive and empirical investigation of risk factors and protective factors in medical education that effective prevention and intervention programs can be implemented. In this paper, evolutionary theories of psychopathology as well as medical student distress will be briefly discussed and reviewed. A new framework for medical student distress will then be introduced; an investigation of the proposed framework will be discussed followed by a review of implications of the proposed model and the findings of the present study.

Medical Student Distress

Psychological distress has been well documented among medical students (Compton, Carrera, & Frank, 2008; Dyrbye, Harper, et al., 2011; Dyrbye, Thomas, & Shanafelt, 2005; Guthrie et al., 1998; Guthrie et al., 1995). Depression and anxiety have been shown to have higher prevalence in medical students when compared with their same-age peers and the general population (Dyrbye, Thomas, & Shanafelt, 2006; Schewnk, Davis, & Wimsatt, 2010). Studies have suggested that up to one third of medical students endorse symptoms of depression, with most studies reporting a range between 10-25% depending on severity of depression and diagnostic instruments used (Roberts, 2010; Schwenk et al., 2010). It is also reported that symptoms of anxiety may actually be more common than mood disorders in this population (Roberts, 2010). The higher rates of depression and anxiety are particularly evident in the later years of training, during the "clinical years" (Dyrbye, Thomas, & Shanafelt, 2006; Schwenk et al., 2010).

The need to address psychological morbidity in medical schools has been increasingly highlighted over the past few decades. A growing body of research has documented the negative effects of depression and distress on patient care and safety, empathy and compassion, students' academic performance, professionalism, dropout rates, and professional development in medical settings (Compton & Frank, 2011; Dyrbye, Thomas, Huntington, et al., 2006; Dyrbye, Massie, et al., 2010; Dyrbye, Thomas, et al., 2010; Pitt, Rosenthal, Gay, & Lewton, 2004; Shanafelt, Bradley, Wipf, & Back, 2002; Wallace, Lemaire, & Ghali, 2009). Given the finding that patient care and safety can be compromised when medical professionals are in distress, a greater emphasis

has been placed on the understanding, prevention and treatment of depression and anxiety in medical students and residents.

In order to appropriately address depression and anxiety in medical students, it is important to understand the causes of such concerns in this population. In their reviews of the literature, Dyrbye et al. (2005) and Dyrbye, Thomas, & Shanafelt (2006) identified a number of potential causes of student distress including: adjustment to the medical culture and transition to medical school, academic pressures, a demanding workload, facing ethical conflicts, confronting death and human suffering, sleep deprivation, mistreatment by faculty or preceptors, personal life events, and financial concerns. Despite these hypotheses regarding possible causes of student distress, Dyrbye, Thomas, & Shanafelt (2006) emphasized that "limited data were available regarding the causes of student distress" (p. 354), and they reiterated the need for further studies that provide an empirical understanding of the factors that predict emotional distress in medical students.

In order to investigate the contributing factors to depression and anxiety in medical students, it will be useful to adopt a theoretical framework that has improved our understanding of the etiology of depression and anxiety in the general population. The evolutionary theory of psychopathology is a framework that has enlarged and deepened our understanding of psychopathology and led to a substantial archive of empirical findings. Evolutionary models of anxiety and depression will be briefly reviewed as they formed the foundation for the present study's investigations and hypotheses.

Evolutionary Models of Psychopathology

Evolutionary theories contend that depression and anxiety can represent evolutionary adaptations to our ancestral environments and have served to increase our

Darwinian fitness (Bateson, Brilot, & Nettle, 2011; Dunn, Whelton, & Sharpe, 2012; Gilbert, 1992; Gilbert, McEwan, Bellew, Mills, & Gale, 2009; Gilbert, McEwan, Mitra et al., 2009; Price, Sloman, Gardner, Gilbert, & Rohde, 1994). Both depression and anxiety are characterized by a set of specific physiological, behavioral and cognitive responses that have been subjected to natural selection throughout history (Allen & Badcock, 2006; Almeida, 2011; Gilbert, 2006; Marks & Nesse, 1994).

Anxiety disorders as defined in the Diagnostic and Statistical Manual of Mental Disorders, fifth edition (DSM-5) include social and other specific phobias, generalized anxiety disorder (GAD), separation anxiety disorder, selective mutism, panic disorder, agoraphobia, anxiety due to another medical condition, other specified anxiety disorder and substance-induced anxiety disorder. Anxiety disorders are typically associated with excessive and uncontrollable worrying and apprehension, significant impairment in social, occupational or other important areas of functioning, as well as a number of physiological and somatic symptoms (American Psychiatric Association [APA], 2013; Bateson et al., 2011). These symptoms can include hypervigilance, exaggerated startle response, trembling and shaking, sweating, increased heart rate and palpitations, sensation of shortness of breath or suffocating, and sensations of tingling in the extremities also known as paresthesias (APA, 2013; Bateson et al., 2011).

Clinical depression or major depressive disorder is a commonly occurring mental illness that affects the individual's mood and/or interest in activities and causes a significant amount of stress and impairment in the individual's functioning (APA, 2013). Major depressive disorder commonly includes a number of symptoms such as feelings of sadness, emptiness, hopelessness, crying spells, reduced motivation and interest in most

activities, anhedonia, fluctuations in weight, appetite, and sleep, fatigue and loss of energy, social withdrawal, difficulty concentrating and thinking, psychomotor agitation or retardation, feelings of worthlessness, excessive guilt and self-criticism, and at times recurrent suicidal ideation (APA, 20013, Price et al., 1994). In addition to depressive symptoms, a number of factors are often affiliated with depression. Depressed states can be triggered by experiencing bullying, abuse, harassment, social conflicts, and social loss such as losing a loved one (Gilbert, 2006). Low self-esteem, self-criticism and perceiving self as inferior to others is highly linked to experiences of bullying and abuse as well as depression (Gilbert, 1992 & 2006). Lower socioeconomic status, as well as poor early attachments and abusive or neglectful parenting also are associated with depression (Bowlby, 1982; Gilbert, 2006).

The universality of the human capacity for anxiety and depression suggests that these responses provided an advantage to those who experienced them at least at mild to moderate levels (Allen & Badcock, 2003, 2006; Gilbert, 2006; Marks & Nesse, 1994). For example, a substantial number of epidemiological and ethological studies have shown that anxiety has helped organisms defend against or cope with a variety of threats (Bateson et al., 2011; Marks & Nesse, 1994; Nesse & Ellsworth, 2009). Similarly, it is suggested that responses associated with depressed mood have been adaptive and facilitated survival especially in hostile and competitive environments where it was advantageous for the organism to accept defeat, or elicit social support (Almeida, 2011; Gilbert, 2006).

It should be noted that unlike anxiety, there is limited consensus regarding understanding of depression via an evolutionary lens. Within an overarching evolutionary

framework, several evolutionary models of depression exist (Allen & Badcock, 2006; Gilbert, 2006). These models can be broadly categorized into social and non-social theories of depression (Gilbert, 2006). Non-social models are primarily concerned with preservation of energy and resources while the social models emphasize the role that social support has played in humans' inclusive fitness and survival (Allen & Badcock, 2003).

In proposing a new evolutionary model of medical student distress, Shahin & Whelton (2015) reviewed both non-social and social evolutionary models of depression. They reiterated that given the significant role that social support has played in humans' evolutionary history combined with a need for better understanding the social context of medical learners, social models of depression are more appropriate to form the basis of their model. More specifically, the social competition model of depression formed the theoretical underpinnings of their new model of understanding psychological distress in medical learners. The social competition model will be briefly introduced, and the present study's efforts at investigating hypotheses arising from Shahin & Whelton's (2015) model of student distress will be presented.

The social competition model of depression. Given the social nature of the human species, the individual's ability to maintain or increase his or her reproductive fitness varies based on their social rank within their social group (Buss, 2012; Gilbert, 2001). Humans are motivated to compete with each other for resources that are crucial for reproduction as well as the survival and upbringing of their offspring (Barkow, Cosmides & Tooby, 1992; Gilbert, 2001). These resources could include basic necessities

such as access to mates, food, and social resources such as caring and support by others (Bateson, Nettle, & Roberts, 2006; Gilbert, 2001).

The social competition theory of depression views depression as an evolved de-escalating strategy by the inferior contestant in a competition for resources (Allen, & Badcock, 2006; Price et al., 1994). These social encounters are often ritualistic in nature and known as 'ritual agonistic behavior' and are observed in most vertebrate species (Price et al., 1994). This de-escalating strategy which includes withdrawal and subordinate behaviors indicates that the inferior competitor presents no threat to the superior competitor (Price et al., 1994). This in turn reduces the inferior competitor's risk of injury or even death, hence increasing his or her survival (Price et al., 1994). Human social competition has largely replaced ritual agonistic behavior with competition through attraction as the main form of obtaining prestige, and social value which in turn will determine the individual's fitness (Price et al. 1994). Therefore, humans compete for obtaining a higher social rank by making themselves more attractive to others and when their status is seriously threatened or they perceive a substantial loss in their social resources, they experience depression (Allen & Badcock, 2006; Gilbert, 2001; Price et al., 1994).

Based on social competition theory, several studies have explored a number of variables that might contribute to depression. Factors such as low perceived social rank and status, high levels of perfectionism, low perceived social safeness, and high submissive behaviors were identified as factors that increased one's vulnerability to depressive symptoms (Gilbert et al., 2010; McEwan, Gilbert, & Duarte, 2012; Wyatt, & Gilbert, 1998).

Shahin & Whelton (2015) pointed out that medical culture is very competitive and hierarchical social structures in medicine are very pronounced with preceptors and staff at the top of the hierarchy followed by residents and finally medical students. Medical students engage in an ongoing competition for obtaining higher status, positive references and evaluations from preceptors in order to gain admission to competitive and prestigious residency programs. They also pointed out the prevalence of the alarming pattern of mistreatment of medical students that has been well documented in the past two decades by staff, residents and nurses (Fried, Vermillion, Parker, & Uijtdehaage, 2012). Shahin & Whelton (2015) asserted that in a competitive and hostile medical training environment, the medical students' psychological distress may represent an evolutionary adaptation similar to that described in the social competition model of psychopathology. They concluded that a suitable new model of understanding psychological distress in medical trainees is an evolutionary model highlighting the role of social competition and the training environment in manifestations of depression and anxiety. As a result, the evolutionary model of social competition was selected as the main framework guiding their model of understanding psychopathology in medicine. Hence, the present investigations and hypotheses are based on their proposed evolutionary model of distress. This study is to serve as a follow up to Shahin & Whelton's model and it aims to investigate its implications.

Rationale for the Present Study

One of the most important aspects of the evolutionary theories of psychopathology is that they highlight the significance of an individual's environment and social context and the need to adapt to it in order to increase one's survival and

Darwinian fitness (Allen & Badcock, 2006; Gilbert, 2001; Price et al., 1994). The literature on medical student wellbeing and distress has largely focused on the individual medical student and their characteristics (e.g. perfectionism, Type A personality, suppressed anger, etc.), while the issue of their social context and environment has been largely ignored. The higher prevalence of depression and anxiety in higher years of training as compared to earlier years during the training may point to the role of the training environment in the manifestation of mental illness in medical students. Therefore, it is the aim of this study to explore environmental factors and the medical students' social context during their training program in addition to individual characteristics.

Shahin & Whelton's (2015) adapted evolutionary model of distress in medical school was used as the primary theoretical framework for the present study's investigations. Based on this model, a number of environmental and personal factors were carefully selected. For the purposes of the present study, psychopathology was defined as clinical depression and clinical anxiety. The individual characteristics investigated in this study consisted of submissive behaviors, perfectionism, and perceived social rank which were identified as risk factors to depression based on social competition model (Gilbert et al., 2010; McEwan et al., 2012; Wyatt & Gilbert, 1998). Environmental factors were defined as perceived level of social safety (social safeness), and experiences of mistreatment. Social safeness referred to the students' perception of their safety within their social context. Mistreatment was selected as a measure of experiences of threat in the environment. Social safeness was a variable of particular interest since in a study by McEwan and colleagues (2012), social safeness was shown to

be a full mediator between competitiveness and depression, meaning that competitive individuals who did not feel safe in their social environment were at higher risk of depression. Therefore, feeling socially safe appeared to protect against depression.

Based on evolutionary theories of psychopathology, we hypothesize that manifestation of both depression and anxiety can be predicted based on combination of both environmental factors and individual factors. In order to develop appropriate and effective prevention and intervention strategies to address medical student distress, it is crucial to understand risk factors and protective factors both at a personal level as well as at a cultural and environmental level. This study set out to test whether environmental factors contributed significantly to the prediction of depression and anxiety after personal risk factors were accounted for.

Methods

Participants

All undergraduate medical students at the University of Alberta (approximately 673 students) were eligible and invited through e-mail advertisements to participate in this study. The email invitation contained a link to a secure website containing the survey. A total of 219 medical students completed the online survey, representing a response rate of 32.5%. Of the 219 respondents (59.8% females, 40.2% males), the vast majority were students in the MD program (n = 214), three were in the MD/PhD program, and two were in the MD/MBA program. The respondents ranged in age from 20 to 49 years old (M = 24.75, SD = 3.20). More than half (55.7%) of respondents were between the ages of 20 and 24, 41.6% were between 25 and 30, and only 2.7% were older than 30. The sample consisted of students roughly evenly distributed across all four years

of the medical program with 23.7% in their first year, 24.2% in their second year, 27.4% in their third year, and 23.7% in their fourth year. Table 1 summarizes the demographics of the sample including relationship status, ethnicity, gender, and whether the respondents have children. The demographic characteristics of the sample were generally comparable to that of the University of Alberta medical student population, with female students somewhat overrepresented in the sample compared to the population which consists of approximately equal numbers of males and females.

Measures

Depression Anxiety Stress Scales 21 (DASS-21; Lovibond & Lovibond, 1995)

The Depression Anxiety Stress Scales (DASS-21) was selected as the measure of the affective states of depression, anxiety, and stress. DASS-21 is a shortened version of the DASS-42, and contains seven questions per subscale (Sinclair et al., 2012). Each item uses a Likert scale to assess the symptoms experienced by the respondent within the prior week, ranging from 0 (did not apply to me) to 3 (applied to me most of the time) (Lovibond & Lovibond, 1995). DASS was developed in non-clinical samples and has been supported for use with young adults. Furthermore, it has been specifically used with university student populations (Hall & Staten, 2010; Henry & Crawford, 2005; Lovibond & Lovibond, 1995). DASS-21 has been shown to effectively distinguish between depression and anxiety, and has a strong relationship with other diagnostic tools of depression and anxiety such as the Beck Depression and Anxiety Inventories (Hall & Staten, 2010; Henry & Crawford, 2005; Sinclair et al., 2012). The reliability, validity, and three-factor dimensionality of the instrument has been supported, and the internal

Table 1

Demographic Characteristics of the Sample

Characteristic	Number	Percentage
Sex		
Male	88	40.2
Female	131	59.8
Program Type		
MD	214	97.7
MD/PhD	3	1.4
MD/MBA	2	0.9
Year in the Program		
1	52	23.7
2	53	24.2
3	60	27.4
4	52	23.7
Missing	2	0.9
Relationship Status		
Single	92	42
In a Relationship	89	40.6
Common-Law	13	5.9
Married	24	11
Divorced	1	0.5
Children		
yes	10	4.6
no	209	95.4
Ethnicity		
Aboriginal	2	0.9
White (European descent)	147	67.1
Black (African descent)	2	0.9
Latin American	1	0.5
Arab	1	0.5
Chinese	34	15.5
Japanese	1	0.5
Korean	3	1.4
South Asian (e.g., East Indian, Pakistani, Sri Lankan, etc.)	14	6.4
West Asian (e.g., Afghan, Iranian, etc.)	1	0.5
Other	11	5
Missing	2	0.9

consistency has been consistently strong (Hall & Staten, 2010; Henry & Crawford, 2005; Lovibond & Lovibond, 1995; Sinclair et al., 2012). The subscales had Cronbach alphas of $\alpha = 0.88$ for Depression, and $\alpha = 0.80$ for Anxiety in the present study. Only the Depression and Anxiety subscales were used for the purposes of the present study. The DASS-21 manual suggests that each subscale's raw score be doubled in order to obtain results that are comparable to DASS-42. This procedure was followed to facilitate comparison to normative data. Higher scores indicated a greater degree of depression and anxiety.

Social Comparison Scale (SCS; Allan & Gilbert, 1995)

The Social Comparison Scale (SCS) consists of 11 bipolar constructs that are ranked from 1-10. The SCS is designed to measure perceived social rank and social standing compared to others using a semantic differential methodology (Allan & Gilbert, 1995). Lower scores on the scale indicate that the individual feels inferior and of lower rank compared to others while higher scores indicate an individual who perceives a higher rank compared to others (Allan & Gilbert, 1995). The scale measures rank, attractiveness, and fitting in within the social group (Allan & Gilbert, 1995). The scale has been shown to have good reliability in both clinical samples and non-clinical samples of university students (Allan & Gilbert, 1995, 1997). Only an overall score of social comparison (also known as social rank) was used. Cronbach's alpha calculated for the present study was $\alpha = 0.87$.

Submissive Behavior Scale (SBS; Allan & Gilbert, 1997)

The Submissive Behavior Scale (SBS) is a 16 item questionnaire derived from the work of Buss and Craik (1986), and later refined by Allan and Gilbert (1997). The SBS

measures the frequency of a number of submissive behaviors from 0 (never) to 4 (always). The scale has been shown to have good test-retest reliability as well as internal consistency (Allen & Gilbert, 1997; Gilbert et al., 2010). Cronbach's alpha calculated for the SBS in this study was $\alpha = 0.86$.

Frost's Multidimensional Perfectionism Scale (FMPS; Frost, Marten, Lahart, & Rosenblate, 1990)

Frost's Multidimensional Perfectionism Scale (FMPS) is a 35 item questionnaire designed to measure the six dimensions of Concern Over Mistakes (CM), Personal Standards (PS), Parental Expectations (PE), Parental Criticism (PC), Doubts About Actions (D), and Organization (O) (Frost et al., 1990). The subscales of the FMPS have shown good internal consistency with Cronbach's alphas ranging from 0.77 to 0.93 (Frost et al., 1990). The Total Perfectionism score includes all the subscales except for the Organization subscale which was shown to have a weak correlation with the other subscales (Frost et al., 1990). The FMPS has been validated in adult nonclinical populations, and it has been shown to have good concurrent validity with a number of other perfectionism measures including Multidimensional Perfectionism Scale (MPS-H) by Hewitt and Flett (1991; Frost et. al., 1990; Hawkins, Watt, & Sinclair, 2006; Hewitt, Flett, Turnbull-Donovan, & Mikail, 1991). The Total Perfectionism score was the only score used in the present study and Cronbach's alpha for this measure was $\alpha = 0.91$.

Social Safeness and Pleasure Scale (SSPS; Gilbert, McEwan, Mitra, et al., 2009)

The Social Safeness and Pleasure Scale (SSPS) is an 11 item questionnaire designed to measure how safe, warm, and soothing an individual perceives their social context to be (Gilbert, McEwan, Mitra, et al., 2009). Using a Likert scale, participants

rank from 1 (Almost never) to 5 (Almost always), their agreement with each of the SSPS items. The SSPS has been shown to have a high internal consistency (Gilbert, McEwan, Mitra, et al., 2009). The introduction for this measure was modified slightly in the present study by asking the participants to respond to the items in relation to their school and training environment. This request was made to obtain a measure of how safe, warm, and soothing the respondents perceived their school and training environment to be. The SSPS was then used as an index of the environmental context of the medical students. The scale's Cronbach's alpha was $\alpha = 0.94$.

AAMC Student Mistreatment Questions (AAMC, 2012)

The Association of American Medical Colleges (AAMC) administers surveys annually to graduates from medical schools across the United States and Canada that include questions regarding students' experiences of mistreatment throughout their training (Association of American Medical Colleges [AAMC], 2011). The 2012 Medical School Graduation Questionnaire included a list of 15 behaviors and the students were asked to rank the frequency with which they had experienced any of these behaviors from 0 (never) to 3 (frequently). The behaviors included various items relating to general, racial/ethnic, and sexual orientation mistreatment as well as sexual harassment (AAMC, 2011). General mistreatment included public belittlement or humiliation, the threat of physical harm or physical punishment (e.g., Hit, slapped, kicked), or if the student was required to perform personal services such as shopping or babysitting (AAMC, 2011). Sexual harassment included being subjected to offensive sexual remarks, unwanted sexual advances, or being asked to exchange sexual favors for grades or rewards (AAMC, 2011). Racial/ethnic as well as sexual orientation mistreatment included being

subjected to offensive remarks or being denied opportunities due to racial/ethnic background or sexual orientation (AAMC, 2011). For the present study, two additional items were added as a general measure of emotional mistreatment. These items included "Been criticized and insulted" and "Emotionally abused (e.g., Put down, demeaned, etc.)". It should be noted that one of the original items of "Received lower evaluations or grades based solely on gender" was erroneously omitted from the survey. In 2012, 3.1% and 3.7% of respondents from the University of Alberta and across all schools respectively, endorsed this item (AAMC, 2012). As a result of the changes made to the questionnaire, the measure of mistreatment for the present study included a list of 16 behaviors. The new list of 16 behaviors was then recoded into a single dichotomous yes/no measure of mistreatment. If a respondent indicated at least one of the 16 behaviors had occurred at least once, they were coded as having been mistreated. If none of the behaviors had ever occurred, they were coded as not having experienced mistreatment. This procedure was done since the AAMC GQ (2012) used the same method in order to provide an estimate of percentage of students who have experienced abusive behaviors regardless of whether the students perceive the behaviors as mistreatment or not. Additionally, 33.8% of our sample did not report any experiences of mistreatment, while the pattern of responses by the remaining part of the sample was generally similar with items related to emotional abuse as being the most commonly endorsed items. Therefore, a simplified dichotomous variable appeared to be the best index of mistreatment for the purposes of our study.

Procedure

Both University of Alberta Ethics Review Committee as well as the Faculty of Medicine & Dentistry Trainee Access Committee (TRAC) approved this study. The recruitment and data collection began in February of 2014 and lasted approximately 2 months. All medical students in the undergraduate medical education program at the University of Alberta were invited to participate in the study via email-advertisements and several in-class presentations. The emails were distributed internally through the Learner Advocacy and Wellness (LAW) office. The LAW office is dedicated to advocating for learners in the Faculty of Medicine & Dentistry as well as supporting their overall health and wellbeing; therefore, it is well-respected among the medical students. The email advertisements included an introduction to the study as well as a link to access the online survey via FluidSurvey. The students received the same email on three occasions with the last two emails serving as a reminder for them to complete the survey. Fluidsurvey was chosen as the host website for the online survey due to the website's specific security features in order to protect the privacy of participants. The data were stored on a highly secure website based in Canada, and were encrypted and only accessible to the researcher.

Once students accessed the online survey, they were presented with an informed consent page that outlined the purpose, benefits and risks of participation in the study. Following informed consent, the participants completed demographic questions followed by the validated measures as discussed previously. At the end of the survey, all participants were directed to a page that included information on available resources if

they were upset or distressed by any of the survey questions and were interested in obtaining support.

The surveys were administered and collected voluntarily and anonymously. The survey was estimated to take 15 to 20 minutes to complete. No incentives were provided for participation in the study, and informed consent was implied by the completion of the survey in its entirety.

Results

Descriptive Statistics

All analyses were conducted using IBM SPSS Version 21. Means, standard deviations, skewness, and kurtosis for all the measured variables are included in Table 2.

The means calculated for depression and anxiety were higher than previously established normative data based on a large non-clinical sample of adults in the United States ($M = 5.7$, $SD = 8.2$ and $M = 4.0$, $SD = 6.3$, respectively) (Sinclair et al., 2012). Henry & Crawford (2005) demonstrated that when the doubling procedure is used to obtain means for depression and anxiety using DASS-21 ($M = 5.66$ and 3.76), these values are indeed comparable to those obtained from DASS-42 ($M = 5.55$ and 3.56) (Crawford & Henry, 2003; Henry & Crawford, 2005; Sinclair et al., 2012). The higher means for depression and anxiety in our sample is consistent with previous literature that indicated a higher degree of depression and anxiety in medical students as compared to the general population (Dyrbye, Thomas, & Shanafelt, 2006). A direct comparison to a sample of medical students was difficult to establish since most studies have used other measures for depression and anxiety. It should be noted that although the means for the present sample were higher than non-clinical samples, they were lower than the norms

established in clinical samples (M = 13.2, SD = 5.8 and M = 9.9, SD = 6.2 respectively) (Sinclair et al., 2012). Clinical samples refer to norms established in samples of patients with a Diagnostic and Statistical Manual of Mental Disorders diagnosis.

The original published sample means for social rank were 64.7 (SD = 11.7) for a group of college students and 38.9 (SD = 13.5) for a clinical sample (Allan & Gilbert, 1995). The mean obtained for social comparison in the present study was lower than the non-clinical normative data established in a sample of college students. Several other studies have published values for non-clinical samples of UK college students that were roughly identical to the means in the original study (Gilbert et al., 2010; McEwan et al., 2012; Wyatt & Gilbert, 1998). These samples typically consist of first year British undergraduate students who are younger than our sample of medical students. Several factors such as maturation and cultural differences could account for the differences between the means of previous studies and the present sample (Gilbert et al., 2010; McEwan et al., 2012; Wyatt & Gilbert, 1998). Another possible explanation for the lower social rank in our sample of medical students could be that the medical students are surrounded by peers of similar intellectual ability and aptitude in a competitive environment, and so may be more likely to perceive themselves as inferior and of lower rank since their comparison pool is much smaller with less variability in talents and abilities.

The mean obtained for submissive behavior for the present study was also slightly higher compared to published normative data of a non-clinical sample of college students (M = 21.4, SD = 7.6) and lower than clinical samples (M = 34.7, SD = 9.8; Allan & Gilbert, 1987). These variances could also be due to factors such as maturation, the

Table 2

Summary of Descriptive Statistics

Variables	*M*	*SD*	Skew	Kurtosis
Depression	9.40	9.20	1.31	1.47
Anxiety	6.94	7.56	1.77	3.51
Social Safeness	39.69	8.87	-0.45	-0.04
Social Rank	55.63	14.37	-0.71	1.59
Submissive Behavior	27.33	8.94	0.20	-0.05
Perfectionism	56.36	16.52	0.24	-0.14

program of study, and cultural factors since most non-clinical samples in the previous literature were undergraduate students in the UK (Allan & Gilbert, 1997; Wyatt & Gilbert, 1998).

Social safeness is a relatively new measure, therefore, available normative information was limited. However, the mean calculated for social safeness was very similar to previous studies using non-clinical samples of college students (M = 39.88, SD = 9.7 and M = 40.47, SD = 7.2; Gilbert, McEwan, Mitra, et al., 2009; McEwan et al., 2012).

Surprisingly, the mean perfectionism score in the present sample was much lower than the overall perfectionism score obtained using the same measure in other samples of college students. Parker & Adkins (1995) reported that means can range from 76.4 to 86.3 (SD ranged from 17.1 to 17.6) depending on the nature of particular samples selected from various colleges. The lower perfectionism mean was especially surprising since it has been hypothesized that due to the competitive nature of medical schools, medical students tend to be more perfectionistic. Enns, Cox, Sareen & Freeman (2001) explored perfectionism in medical students and compared a sample of Canadian university art students with a sample of medical students using the Frost's Multidimensional Perfectionism Scale. The authors found that all subscales of the FMPS were similar except that medical students had higher personal standards and lower doubts about their actions. Their study did not include the overall perfectionism score, so we compared the subscales from the present study with the subscales from the Enns and colleagues (2001) study. Interestingly, the means in the present study were not only lower

than the means obtained for medical students in the Enns et al. (2001) study, but in fact these scores were also lower than those of the art students.

Statistical Assumptions

Prior to conducting statistical analyses, the data were examined in order to ensure that the necessary statistical assumptions were adequately met. The analyses included independent t-tests, Pearson's correlations, chi-squared test of independence, and hierarchical multiple regressions.

All variables of interest were assessed for normality by examining skewness and kurtosis as well as conducting the Shapiro-Wilk test. Skewness values ranged from -0.45 to 1.77 and Kurtosis values ranged from -0.04 to 3.51 (Table 2). Variables of perfectionism and submissive behavior displayed a normal distribution. Both depression and anxiety were positively skewed; social rank and social safety were negatively skewed. These results are consistent with general trends found in the population. Visual inspection of the histograms and examination of standard deviations indicated that there is still high variability in the scores despite the skewness. Given the large sample size, the central limit theorem and robustness of our statistical analyses to violations of normality, it was unnecessary to transform the data.

For tests involving hierarchical multiple regressions, assumptions of independence of residuals, linearity of scatterplots and partial regression plots, homoscedasticity, and normal distribution of residuals were all examined and met. Tests for multicollinearity indicated VIF values ranging from 1.03 to 1.98. Casewise Diagnostics identified three outliers for the Depression regression and six outliers for the Anxiety regression model (standardized residuals greater than three standard deviations

from the mean). All leverage points were below 0.2, and Cook's Distance values for influential points did not indicate any values higher than one. Therefore, no outliers were removed and the sample size was kept at 219.

Gender Differences

The previous literature has provided mixed results regarding gender differences for depression, anxiety, social rank, and submissiveness (Dyrbye, Thomas, & Shanafelt, 2006; McEwan et al., 2012; Richman & Flaherty, 1990). Independent sample t-tests were conducted and there were no statistically significant differences found between males and females with regards to depression, anxiety, perfectionism, and social safeness. Submissive behavior was the only variable that differed between males and females (t (217) = 2.99, $p < 0.01$; *Cohen's d* = 0.41). Women reported more submissive behaviors than their male counterparts. These results were replicated using the bootstrap procedure in SPSS in order to ensure the results were not impacted by outliers and violations of normality.

Additionally, a two-by-two chi-squared test of independence was conducted to assess gender differences with regards to the categorical variable of mistreatment. There was no statistically significant difference between males and females with regards to mistreatment (χ^2 (1) = .083).

Relationships Among Variables

The relationships between all variables of interest were investigated. Pearson correlation coefficients are provided in Table 3. Consistent with the literature and as expected, depression and anxiety were moderately correlated. Depression was also positively correlated with submissive behavior, perfectionism, and mistreatment.

Depression had a negative relationship with both social safeness and social rank. The correlations between anxiety and the other variables followed the same pattern as depression. Anxiety was positively correlated with submissive behavior, perfectionism, and mistreatment, and negatively correlated with social safeness and social rank. The strength of the relationship between both depression and anxiety and the categorical variable of mistreatment was weaker than the association with other variables. Nevertheless, these relationships were statistically significant, though at the 0.05 rather than the 0.01 level.

Social safeness had a strong positive correlation with social rank and a moderate negative relationship with submissive behavior and perfectionism. Social rank was negatively correlated with both submissive behavior and perfectionism while perfectionism and submissive behavior had a negative association. Overall, these results were consistent with previous studies (McEwan et al., 2012; Wyatt & Gilbert, 1998).

Hypothesis One: Predicting Depression

This paper's first hypothesis was that both individual characteristics (perfectionism, submissiveness and social rank) as well as environmental factors (experiences of mistreatment and perceived social safeness) contribute to the prediction of depression in medical students. Hierarchical multiple regressions were conducted to determine if individual characteristics of perfectionism, social rank, and submissiveness contributed to prediction of depression in the medical context, and whether the addition of environmental factors improved the prediction of depression over and above that of individual characteristics. For the first block of the hierarchical multiple regression, social rank, submissiveness, and overall perfectionism were entered. Consistent with the

Table 3

Correlation Analyses

Variable	1	2	3	4	5	6	7
1. Depression	——	.541**	-.569**	-.463**	.358**	.347**	.170*
2. Anxiety	——	——	-.309**	-.375**	.374**	.334**	.138*
3. Social Safeness	——	——	——	.605**	-.417**	-.354**	-.104
4. Social Rank	——	——	——	——	-.562**	-.370**	.000
5. Submissive Behavior	——	——	——	——	——	.432**	.105
6. Perfectionism	——	——	——	——	——	——	.082
7. Abuse (Yes/No)	——	——	——	——	——	——	——

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

previous literature, this model consisting of personality variables was statistically significant and accounted for 25.5% of the variance in the prediction of depression, F (3, 215) = 24.468, $p < .001$, $R^2 = .255$. Both social rank and perfectionism contributed to the prediction of depression ($p < .01$) while submissiveness was not a statistically significant predictor (See Table 4). These results suggest that individual characteristics such as high levels of perfectionism and perceiving oneself as inferior to others and of low social rank can contribute to prediction of depression in medical school.

For the second block, environmental factors of mistreatment and social safeness were added (Model 2). As anticipated, the new model including both personal and environmental factors was statistically significant, F (5, 213) = 25.682, $p < .001$, $R^2 = .376$. The improvement from Model 1 to Model 2 was also statistically significant, $\Delta F (2, 213) = 20.76, p < .001$, $\Delta R^2 = .122$. This suggests that when personality factors were accounted for, the addition of environmental variables accounted for 12.2% unique variance in the prediction of depression.

Statistically significant predictors in the second model were the environmental factors of social safeness ($\beta = -0.40$, $p < 0.05$), and mistreatment ($\beta = 0.11$, $p < 0.05$) while personality variables of social rank and perfectionism ($\beta = -0.15$ and $\beta = 0.12$ respectively) approached statistical significance at $p = 0.051$ (Table 4). This is especially interesting since the strength of the relationship between mistreatment and depression was relatively weaker ($r = .17$) compared to the relationship between depression and personal variables of social rank, perfectionism, and submissiveness (r ranged from .35 to .46). Despite the weaker correlation, mistreatment remained as a significant contributor in Model 2. Possible explanations for this finding will be reviewed in the discussion.

Table 4

Hierarchical Multiple Regression Predicting Depression From Perfectionism, Submissiveness, Social Rank, Perceived Mistreatment, and Perceived Social Safeness

	Depression			
	Model 1		Model 2	
Variable	B	β	B	β
Constant	13.79		25.08	
Social Rank	-0.22	-0.35**	-0.10	-0.15
Submissiveness	0.09	0.08	0.04	0.04
Perfectionism	0.10	0.18**	0.07	0.12
Social Safeness			-0.42	-0.40**
Mistreatment			2.20	0.11*
R^2	0.26		0.38	
F	24.47**		25.68**	
ΔR^2	0.26		0.12	
ΔF	24.47**		20.76**	

Note. $N=219$. *p <0.05, **p < 0.01

Mistreatment as a Moderator in Predicting Depression

A series of hierarchical multiple regressions were conducted in order to assess the increase in variation explained by adding interaction terms between mistreatment and social rank, submissiveness, and social safeness. These interaction terms were added as a third step to each hierarchical regression analysis. The only statistically significant result that was found was that of mistreatment and submissiveness. The final model including all personal, environmental and interaction between submissiveness and mistreatment variables was statistically significant, F (6, 212) = 23.118, $p < .001$, $R^2 = .396$. The results suggested that mistreatment moderates the relationship between depression and submissiveness, as evidenced by the addition of 1.9% of the total variance, ΔF (1, 212) = 6.800, $p = .01$, $\Delta R^2 = .019$. These results suggested that medical students who scored high on submissiveness and experienced mistreatment scored higher on depression as compared to students who scored high on submissiveness but did not experience mistreatment (Figure 1).

Hypothesis Two: Predicting Anxiety

Similar to the first hypothesis, the second hypothesis proposed that both individual characteristics (perfectionism, submissiveness and social rank) as well as environmental factors (experiences of mistreatment and perceived social safeness) contribute to the prediction of anxiety in medical students. In order to initially assess the predictive power of personality factors, the variables of social rank, submissiveness, and perfectionism were added in the first block of the hierarchical regression. Similar to the regression model for depression, and consistent with the literature, the regression model including personality characteristics of social rank, submissiveness, and perfectionism

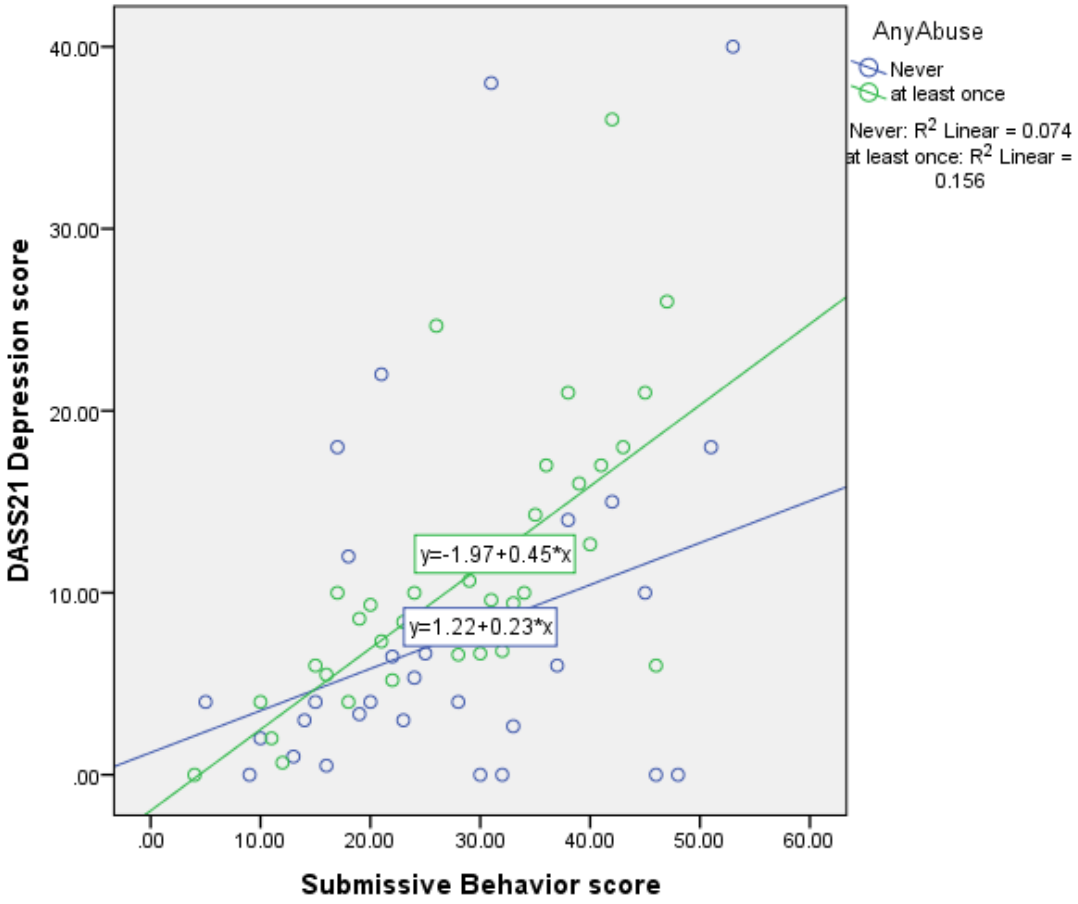

Figure 1. Two-way interaction between mistreatment and submissiveness predicting depression.

(Model 1) was statistically significant in prediction of Anxiety. Model 1 accounted for 20.5% of the variance in prediction of anxiety, F (3, 215) = 18.459, $p < .001$, $R^2 = .205$. All three variables in Model 1 were statistically significant predictors (See Table 5 for regression coefficients). Higher submissive behavior and higher perfectionism as well as perception of being inferior and of lower rank contributed to the prediction of anxiety in medical students.

Interestingly, when the environmental factors of mistreatment and social safeness were added as a second block to the hierarchical multiple regression (Model 2), they did not lead to an increase in the predictive power of the regression model, ΔF (2, 213) = 1.794, $p = .169$, $\Delta R^2 = .013$ (Table 5). Therefore, contrary to our hypothesis, Model 1 appears to be the best model in prediction of anxiety and individual characteristics appear to be the best predictors.

Mistreatment as a Moderator in Predicting Anxiety

Similar to moderation analyses performed for depression, the same series of hierarchical regression analyses were performed with the interaction terms added as part of the third step. These interaction terms included mistreatment and social rank, social safeness, and submissiveness. Interestingly, none of these regression analyses indicated a contribution made to the model by the addition of the interaction terms. Therefore, mistreatment does not appear to moderate the effect of variables of submissiveness, social rank, and social safeness in prediction of anxiety.

Table 5

Hierarchical Multiple Regression Predicting Anxiety From Perfectionism, Submissiveness, Social Rank, Perceived Mistreatment, and Perceived Social Safeness

	Anxiety			
	Model 1		Model 2	
Variable	B	β	B	β
Constant	4.23		5.33	
Social Comparison	-0.11	-0.21**	-0.10	-0.19*
Submissiveness	0.15	0.18*	0.14	0.16*
Perfectionism	0.08	0.18**	0.77	0.17*
Social Safeness			-0.05	-0.06
Mistreatment			1.61	0.10
R^2	0.21		0.22	
F	18.46**		11.88**	
Δ R^2	0.21		0.01	
ΔF	18.46**		1.79	

N=219. *$p < 0.05$, **$p < 0.01$

Discussion

The present study aimed to investigate hypotheses arising from Shahin & Whelton's (2015) new evolutionary model of medical student distress. Shahin & Whelton (2015) used the social competition model of depression along with evolutionary explanations of anxiety as theoretical foundations for their novel approach to understanding medical student psychopathology. Shahin & Whelton (2015) proposed that both individual characteristics and the environment are significant predictors in manifestation of depression and anxiety during medical school.

Social competition theory of psychopathology suggests that depression is an evolved de-escalating strategy typically triggered by actual or perceived loss of social rank and status, and that this response has been especially helpful in competitive and hostile environments (Almeida, 2011; Gilbert, 2006). Based on the social competition model, individual characteristics of maladaptive perfectionism, low social rank, and high submissiveness have been shown as risk factors to depression (Dyrbye, Thomas, & Shanafelt, 2006; Gilbert, 2006; Wyatt & Gilbert, 1998). Evolutionary models also view anxiety as an adaptive response that can help the individual detect and respond to threat (Marks & Nesse, 1994; Nesse & Ellsworth, 2009). Therefore, we carefully selected and used measures of social safeness and experiences of mistreatment as a way to determine the degree of hostility and threat as well as safety experienced by medical students during their professional training. We hypothesized that the measures of safety and mistreatment in the training environment likely help in prediction of anxiety and depression beyond that of individual characteristics of submissiveness, perfectionism, and social rank.

Consistent with the present study's hypothesis, the results provided support for the role of both the environment and of individual characteristics in prediction of depression. These results suggested that experiences of mistreatment and a low sense of social safety within the training environment were both predictors of depression. This is an especially significant finding because although the correlation between mistreatment and depression was relatively weaker compared to the correlation between depression and individual characteristics of social rank, submissiveness, and perfectionism, mistreatment maintained its status as a significant contributor to depression. This is in line with concerns raised in the literature regarding the detrimental effects of mistreatment in medical schools on medical student wellbeing (Frank, Carrera, Stratton, Bickel, & Nora, 2006; Fried et al., 2012; Lubitz, & Nguyen, 1996; Richman, Flaherty, Rospenda, & Christensen, 1992; Silver & Glicken, 1990). Several studies have consistently shown high submissive behaviors, high levels of perfectionism, and perceiving self as of low social rank and value increase the risk for depressed mood (Gilbert & Allen, 1994 & 1998; Gilbert, et al., 1994; Gilbert et al., 2010; McEwan et al., 2012; Wyatt & Gilbert, 1998). In the present study, the individual characteristics of social rank, and perfectionism approached significance, while submissiveness was not a significant contributor to the prediction of depression. This was somewhat surprising as we anticipated that all individual characteristics would remain as significant contributors in the full model of depression. It should be noted that although these variables did not reach significance in the model, they are likely still important factors to consider when designing interventions and prevention programs to address depression. It is possible that

these variables were not statistically significant due to the overlap and correlations between the various predictors and the measures used.

Additionally, the results suggested that perception of warmth and safety in the environment can act as a protective factor against depression. This was an important finding since the social context of medical students in their training environment has been largely ignored, particularly positive contributors to that environment. Some studies that have investigated aspects of the social context in medical schools, reported the positive impact that a nurturing learning environment can have on medical student wellness (Dyrbye et al. 2009; Dyrbye & Shanafelt, 2012). Recommendations for creating a positive and nurturing learning environment included mentorship and tutoring programs between preceptors and students, as well as peer to peer support programs (Dyrbye et al., 2005). The present study's findings reiterates the significance of feeling safe and warmth in relationships with all individuals during medical training including peers, residents, preceptors and staff.

Another interesting and touching finding from the present study was the role of mistreatment as a moderator on the relationship between depression and submissiveness. Medical students who scored high on submissiveness and were mistreated were at higher risk of depression while students who scored high on submissiveness and did not experience mistreatment, were at lower risk of depression. This finding provided additional support for Shahin & Whelton's (2015) model of medical student distress which asserted that the social environment of medical students can influence the expression of psychopathology. This reiterates a need to address the high prevalence of

mistreatment in medical school as it appears to play a critical role in the manifestation of depression.

Overall, these results provided support for the hypothesis that the combination of personality and environmental factors can play a significant role in manifestation of depression in medical students. This is in line with ethological observations and various evolutionary studies that have demonstrated phenotypic variations (differences in how a characteristic can be represented) in mood based on the specific social context that the animal/individual is in (Gilbert, 2006; Haber, Barchas, & Barchas, 1981; MacLean, 1990; Yeh, Fricke, & Edwards, 1996). For example, it has been shown that subordinate animals that have been harassed and threatened by a dominant animal are more likely to exhibit depressed-like mood and behaviors (Price, 1972). These findings imply and support Shahin & Whelton's (2015) position that not only is it important to address the individual characteristics that can act as risk factors to depression, but prevention and intervention efforts should also target the social context of medicine. Reduction of occurrences of mistreatment while enhancing feelings of safety and social acceptance will likely be beneficial in addressing depression in medical school. More specific recommendations and approaches on how to focus these efforts will be discussed in more detail in the next section of the dissertation.

The hypothesis as outlined on page 27 essentially implies that both the environment and the individual characteristics contributed to prediction of anxiety. When testing this prediction, the results provided support only for part of the hypothesis. In predicting anxiety, the individual characteristics of submissiveness, perfectionism, and social rank were all predictors to anxiety. The largest contributor to prediction of anxiety

appeared to be perceived social rank. This is congruent with the previous research that has shown individuals who perceive themselves as superior and having high status score lower on anxiety while individuals who perceive themselves as inferior and of low rank score higher on anxiety (Wyatt & Gilbert, 1998; Gilbert et al., 2010). Surprisingly, addition of environmental factors of social safeness and mistreatment did not appear to significantly improve the prediction of anxiety. Comparative studies investigating anxiety-like responses in other species have indicated a higher likelihood of the animal to be hypervigilant, restless, detect unknown and ambiguous stimuli, and interpret them as threatening (Bateson et al., 2011). Therefore, one possible explanation for this finding could be that since anxiety has been an evolved mechanism to protect against threat, anxious students are more likely to exhibit hypervigilance and scan their environment for signals that could suggest a threat. Therefore, it is possible that anxious students are more likely to avoid environments where they may be mistreated or feel socially unsafe. Therefore, the environment does not add a unique contribution to the prediction of anxiety.

Overall, the present study found support for Shahin & Whelton's (2015) evolutionary model of medical student distress at least with respect to depression. The findings reinforced the notion that phenotypic variants in moods and emotions are based on our social ecology. These findings contributed significantly to the literature on medical student distress by identifying personal and environmental risk factors and protective factors. The results of the study also affirmed the importance of addressing both the personality and personal development of medical students as well as the

relationships and social context of their training environment in order to effectively reduce their distress.

Future Directions and Limitations of the Study

The present study aimed to establish an empirical understanding of environmental and individual factors that contribute to prediction of depression and anxiety in medical school. However, caution should be used in interpretation and generalization of these results. The sample used in this study consisted entirely of medical students at the University of Alberta. Therefore, a larger sample including students from various schools across the country and around the world would be needed to apply the results and suggestions for interventions to the larger medical student population. Additionally, self-selection bias may be present due to the voluntary nature of the surveys and the 30% response rate which may have skewed the results. Hierarchical multiple regression and correlational analyses were used to analyze the data. Therefore, no causal conclusions can be made regarding the data. Using quasi-experimental research designs may assist to further investigate the causal relationships among the examined variables. This would be especially important in order to determine whether environmental risk factors can cause psychopathology or whether there are other mechanisms mediating the association between depression and environmental risk factors and protective factors.

Despite the limitations of a localized and relatively small sample size, it would be prudent to use this model as a basis for further larger and multi-center studies in order to further assess the models in predication of anxiety and depression. Once support has been found, then targeted intervention and prevention programs can be established in order to address psychological morbidity in medical education in a systemic and efficient way.

Given the significant role that physicians play in our society and the society's health and wellness, it is our responsibility to support physicians in reaching their own optimum health and wellness. After all, the quality of the healthcare system is dependent on a healthy pulse of its individual members.

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PAPER 3: Strengthening Undergraduate Medical Education: A Mental Health Strategy

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Abstract

Psychological distress is a widespread issue in medical training. Physicians' and medical learners' mental health has become a public concern in light of the literature that has identified significant consequences to untreated mental illness in physicians. Not only does psychopathology impact the medical professional's personal and professional life, it also has deleterious effects on the healthcare system. These include lowered quality of patient care, increased medical errors, and dissatisfaction in the workplace which can lead to complex and difficult work dynamics, as well as economic costs due to absenteeism and/or reduced efficiency. Therefore, it is prudent to address mental health among physicians in training. Research has shown a higher prevalence of depression and anxiety in medical students as compared to the general population. The present paper has adopted an evolutionary model of psychopathology in medical students as a guide in developing a mental health strategy to address these concerns. The proposed mental health strategy will offer both prevention and intervention programs that aim to address individual and environmental factors affecting medical student wellness.

Introduction

Enrolling in medical school is an exciting period for new students aspiring to become competent physicians who can treat the ill and give back to their community. At the same time, medical training is a stressful time for young learners who are beginning to develop their professional identities (Dyrbye, Thomas, & Shanfelt, 2005). The transition into an academically demanding program and adjusting to an environment with peers with similar skills, intelligence, and drive can be an intimidating experience (Dyrbye et al., 2005). There are a number of additional factors that can lead to high levels of stress in medical school. These include facing complex human experiences such as pain, death, and suffering, a demanding workload, difficulties maintaining work-life balance, a culture that can be cynical, and experiencing mistreatment by staff and/or residents (Compton, Carrera, & Frank, 2008; Frank, Carrera, Stratton, Bickel, & Nora, 2006; Dyrbye et al., 2005; Firth, 1986; Guthrie et al., 1995; Guthrie et al., 1998). Additionally, a number of personality characteristics such as high levels of perfectionism, suppressed anger, and type A personality have been shown to increase medical students' vulnerability to psychological distress (Dyrbye et al., 2005).

The literature has consistently shown high levels of psychological morbidity in medical students in the form of stress, depression, anxiety, and burnout (Dyrbye, Thomas, & Shanafelt, 2006; Compton et al., 2008; Guthrie et al., 1995; Guthrie et al., 1998). The prevalence of psychological distress has been shown to be higher than in the general population as well as age-matched peers especially by the end of undergraduate medical education (Dyrbye et al., 2005). In a large systematic review of the literature on distress among Canadian and American medical students, Dyrbye, Thomas, & Shanafelt

(2006) reported that there are inconsistent findings with regards to prevalence rates of mental illnesses. Despite this inconsistency, they indicated that there is consensus that overall, medical students experience higher rates of psychological distress by the end of their training compared to the general population. In their review, they then discussed a number of personal and professional consequences of untreated mental illness in medical learners. These consequences included professionalism issues, lowered academic performance, lowered empathy and compassion, reduced quality of patient care and safety, increase in academic dishonesty, consideration of dropping out of medical school, rise of cynicism, substance and/or alcohol abuse, relationship difficulties, suicidal ideations and even suicide attempts (Compton et al., 2008; Frank et al., 2006; Pitt, Rosenthal, Gay, & Lewton, 2004; Shanafelt, Bradley, Wipf, & Back, 2002).

Canadian physicians, residents, and medical students follow a similar pattern of distress as their counterparts in the United States. In a study of Canadian medical residents, one third of respondents reported a history of mental health problems and one third (33%) described their life as "quite a bit to extremely stressful" (Cohen et al., 2008). In a study of Canadian physicians by Compton & Frank (2011), a quarter (23.2%) of respondents identified experiencing depressed mood for at least 2 weeks consecutively, and a quarter (26.5%) indicated that their mental health difficulties interfered with their work in the month prior to their completing the survey. In response to the high prevalence and burden associated with Canadian medical professionals' mental health concerns, the Canadian Medical Association (CMA) published a mental health strategy for Canadian physicians, and reiterated the significance of addressing mental health in doctors (CMA, 2010).

In this paper, the focus will be on prevention and early intervention during undergraduate medical education. The Canadian Medical Education system will be briefly introduced, barriers to seeking mental health among medical students discussed, and resilience factors and a comprehensive model of prevention and intervention grounded in empirical evidence will then be presented and discussed.

Literature Review

Canadian Medical Education

In Canada, there are 17 medical schools (Association of Faculties of Medicine of Canada [AFMC], 2013). The Canadian medical curriculum typically offers a four year medical degree with the first two years focused on preclinical training also known as pre-clerkship. The pre-clerkship portion of the program is primarily classroom-based. It offers coursework in the basic sciences, physiology and human anatomy while integrating highly supervised clinical experiences as an introduction into the medical profession. A significant goal of pre-clerkship training is to facilitate formation and development of the learner's professional identity. The clerkship years are the second part of the program that is focused on increasing responsibility within the healthcare team situated almost entirely within the clinical realm. The students are enrolled in a number of mandatory clinical rotations and have a choice of a number of elective rotations. It should be noted that some medical schools in Canada (for example, McMaster University and Cummings School of Medicine) offer the undergraduate medical education program over three years compared with the traditional four year programs. The structure of these programs is very similar to the four year degree with clerkship portion of the program following the pre-clerkship training. In both three and four year programs, at the end of the training, students will

complete the Medical Council of Canada's licensing exam. Following completion of the medical degree, the learners' will begin their postgraduate training also known as 'residency' which is a period of specialized clinical training prior to practice as a fully licensed and independent physician. The competition for acceptance into residency programs in Canada varies by specialty; however, programs are typically competitive and the competition for residency programs can be a stressful time for students (Dyrbye, Thomas, & Shanafelt, 2006).

Medical schools across Canada typically provide access to mental health resources through student affairs offices also known as wellness programs (Canadian Federation of Medical Students [CFMS], 2014). Additionally, every province in Canada offers a Physician Health Program (PHP) which entails a comprehensive range of mental health services for medical students, residents, and physicians and their family members (CMA, 2010). PHPs also offer outreach, workshops, and educational seminars. Furthermore, medical students have access to their respective university counseling services as well as a range of services offered through the community (CFMS, 2014). These resources are valuable as they offer various entry and access points for distressed medical learners.

Barriers to Seeking Help

Despite the prevalence of depression and anxiety among medical students and the availability of a number of resources, research has consistently found that many distressed students do not seek help or are reluctant to access services (Midtgaard, Ekeberg, Vaglum, Tyssen, 2008; Roberts et al., 2000; Roberts et al., 2001). A number of barriers to accessing help have been identified including high academic workload and

lack of time, concerns about academic consequences or academic documentation, worries about lack of confidentiality, stigma of mental illness, limited sessions, accessibility, cost and fear of unwanted interventions such as medication instead of counseling (Givens & Tjia, 2002; Pitt et al., 2004; Midtgaard et al., 2008; Roberts et al., 2000; Seigle, Schuckit, & Plumb, 1983). Depressed students are particularly sensitive to the stigma of being recognized as struggling with depression by peers, and preceptors (Roberts, 2010). Schwenk, Davis, and Wimsatt (2010) found that depressed compared to non-depressed medical students were more likely to endorse beliefs such as fearing that they would be viewed as less competent, less able to cope, and weak. They also were more likely to report that speaking with a counsellor was risky. Schwenk et al. (2010) discussed how this may represent depressed medical students' skewed perception of others and their environment or a reflection of the stigmatization of mental health difficulties in the medical culture. They recommended that in order to address the stigma associated with mental illness, new approaches to developing a more nurturing culture where students will feel safe to discuss their difficulties should be encouraged.

A new challenge to accessibility of counseling services in recent years has been the prevalence of new training opportunities such as electives at various locations across the world. Not only do students have the ability to complete electives across Canada, they are also provided with opportunities to complete international electives. This is especially evident in third and fourth year students who often travel to various locations in order to complete their clinical and elective rotations. Distributed Medical Education (DME) is the overarching term used to describe various educational activities that medical students engage in outside of the boundaries of their home institution (AFMC, 2006). Faculties of

medicine across Canada have placed greater emphasis on DME in the past several years with the objective of providing a variety of educational and clinical experiences across various settings (AFMC, 2006). One example of distributed medical education has been the implementation of longitudinal integrated clerkships (LIC) where students are typically placed in a rural and/or community placement for one year as opposed to completing a series of short rotations in various urban teaching hospitals (Norris, Schaad, DeWitt, Ogur, & Hunt, 2009). The main guiding principle for longitudinal integrated clerkships has been continuity both for students and for patients. This in turn, increases patient-centered care as well as learner-centered education (Norris et al., 2009).

The growth and development of distributed medical education has led to a need for counseling services that can accommodate not only the student's busy schedules, but also provide counseling at a distance via new technology such as telehealth or Skype, and accommodating the time difference between locations. E-counseling is a relatively new area in mental health and is still in its infancy. There are a number of challenges associated with such new methods of delivering services. Some of these challenges include privacy and confidentiality concerns and variable practice standards by the regulatory bodies overseeing the mental health professionals offering the service (DeAngelis, 2012). For many mental health professionals, there is a lack of comprehensive liability insurance for offering e-counseling, which in turn, leads to reluctance for mental health professionals to provide the service. When offering such services, the clinicians also need to consider local laws and regulations, as well as available resources in the local area where the client is receiving e-counseling services which can be challenging (College of Alberta Psychologists [CAP], 2000). Therefore,

these barriers should be considered carefully in developing a mental health strategyto address these challenges.

Resilience

In developing an effective mental health strategy for medical students, it is also prudent to explore the literature on their resilience. Resilience has been defined as an emotional competence that enables the individual to overcome adversity while remaining positive (Dyrbye & Shanafelt, 2012; Tempski, Martins, & Paro, 2012). It consists of several cognitive processes including: self-control, planning, perseverance and commitment, and self-efficacy (Atkinson, Martin, & Rankin, 2009; Tempski et al., 2012). Resilience includes a number of skills including identifying personal and social resources, creativity, optimism, humour, flexibility, self-reflection, and the ability to act ethically and responsibly (Atkinson et al., 2009; Tempski et al., 2012). Tempski and colleagues (2012) suggested that in order to promote essential values and humanism in medical practice, it is important to provide medical students with opportunities to develop emotional competencies such as resilience, effective team working skills, leadership, communication, empathy, self-control, and metacognition. They discussed the literature that suggested a number of self-reflective experiences such as role modeling, role-play, video feedback, and mentoring as means to help students in developing their emotional competencies.

Dunn, Iglewicz, & Moutier (2008) conceptualized medical student wellbeing as a "coping reservoir". They discussed that the coping reservoir entails an internal structure which is made up of the individual's temperament, personality, and coping style. The reservoir can be depleted by various stressors such as academic and personal demands,

existential difficulties in relation to their careers and purpose in life, and interpersonal conflicts, while it can be replenished by self-care activities, social support, peer and clinical mentorship, and intellectual stimulation of their training program. The concept of coping reservoir highlighted the importance of the complex and dynamic nature of various aspects of a medical learner's experiences during medical school that can contribute to their enhanced resilience or burnout. Dunn et al. (2008) concluded that learners' resilience and wellbeing can be enhanced by medical schools providing various positive inputs into the coping reservoir through formal or informal programs.

Consistent with the coping reservoir concept, a number of coping mechanisms have been shown to be protective of the students' emotional wellbeing. These include the ability to find meaning and purpose in their work, maintaining a positive outlook, identifying and focusing on priorities and values, problem solving, positive reframing, self-care activities and maintaining work-life balance (Dyrbye & Shanafelt, 2012; Howe, Smajdor, & Stockl, 2012). One of the most significant protective factors identified is the role of social support in resilience and emotional wellbeing (Dyrbye & Shanafelt, 2012; Howe et al., 2012). Social functioning not only acts as a buffer against distress, but has also been shown to reduce the risk of depression (Dyrbye & Shanafelt, 2012). This highlights the significance of better understanding the social context of medical students to develop improved programs and policies that will foster connectedness and supportive social relationships in medicine.

Currently, a number of efforts have been directed at nurturing connectedness and collaboration amongst the students (Dyrbye & Shanafelt, 2012). A few examples of such efforts include reducing the competitive nature of the programs by implementing pass/fail

grading systems, as well as replacing norm-based grading with criterion-based grading during clinical years (Dyrbye & Shanafelt, 2012). A new promising approach to medical student wellness and resilience has been the implementation of mindfulness based stress reduction (MBSR) programs either as an elective or part of the core curriculum (Ludwig & Kabat-Zinn, 2008; Shapiro, Schwartz, & Bonner, 1998). MBSR is associated with a supportive and safe group experience which is believed to enhance and strengthen the connectivity and relationships among the participants (Rosenzweig, Reibel, Greeson, Brainard, & Hojat, 2009). Additionally, several studies have suggested that MBSR reduces psychological distress, anxiety, and tension in medical students while increasing their empathy and overall wellbeing (Rosenzweig et al., 2009; Shapiro, Shapiro, & Schwartz, 2000; Shapiro et al., 1998). Despite the number of studies suggesting MBSR or more broadly mindfulness as an efficacious program in reducing psychological distress among medical learners, there are very few programs that offer it as part of the core curriculum (Rosenzweig et al., 2009).

In a study by Slavin, Schindler, & Chibnall (2014), a six hour resilience and mindfulness (R/M) program was introduced into the core curriculum at the Saint Louis University School of Medicine as part of a larger set of curricular changes in order to enhance the wellness of medical students. The R/M program incorporated elements of mindfulness, relaxation, and cognitive stress management strategies such as cognitive reframing and addressing cognitive distortions. In addition to these elements, the program included a number of broader curricular changes such as changes to the course content, evaluation process, electives, and scheduling. Although it is difficult to establish the exact impact of the R/M program on student wellness since there were other curricular

changes implemented, the overall program was shown to be associated with less depressive symptomology, anxiety, and stress (Slavin et al., 2014). This, in combination with other studies that demonstrate that mindfulness can contribute to a reduction in medical errors and an improvement in the doctor-patient relationship, suggest that resilience programs that incorporate mindfulness strategies can contribute to improved mental health in medical schools (Ludwig & Kabat-Zinn, 2008).

In light of the research that emphasizes the role of social support in resilience and wellbeing, it is also important to explore and understand not only the student's social support system as well as the social relationships amongst the students, but also their relationships with faculty, residents and other staff. Understanding the barriers to nurturing a safe and supportive social context may shed further light on appropriate interventions and steps to promote student wellbeing and resilience. One of these barriers has been the high occurrence of student mistreatment and its widespread impact on medical trainees.

Mistreatment

The high prevalence of medical student mistreatment combined with its negative impact on students' confidence, emotional wellbeing, and overall satisfaction with their careers has been very troubling (Fried, Vermillion, Parker, & Uijtdehaage, 2012). Data from the 2012 Medical School Graduation Questionnaire by the American Association of Medical Colleges (AAMC) indicated that 57.4% of Canadian medical students endorsed at least one of the abusive behaviors catalogued in the survey. The high prevalence in 2012 was partly due to removal of a screening question that asked participants if they had personally experienced mistreatment (Mavis, Sousa, Lipscomb, & Rappley, 2014). In the

previous surveys, only participants who responded "yes" to the screening question were given the list of abusive behaviors as a follow up. Even with the screening question included and when taking into account the subjective perception of mistreatment, data from 2000 through 2011 suggested 12% to 20 % of American and Canadian medical students reported that they had experienced mistreatment (Fried et. al, 2012; Mavis et. al, 2014). The most common form of mistreatment in medical schools is public belittlement and humiliation, and the most common perpetrators were identified as clinical staff, residents and nurses (Fried et. al, 2012; Mavis et. al, 2014).

Since 1995, the David Geffen School of Medicine at UCLA (DGSOM) took the lead in addressing medical student mistreatment by instituting a number of prevention policies, implementing procedures to report incidents of mistreatment and resolve them, as well as educating students, faculty and residents about mistreatment and relevant coping mechanisms (Fried et al., 2012). In 2012, Fried and colleagues provided a report on this 13 year longitudinal study and efficacy of the DGSOM's programs and efforts to eradicate student mistreatment. They reported that despite the multipronged effort over a thirteen year period, there was little change in prevalence of student mistreatment. They indicated that their findings spoke to the complexity of the culture of mistreatment in medicine, and discussed cynicism and burn out amongst residents as a possible contributing factor to their perpetuating mistreatment and viewing mistreatment as a "rite of passage". They further discussed a need for a national effort in addition to small scale efforts since residents are recruited from various medical schools across the country. They stressed the larger need to address the issue of mistreatment in the national medical

culture. The longitudinal study at DGSOM highlighted the complexity of the social context of students particularly in their clinical years.

Interestingly, even though several studies have emphasized the importance of investigating and addressing the role and impact of the medical culture and training environment on student distress, this area has been largely ignored. More specifically, few studies have empirically and systematically explored the role of the training environment and its relationship to student distress. This has led to a gap between interventions that aim to target the training environment while the relevant risk factors and protective factors within the environment have not yet been identified. This may explain the relative ineffectiveness of the interventions addressing mistreatment that have been implemented thus far. We believe that in order to find more effective interventions, a comprehensive theoretical framework that is grounded in empirical evidence is needed. Additionally, this framework should explain how and why certain factors contribute to increased risk or protection against psychological morbidity. Such a framework should examine both the personal and environmental factors contributing to learners' psychological distress and wellbeing. This comprehensive approach can then be used as a guiding foundation for prevention and intervention recommendations.

New Model for Understanding Psychological Distress*

In a study at one Canadian medical school, Shahin & Whelton (2015) proposed a new comprehensive theoretical framework exploring both personal and environmental variables and their relative contribution to medical student distress (defined as clinical depression and anxiety). The study adopted an evolutionary model of psychopathology known as social rank theory that has led to a substantial archive of empirical findings

while also highlighting the significance of both the individual's environmental context and their individual vulnerabilities.

The social rank theory of psychopathology discusses depression and anxiety as evolutionary adaptations to humans' ancestral environments (Price, Sloman, Gardner, Gilbert, & Rhode, 1994). Similar to other social animals, humans are required to compete with each other for access to resources such as shelter, food, social support, and mates in order to ensure increased likelihood of surviving and passing on their genes to future generations (Allen & Badcock, 2006; Price et al., 1994). In this model, depression is viewed as an involuntary deescalating strategy by the inferior members of the group when competing for resources (Price et al., 1994). The inferior contestant exhibits withdrawal and submissive behaviors in order to signal to the superior contestant that it poses no threat (Price et al., 1994). This in turn, minimizes the chances of a life-threatening attack by the superior competitor (Price et al., 1994). Therefore, this involuntary strategy increases the inferior contestant's chances of survival while minimizing risk of harm (Price et al., 1994). In humans, social competition through attraction has largely replaced confrontational competitions for resources (Gilbert, 2001; Price et al., 1994). Humans will compete to obtain prestige and higher social rank in their social group by making themselves more attractive to others (Gilbert, 2001; Price et al., 1994). Consequently, when they perceive a threat or a loss in their social standing and social resources, they exhibit depressive and anxious symptoms (Gilbert, 2001; Price et al., 1994).

Several studies have explored a number of variables and their role in predicting depression and anxiety based on social competition theory of psychopathology. Variables

such as low social rank, high submissiveness, high perfectionism, and low perceived safety within the social group were identified as risk factors for psychological distress (Gilbert et al., 2010; McEwan, Gilbert, & Duarte, 2012; Wyatt, & Gilbert, 1998). In their study, Shahin & Whelton (2015) explained the need for a comprehensive model that explores both the environmental and personal factors. Given the hierarchical culture of medicine and the intense competition for higher prestige and social standing among medical students and residents, social rank theory seems particularly appropriate as a guide for developing a new model of medical student stress.

Based on this theoretical underpinning, Shahin & Whelton (2015) proposed a new model of medical student distress that included a number of carefully selected environmental and personal variables. These variables included personal factors such as social rank, submissiveness, and perfectionism as well as environmental characteristics of mistreatment and social safeness. Social rank refers to the individual's perception of their social standing or how inferior they believe they are compared to others, while submissiveness is a measure of frequency of submissive behaviors. Social safeness was defined as the medical students' perception of feeling safe and supported during their training. This variable was of particular interest since little is known about the social context in medical schools.

Shahin & Whelton (2015) found that in predicting depression, environmental variables of mistreatment and social safeness were statistically significant even after personality variables of social rank, submissiveness, and perfectionism were accounted for. This highlighted the impact of the training environment on the manifestation of depression and the significance of incorporating strategies that enhance a medical culture

where students feel safe and supported while minimizing mistreatment in medical schools. Additionally, all three personal variables of perfectionism, submissiveness, and social rank were statistically significant in predicting anxiety. Students who perceived themselves as inferior to others, ranked high on perfectionism and were more submissive, were at higher risk of experiencing anxiety.

Based on this empirically supported expansive model of psychological distress, the following prevention and intervention strategies are recommended. These recommendations aim to specifically address risk factors of low social rank, high perfectionism, high submissiveness, and experiences of mistreatment while enhancing the protective factor of social safeness.

Recommendations

The World Medical Association (WMA) released a "Statement on Physicians Well-being" which encouraged the national medical associations to take a number of steps including prevention, education, interventions, and research initiatives in order to address physician wellness (WMA, 2015). The Canadian Medical Association discussed intervention efforts with regards to physician mental health issues as a continuum beginning with health promotion followed by primary, secondary and tertiary prevention strategies (CMA, 2010). Health promotion was broadly defined as preventative and systemic initiatives to promote the health of the physicians such as encouraging a balanced workload, obtaining adequate sleep and exercise by offering recreational facilities, increased support staff, and addressing duration of call shifts (CMA, 2010). Primary prevention referred to addressing risk factors for psychological morbidity via activities such as resilience building, stress reduction and fatigue management programs,

and various workshops. Secondary prevention represented early diagnosis and intervention and emphasized importance of easy access to services and interventions as early as possible. Finally, tertiary prevention was discussed as an intervention for already established areas of difficulties through availability of various inpatient and outpatient treatment services.

In relation to the role of medical education in this mental health strategy, the CMA (2010) recommended that medical schools foster a supportive environment between medical students and residents, try to eliminate the "hidden curriculum", address stigma, provide programs and services to build resilience and address mental health challenges. "Hidden curriculum" refers to a "socialization process" that occurs during medical training when implicit beliefs, behaviors, and attitudes are transmitted to medical learners by their seniors (Gofton & Regehr, 2006; Mahood, 2011). The main challenge in the hidden curriculum in medicine is that these negative norms and behaviors typically undermine the explicit professionalism teachings of the medical curriculum, and can lead to cynicism and perpetuating stigma or unprofessional behaviors (Gofton & Regehr, 2006; Mahood, 2011). Therefore, addressing the "hidden curriculum" will likely play a significant role in nurturing a supportive and safe environment.

In a position paper by the Canadian Federation of Medical Students (CFMS, 2014), four recommendations were made to specifically address the mental health concerns of medical students. These recommendations were similar to the CMA recommendations and included addressing stigma, providing various programs and services in medical schools, raising awareness of mental health issues both locally and nationally, providing support for research and evaluation initiatives regarding medical

student mental health, and establishing standards for accommodating students with mental illnesses during their training.

It should be noted that the vast majority of the recommendations provided in Canada to address physician and learner mental health are informed by expert opinion as opposed to empirical data. Therefore, there are tremendous opportunities to supplement these recommendations offered by experts with empirically-informed strategies.

Using both of these papers and their recommendations as a foundation for the present mental health strategy, this paper will focus on specific recommendations that target risk factors and protective factors identified in the aforementioned empirically supported model. These recommendations are not meant to supplant the others but to build on and complement them. It is crucial for these strategies to be evaluated and their effectiveness determined in order to further fine tune an empirically supported mental health strategy that strengthens the Canadian medical education curriculum.

The recommendations have been divided into two groups since the model has emphasized the role of both personal risk factors as well as environmental variables. Suggestions with respect to the culture of medicine will entail strategies to enhance protective environmental factors while minimizing the risk factors in the training environment. Strategies with respect to personal factors will address protective and risk factors associated with the personality and personal lives of trainees.

Personal factors

Perceiving oneself as inferior to others, and higher levels of submissiveness and perfectionism were identified as risk factors to depression and anxiety (Shahin & Whelton, 2015). Additionally, past mental health history, family history of mental health

issues, genetic predisposition, an individual's upbringing and past life experiences, as well as personal life events such as traumatic experiences, critical illness, or experiences of loss and grief may play a role in increasing a medical student's vulnerability to psychological morbidity (Dyrbye, Thomas, & Shanafelt, 2005; Firth, 1986; Guthrie et al., 1995; Guthrie et al., 1998). We broadly categorized all factors related to the individual as 'personal factors'. In order to effectively address personal factors, we suggest the following strategies to enhance the learners' resilience, address barriers to seeking support, and enhance accessibility to supports:

- *Wellness Curriculum***.** A number of efforts have been made by various medical schools to address medical student wellness. These typically include offering various social and recreational activities and spaces, counseling and support services, workshops and presentations on burnout, balanced lifestyle, healthy living, stress management, anxiety and depression, as well as student wellness committees to promote health and wellness of medical students (Frank, Elon, & Hertzberg, 2007; Frank, Smith, & Fitzmaurice, 2005; Slavin, Schindler, & Chibnall, 2014). In Canada, there are also ongoing national efforts to ameliorate medical learner distress through AFMC wellness and/or student affairs groups. One main challenge with these initiatives has been the lack of appropriate documentation, which has made it difficult to determine what these efforts are, whether or how they have been implemented, and whether there are ongoing evaluations of these activities. Therefore, the current network of activities to address learner distress appears to be fragmented and not

meaningfully integrated into the formal medical curriculum. Therefore, in addition to these preexisting strategies, we recommend a comprehensive wellness and resilience curriculum similar to the R/M program implemented at the Saint Louis University School of Medicine (Slavin et al., 2014). The wellness curriculum can be implemented as part of introduction to clinical skills and professionalism during first or second year. We recommend that this program include the following elements which have been shown to be effective strategies to address psychological distress and promote resilience:

- Mindfulness: Introducing mindfulness, teaching mindfulness techniques such as breath awareness, body-scan, the mountain meditation, and the leaves in a stream meditation can be beneficial in assisting trainees to self-soothe and relax. It is recommended that learners learn and practice these techniques in small groups with a trained facilitator who can nurture a safe and supportive environment.
- Cognitive Behavioral techniques: Introduction of the relationship between thoughts, emotions, and behaviors, as well as introduction of cognitive distortions and how to address them in order to effectively manage stress and anxiety. This portion of the curriculum should specifically target submissiveness, high perfectionism, and perceiving oneself as inferior to others since these variables have been identified as risk factors to psychological

distress. Relaxation techniques such as diaphragmatic breathing and progressive muscle relaxation can be used as additional strategies to promote relaxation.

    - Resilience building: The cognitive behavioral and mindfulness strategies can be incorporated to encourage positive reframing when dealing with adversity, flexibility in thinking and problem-solving, self-reflection, and an overall improvement in the learner's resilience. We suggest that the experiential aspects of the resilience and wellness curriculum such as mindfulness practices be facilitated within a small group format. Additionally, it is suggested that once students have gained the knowledge regarding cognitive behavioral strategies, they be provided with opportunities to practice, discuss and debrief these strategies within a small group format.

- *Improved accessibility to services and addressing barriers*. Much effort has been made especially in Canada in order to increase accessibility and availability of support services. The provincial health programs, the central university counseling services as well as community mental health programs have served as various access points for distressed medical students. In recent years, a number of schools have adopted in-house counseling programs in order to supplement the pre-existing support services in an effort to provide a convenient and specialized service to medical students. In this age of distributed medical education, some of

these in-house counseling programs even offer skype or e-counseling and flexible times for appointments in order to address geographical and time barriers to seeking help. Unfortunately, there is little known about how many schools have adopted such programs, and how these on-site counseling services compare to other supports. Additionally, little is known about the efficacy of such programs. In fact, despite a wealth of interventions and programs available throughout Canada, very little is written about these efforts and research in this area is limited. The vast majority of research on medical student wellness, prevention, and intervention programs are based in the United States. We strongly believe that in order to strengthen the Canadian medical education system, a number of research and evaluation steps need to be taken so that the current programs can be better understood and evaluated:

- Environmental scan and evaluation**.** An environmental scan of Canadian medical schools will help determine what support structures are in place at each medical school, how they operate, and how they may be different across provinces. Various programs need to be evaluated in order to determine the efficacy of such programs, so that the programs can be fine-tuned, modified, and best practices shared.
- A collaborative effort. In order to better understand medical student wellness in Canada, a national collaboration is required. The Canadian Physician Health Institute (CPHI) was created in

2012. CPHI is a national program that is focused on advancing research and knowledge with regards to physician wellness. Additionally, the Association of Faculties of Medicine of Canada (AFMC) is a national partnership that identifies itself as the "voice of academic medicine in [Canada]". AFMC has a number of committees and groups such as physician health and wellbeing, student affairs, and undergraduate medical education. Both the AFMC and CPHI have unique opportunities to fund and encourage national research and evaluation initiatives that aim at developing a map of existing resources and structures, and eventually developing national empirically supported standards of promoting and addressing medical student wellness.

Medical culture

Feeling socially safe and supported in medical school was shown to be a protective factor against depression while experiencing mistreatment was a risk factor for psychological distress (Shahin & Whelton, 2015). Therefore, the following recommendations are designed to specifically enhance trainees' sense of safety within their social context while attempting to reduce learner mistreatment:

- *Strengthening relationships*. A number of previously discussed interventions such as offering formal and informal recreational and social opportunities as well as the recommended small-group mindfulness programs naturally create opportunities for enhanced feelings of safety and connection between the learners. Adopting the recommended

strategies of implementing pass/fail grading, criterion-based grades instead of norm-based evaluations can also be beneficial in reducing the competitiveness nature of medical schools and encouraging cooperation. In addition to peer to peer support, relationship with residents, staff, and nurses is crucial since they make up the fabric of medical culture. Due to the evaluative role and the inherent power differential between trainees and staff, developing opportunities to enhance relationships while maintaining clear boundaries can be challenging. Based on the recommendations of Dunn et al. (2008), it would be beneficial to create more formal opportunities for mentorship between residents, staff, and medical students particularly during clerkship. During traditional clerkship, students move from rotation to rotation rapidly; hence, they typically encounter several preceptors, residents, and nurses on a daily basis. This may not create a conducive environment for a supportive and nurturing relationship due to its fast-paced and short-lived nature. Rather, we suggest that students are assigned a mentor at the beginning of clerkship so that they can connect with and obtain support and guidance from their mentors. This is typically done during the first two years of medical school with assigning pre-clerkship students a “wellness advisor”. However, this is less commonly done during clerkship. Once again, it should be noted that very little is known about the exact procedures and approaches at various schools across the country due to limited information published on this topic. The vast majority of information

included in the recommendations section of this paper is gathered through the knowledge acquired at various Canadian Physician Health Conferences and in discussion with several schools. Also, the Principal Investigator of the present study is a clinician at the University of Alberta Faculty of Medicine & Dentistry and has awareness of programs offered at the University of Alberta. It appears that knowledge dissemination on the topic of medical student wellness in Canada relies heavily on oral tradition primarily at national meetings. This highlights the absolute significance of more research and documentation in this area, and a national collaborative effort to appropriately map out the current practices so that empirically supported standards can be established.

- *Mistreatment*: The study by Fried et al. (2012) on efforts aimed at eradicating student mistreatment at the David Geffen School of Medicine at UCLA highlighted the complexity of the culture of medicine and its impact on student mistreatment. The study also demonstrated that even with a comprehensive multipronged set of prevention and interventions, the prevalence of mistreatment did not change significantly. Fried et al. (2012) recommended that in order to appropriately address mistreatment, zero-tolerance policies need to be well articulated and widely disseminated. They suggested that clear and safe mechanisms for reporting mistreatment as well as clear policies on investigation and mitigation of such reports are required. More specifically, Fried et al. explained that they will be adopting the inclusion of two questions as part of the

students' evaluation of staff and residents they worked with. These questions include how respected the students felt by their preceptor and how respectful they believed the preceptor to be towards others. They explained that they will use the answers to these questions in order to investigate the residents and staffs' disrespectful behavior and implement consequences when necessary. Additionally, they reported that they intend on using this information in promotion decisions as an incentive for staff and residents who score high on respectful behavior towards students and colleagues. We believe that clear policies and procedures with regards to student mistreatment as well as decreasing barriers to reporting incidents of mistreatment are important. We also would like to highlight the impact of peer group as part of interventions for mistreatment. The literature on anti-bullying interventions in schools discuss bullying in schools as a group process and emphasize the critical role of bystanders who either typically are silent witnesses or even at times, encourage the bullying while providing minimal support to the victim (Salmivalli, Kaukiainen, & Voeten, 2005). Salmivalli et al. (2005) discussed that interventions targeted towards the perpetrators rarely lead to long term changes in their behavior. Therefore, they suggested that more effective interventions include educating both the victims and bullies while also working on changing the bystanders' behavior. In their school anti-bullying intervention program, they emphasized importance of discussions of bullying with the entire class in order to raise awareness. Their program

included encouraging the class to self-reflect, understanding group processes and the roles a bystander can take, and finally commit to respectful and supportive behavior. Although there are clear distinctions and differences between anti-bullying interventions for schools and intervention programs for mistreatment in medical schools, we believe that addressing bystander behavior in medical school may play a critical role in amelioration of mistreatment occurrence. This is especially relevant since data gathered from the graduate questionnaires of 2013 and 2014 indicated that 25-27% of medical students reported having witnessed a peer be a target of mistreatment (AAMC, 2013-2014). Therefore, we recommend including explicit education and discussion of bystander behavior along with traditional approach of educating preceptors, residents, and students about professional and respectful behavior, relevant policies and procedures. Information about policies and procedures can be distributed widely during orientation, and easily accessible via each school's respective website. Discussions about mistreatment, the role of the bystander, and self-reflective exercises can be incorporated in small-group learning sessions. Although various schools may choose to incorporate these discussions and topics at different periods of their respective curriculum, we suggest including this topic when discussing professionalism issues during first and second year of medical school. This will likely help in conveying the importance of respectful and

professional behavior not only towards patients, but also towards colleagues and peers.

Overall, there is much work to be done in addressing medical student and physician wellness. In Canada, there have been significant efforts made to provide support services, resources, and offer policies and interventions that aim to provide physicians and trainees with the best chances of success and wellness. A large gap remains between initiatives and interventions, and research regarding and evaluation of these efforts. We believe that more research and evaluation initiatives are absolutely necessary in order to better understand the currently existing support structures, their efficacy, and best strategies to fine-tune them. A more in-depth understanding of Canadian programs will then help with identifying best practices and evidence-based interventions in order to build a healthier and stronger medical education and subsequently healthcare system!

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CONCLUSION

The goal of this research project was to introduce a new empirically supported model of psychological distress in medical students, test hypotheses arising from the model, and then use the results to offer evidence-based recommendations for prevention and intervention programs. This was done by dividing the project into three sections. The first paper focused on establishing a novel model of psychological distress based on already established empirically supported evolutionary models of psychopathology. The second paper served as a follow up investigation of the implications of the new model proposed in order to further establish its validity. The third paper then used the evidence offered by the second paper in order to provide prevention and intervention recommendations.

Paper One

Evolutionary models of psychopathology view mild to moderate depressive symptoms and anxiety as adaptive responses to ancestral environments (Allen & Badcock, 2006; Almeida, 2011; Bateson, Brilot, & Nettle, 2011). One of the most important aspects of evolutionary models is the premise that individuals do not function independently of their immediate environment (Caspi et al., 2003; Cosmides & Tooby, 1997). In other words, individuals adapt to their surrounding (Conti et al., 2012; Cosmides & Tooby, 1997; Ellis, Essex, & Boyce, 2005). In primates, a significant aspect of the individual's ecology is its social context (Suomi, 1997, 2011). This is particularly important since social relationships have significantly contributed to humans' inclusive fitness since eliciting support has been beneficial in obtaining resources for survival and reproduction (Bateson, Nettle, & Roberts, 2006; Buss, 2012). Evolutionary models of

depression and anxiety have gathered substantial scientific support, and have improved our understanding of causes of these disorders in the general population. These models established the theoretical underpinning of the new model of medical trainee distress proposed in this paper. The new model emphasized the role of both individual vulnerabilities in combination with the individual's environment. More specifically, the model asserts that medical students enter medical school with a number of risk factors for psychopathology. These risk factors could include personality characteristics such as competitiveness, perfectionism, type A personality, personal adverse events, and genetic predisposition to psychopathology (Dyrbye, Thomas, & Shanafelt, 2006; Krishnan & Nestler, 2008). Understanding and addressing these individual vulnerabilities alone however are not sufficient in appropriately responding to medical student psychopathology. The model highlights that environmental factors that signal threat of social loss or social resources are particularly significant in predicting depression and anxiety in this population. Overall, the model aims to use empirical evidence to offer a new and comprehensive perspective on understanding learners' distress with a special emphasis on the social milieu in medical culture and the training environment.

Paper Two

This study served as a follow up to investigate hypotheses implicated by the first paper. It used a sample of 219 students at a local Canadian medical school in order to examine whether both environmental factors and personal factors contributed to the prediction of depression and anxiety. The personal factors studied included perfectionism, social rank, and submissiveness. These variables were carefully selected based on previous studies that have identified them as predictors to depression and

anxiety using an evolutionary framework (Allan & Gilbert, 1997; Gilbert & Allan, 1994; Gilbert, Durrant, & McEwan, 2006). The environmental factors of interest included medical students' experiences of mistreatment as well as their perceived level of social safety and connectedness. These variables were selected in order to assess the degree of threat, hostility and social safety within the medical training environment.

Hierarchical multiple regression analyses were used to determine whether both environmental and personality factors contributed to prediction of depression and anxiety. The results provided support that mistreatment was a risk factor to depression while social safety acted as a protective factor. Both Environmental variables were significant predictors to depression even after personal variables of social rank, perfectionism, and submissiveness were accounted for. An interesting finding emerged when investigating the role of mistreatment as a moderator between submissiveness and depression. The results suggested that students who scored high on submissiveness were at higher risk of depression when they experienced mistreatment. This finding provided additional support for the hypothesis that depressed phenotypes can be manifested based on environmental feedback and context.

Surprisingly, the environmental factors did not significantly contribute to prediction of anxiety, and only personal factors of low social rank, high submissiveness, and high perfectionism were significant predictors of anxiety. The largest contributor to anxiety was social rank. One possible explanation for this is that anxious individuals tend to be more hypervigilant, and they are more likely to interpret unknown or ambiguous stimuli as threatening. As a result, they tend to avoid environments and social situations that they may perceive as risky or threatening. Therefore, it is possible that anxious

medical students (especially those who perceive themselves as inferior and of low rank) are more avoidant of risky social situations, and are less likely to be in environments where they could be mistreated. This is in line with evolutionary models of anxiety that view anxiety as an adaptive response to detecting and appropriately responding to threats (Bateson, Nettle, & Roberts, 2011; Nesse, 2006, 2011).

The results of the study provided evidence for the role of the medical training environment in predicting depression, but it did not offer support for this hypothesis in predicting anxiety. Overall, although causal conclusions cannot be made, the results offer promising support for the proposed model of medical student distress and the role of the environment in manifestation of psychopathology at least with respect to depression. This study implies that environmental input especially the social context of medical students need to be considered in designing and implementing prevention and intervention policies and programs in order to effectively address medical student distress.

Paper Three

In this paper, a number of practical applications of the new proposed model of psychopathology in medical students were discussed and reviewed. A comprehensive literature review was provided in order to discuss the Canadian medical education system, barriers to seeking support, factors contributing to medical student resilience, as well as an overview of current wellness initiatives and support services offered. We then built on the existing literature and wellness programs to offer recommendations for prevention policies and intervention programs. These recommendations were broadly categorized to address ‘personal factors’ and ‘medical culture’. Personal factors referred to a number of risk factors to depression and anxiety identified in the literature such as

high perfectionism, low perceived social rank and high submissiveness (Gilbert et al., 2010; McEwan, Gilbert, & Duarte, 2012; Wyatt, & Gilbert, 1998). These recommendations emphasized the importance of implementing a wellness curriculum that increased the individual medical student's resilience as well as offering a variety of support services while minimizing the barriers to accessing these supports.

Medical culture recommendations referred to recommendations that aimed to address the social and environmental context of medicine. These recommendations primarily focused on reducing prevalence of mistreatment by implementing clear policies, reporting procedures, and training the staff, and students. This paper highlighted the importance of strengthening the relationships in medicine including the peer relationships, relationships with residents, staff, and preceptors in order to create a safe and nurturing environment where students can thrive both professionally and psychologically.

The paper concluded by raising the issue of lack of sufficient research on physicians' mental health in Canada. The vast majority of research on this topic has been done in the United States. In Canada, there has been a great deal of effort made in implementing resources and support services, prevention programs and policies, specific mistreatment strategies, and interventions to address mental illness. However, very little is written about these efforts, and evaluation of these initiatives are scarce. Therefore, providing an overview of the present support structures in order to use it as a foundation for further research, program development, and evaluation was quite challenging. The Canadian bodies interested in physician mental health appear to rely heavily on oral traditions as a primary tool to pass on information and knowledge about programs offered

at various institutions across the country. Limited efforts have been made to develop and nurture national collaborative research initiatives that provide a map of existing support structures and programs as well as their efficacy. It is imperative for the Canadian medical community to not only be a leader in providing support services to physicians and trainees, but to also become a leader in research and evaluation efforts aimed at improving physician mental health. Focusing and improving knowledge synthesis, translation, and dissemination should be a key directive in advancing Canadian physician mental health.

Overall, the research project took a scientific approach to medical student mental health. We began by proposing an overall hypothesis (the model), tested the implications of the hypothesis, and used the results to provide practical suggestions on how the model could be applied to the Canadian medical education system. The vast expansion of various support programs offered to Canadian physicians and trainees as well as developments in the medical education wellness and resilience curriculum have been very encouraging. National organizations such as the Association of Faculties of Medicine of Canada (AFMC), the Canadian Physician Health Institute (CPHI), and the Canadian Medical Association (CMA) are well-positioned to further advance research and innovation in this area, so that Canada can become an international leader in physician wellness!

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Appendix A: Information Letter and Consent Form

Study Title: Impact of relationships and the social environment on medical student wellbeing

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Background

Medical student wellness has a significant impact on the student's experience of medical education. The level of a student's wellbeing will contribute to their sense of professionalism and may affect patient care and safety during later stages of training. Most research has focused on individual factors contributing to medical student wellness, while impact of relationships and the culture of medicine has been understudied. The results of this study could help us better understand the effect of the social context in medicine on student wellbeing and stress.

This study is a part of my doctoral degree (PhD) in Counselling Psychology in the Educational Psychology department at the University of Alberta. Your participation in the study implies that you are providing consent to take part in the study.

Purpose

- Purpose of research is to better understand the impact of relationships and the social aspect of the medical culture on medical student wellbeing.

Study Procedures

- If you choose to volunteer, you will be asked to complete an online survey. The survey will take approximately 25 minutes to complete.

Benefits

- We hope that your participation in the study may help us better understand the social factors contributing to wellness and distress of medical students. We hope to use this understanding to provide recommendations for wellness programs to be implemented in the medical education curriculum.

Risk

- This study involves completing questionnaires while sitting at your computer so risks are very minimal. Some questions may be of a sensitive nature and elicit mild negative emotions.

Voluntary Participation

- Participation in this study is voluntary. You may decline to answer any questions that you do not wish to answer and you can withdraw your participation at any time by not submitting your responses.

Confidentiality & Anonymity

This is an ANONYMOUS survey. The data, with no personal identifiers, collected from this study will be maintained on a highly secure server. All information collected will be confidential. All of the data will be summarized and no individual could be identified from these summarized results. Furthermore, the web site is programmed to collect responses alone and will not collect any information that could potentially identify you (For example, IP addresses will not be collected or identified).

Further Information

- If you have any further questions regarding this study, please do not hesitate to contact Jaleh Shahin at jaleh@ualberta.ca

- The plan for this study has been reviewed for its adherence to ethical guidelines by a Research Ethics Board at the University of Alberta. For questions regarding participant rights and ethical conduct of research, contact the Research Ethics Office at (780) 492-2615.

Appendix B: Post-study Information Letter

"Since this is an anonymous survey, we will not be able to follow up with you after this study. If you feel upset after completing the study, or find that some questions or aspects of the study triggered distress, talking with a qualified clinician may help. If you feel you would like assistance please contact one of the following resources:

The Physician and Family Support Program (PFSP)
Available 24 hours/day, 7 days per week
1.877.SOS.4MDS (637)
https://www.albertadoctors.org/services/physicians/pfsp

The Crisis Support Centre
24-Hour Distress Line
780-482-HELP (4357)
http://www.crisissupportcentre.com/

In the case of an emergency please call 911."

Appendix C: Demographics Form

1. Age:

2. Gender:

Male
Female
Transgender

3. What is your ethnic/cultural background?

Aboriginal
White (European descent)
Black (African descent)
Filipino
Latin American
Arab
Chinese
Japanese
Korean
South Asian (e.g., East Indian, Pakistani, Sri Lankan, etc.)
Southeast Asian (e.g., Cambodian, Indonesian, Laotian, Vietnamese, etc.)
West Asian (e.g., Afghan, Iranian, etc.)
Other

4. What language can you speak well enough to conduct a conversation?

English Only
French Only Both
Other

5. Type of degree program from which you are graduating?

M.D.
Joint Bachelor's/M.D.
Joint M.D./Master's
Joint M.D./Ph.D.
Other

6. what year in the program are you?

7. Have you taken time off or taken a leave of absence? If yes, please identify the reason?

8. What is your current relationship status?

Single
Common-law
Married
divorced
In a relationship

9. Do you have children? How many?

10. Finances?

Source if income?

Student loans?

Debt load?

11. Previous education?

Master's?

phD?

What type of undergraduate degree?

12. Have you ever seriously considered leaving medical school?

Yes No

13. If yes, did you feel that:

You could leave the program if you decided you would like to. OR

You felt trapped and stuck in the program**.**

14. what contributed to your decision not to leave the program? Check ALL that apply.

I've already invested too much, and couldn't leave.

Worried about not being able to pay off my student loans.

Worried about how others might view or think of me (for example, parent's reaction, friend or partner's reaction, etc.)

Worried about not being able to find work after.

Other. Please specify.

Appendix D: Measurement Tools Sample

DASS21

Name: *Date:*

Please read each statement and circle a number 0, 1, 2 or 3 which indicates how much the statement applied to you *over the past week*. There are no right or wrong answers. Do not spend too much time on any statement.

The rating scale is as follows:

0 Did not apply to me at all
1 Applied to me to some degree, or some of the time
2 Applied to me to a considerable degree, or a good part of time
3 Applied to me very much, or most of the time

1	I found it hard to wind down	0	1	2	3
2	I was aware of dryness of my mouth	0	1	2	3
5	I found it difficult to work up the initiative to do things	0	1	2	3
7	I experienced trembling (eg, in the hands)	0	1	2	3
8	I felt that I was using a lot of nervous energy	0	1	2	3
9	I was worried about situations in which I might panic and make a fool of myself	0	1	2	3
10	I felt that I had nothing to look forward to	0	1	2	3
11	I found myself getting agitated	0	1	2	3
14	I was intolerant of anything that kept me from getting on with what I was doing	0	1	2	3
15	I felt I was close to panic	0	1	2	3
16	I was unable to become enthusiastic about anything	0	1	2	3
17	I felt I wasn't worth much as a person	0	1	2	3
20	I felt scared without any good reason	0	1	2	3
21	I felt that life was meaningless	0	1	2	3

SOCIAL SAFENESS AND PLEASURE SCALE

We are interested in how people experience pleasure, positive feelings and emotions in social situations. Below are a series of statements about how you may feel in various situations including your school and training environment. Please read each statement carefully and circle the number that best describes how you feel.

Almost never 1 2 3 4 5 Almost all the time

1.	I feel content within my relationships	1	2	3	4	5
2.	I feel easily soothed by those around me	1	2	3	4	5
3.	I feel understood by people	1	2	3	4	5
4.	I feel a sense of warmth in my relationships with people	1	2	3	4	5
5.	I find it easy to feel calmed by people close to me.	1	2	3	4	5

SOCIAL COMPARISON SCALE

Please circle a number at a point which best describes the way in which you see yourself in **comparison to others**.

For example:

Short	1	2	3	4	5	6	7	8	9	10	Tall

If you put a mark at 3 this means you see yourself as shorter than others; if you put a mark at 5 (middle) about average; and a mark at 7 somewhat taller.

If you understand the above instructions please proceed. Circle one number on each line according to how you see yourself in relationship to others.

In relationship to others I feel:

Inferior	1	2	3	4	5	6	7	8	9	10	Superior
Left out	1	2	3	4	5	6	7	8	9	10	Accepted
Different	1	2	3	4	5	6	7	8	9	10	Same
Unconfident	1	2	3	4	5	6	7	8	9	10	More confident
Unattractive	1	2	3	4	5	6	7	8	9	10	More attractive
An outsider	1	2	3	4	5	6	7	8	9	10	An insider

THE SUBMISSIVE BEHAVIOR SCALE

Below are a series of statements which describe how people act and feel about social situations. Circle the number to the right of the statements which best describes the degree to which a statement is **true** for you.

Please use the following scale:

0 = NEVER 1 = RARELY 2 = SOMETIMES 3 = MOSTLY 4 = ALWAYS

1.	I would walk out of a shop without questioning, knowing that I had been short changed	0	1	2	3	4
2.	I let others criticise me or put me down without defending myself	0	1	2	3	4
3.	I do what is expected of me even when I don't want to	0	1	2	3	4
4.	I listen quietly if people in authority say unpleasant things about me	0	1	2	3	4
5.	I am not able to tell my friends when I am angry with them	0	1	2	3	4
6.	At meetings and gatherings, I let others monopolise the conversation	0	1	2	3	4
7.	I don't like people to look straight at me when they are talking	0	1	2	3	4
8.	I say 'thank you' enthusiastically and repeatedly when someone does a small favour for me	0	1	2	3	4
9.	I avoid direct eye contact	0	1	2	3	4
10.	I avoid starting conversations at social gatherings	0	1	2	3	4
11.	I pretend I am ill when declining an invitation	0	1	2	3	4

Competitiveness and Caring Scale

Please circle a number at a point which best describes the way in which you see yourself in **comparison to others**.

For example:

Short	1	2	3	4	5	6	7	8	9	10	Tall

If you put a mark at 3 this means you see yourself as shorter than others; if you put a mark at 5 (middle) about average; and a mark at 7 somewhat taller.

If you understand the above instructions please proceed. Circle one number on each line according to how you see yourself in relationship to others.

In relationship to others I feel:

Unaccomplished	1	2	3	4	5	6	7	8	9	10	Accomplished
Unapproachable	1	2	3	4	5	6	7	8	9	10	Approachable
Unassertive	1	2	3	4	5	6	7	8	9	10	Assertive
Uncompassionate	1	2	3	4	5	6	7	8	9	10	Compassionate
Unconfident	1	2	3	4	5	6	7	8	9	10	Confident
Undetermined	1	2	3	4	5	6	7	8	9	10	Determined
Passive	1	2	3	4	5	6	7	8	9	10	Dynamic
Unforgiving	1	2	3	4	5	6	7	8	9	10	Forgiving
Unsuccessful	1	2	3	4	5	6	7	8	9	10	Successful
Detached	1	2	3	4	5	6	7	8	9	10	Warm

Frost's Multidimensional Perfectionism Scale (FMPS)

Please select the best option that reflects your opinion, using the rating system below:

"1" if you **Strongly Disagree**
"2" if you **Disagree**
"3" if you **Neither Disagree or Agree**
"4" if you **Agree**
"5" if you **Strongly Agree**

1. Organization is very important to me
2. As a child, I was punished for doing things less than perfectly
3. If I do not set the highest standards for myself, I am likely to end up a second-rate person
4. If I fail at work/school, I am a failure as a person
5. I should be upset if I make a mistake
6. My parents wanted me to be the best at everything
7. I set higher goals for myself than most people
8. I have extremely high goals
9. Neatness is very important to me
10. I expect higher performance in my daily tasks than most people
11. I am an organized person
12. I tend to get behind in my work because I repeat things over and over
13. It takes me a long time to do something 'right'
14. The fewer mistakes I make, the more people will like me
15. I never felt like I could meet my parents' standards

Mistreatment of Students

1. Are you are aware that your school has policies regarding the mistreatment of medical students?
    a. Yes
    b. No

2. Do you know the procedures at your school for reporting the mistreatment of medical students?
    a. Yes
    b. No

3. During medical school, did you witness mistreatment of another learner, patient or other health care professional?
    a. Yes
    b. No

4. Please indicate below which person(s) engaged in the behavior that was directed at you. Check all that apply.

    a. Pre-clerkship faculty
    b. Clerkship faculty (in classroom)
    c. Clerkship Faculty (in clinical settings)
    d. Residents
    e. Nurses
    f. Administrators (hospital)
    g. Administrators (Faculty/Staff)
    h. Students
    i. Patients or Patient's Family

5. Have you personally been mistreated during medical school?
    a. Yes
    b. No

For each of the following behaviors, please indicate the frequency you personally experienced the behavior during medical school. Include in your response any behaviors performed by faculty, nurses, resident/interns, other institution employees or staff, and other students. Please do not include behaviors performed by patients or their families.

	Never	**Once**	**Occasionally**	**Frequently**
Publicly humiliated				
Threatened with physical harm				
Physcially harmed (e.g. hit, slapped, kicked)				
Required to perform personal services (e.g. shopping, babysitting)				
Subjected to offensive sexist remarks				
Asked to exchange sexual favors for grades or other rewards				
Denied opportunities for training or rewards based solely on race or ethnicity				
Subjected to racially or ethnically offensive remarks				
Received lower evaluations or grades solely because of race or ethnicity				
Denied opportunities for training or rewards based solely o sexual orientation				