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Testing the Social Risk Hypothesis Model of Depression

by

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Abstract

The main purpose of this research project was to test the *social risk hypothesis* of depression proposed by Allen and Badcock (2003). The *social risk hypothesis* suggests that mild to moderate depression has evolved to promote belonging in small communities by making members sensitive to signs of rejection and motivated to restore their social value. Using self-report data from 397 working adult participants, structural equation modeling (SEM) was used to examine the relationships between secure attachment, social comparison, defeat, self-esteem, depression, submissive behaviours, social risk taking, and interpersonal sensitivity. Two further studies were also performed. The first tested whether the *social risk hypothesis* could explain anxiety as well as depression. The second tested gender invariance within the models of depression and anxiety. The dissertation is organized into three papers, preceded by a general introduction and followed by a general conclusion. The first paper is focused on the general test of the *social risk hypothesis*, the second on the comparison test of anxiety, and the third on the role of gender in the models generated. In the first paper, the SEM analysis indicated a good fit between the data and Allen and Badcock's (2003) algorithmic model, providing empirical support for an evolved adaptive mechanism functioning in mild to moderate depression. Paper 2 reports a test of Allen and Badcock's (2003) claim that the *social risk hypothesis* is exclusive to depression. In general, the anxiety model provided a fairly good fit to the *social risk hypothesis*; however, anxiety did not mediate the relationship between secure attachment and the two outcome variables (i.e., interpersonal sensitivity and submissive behaviours) suggesting that depression and anxiety have not evolved to function in exactly the same way. The goal of Paper 3 was to examine how the variables within the *social risk hypothesis* might operate differently for men and

women given that past research strongly indicates that gender may have differential effects on the depressive (or anxious) mechanism. Two differences were found in the gender invariance analysis: i) the relationship between secure attachment and depression was much stronger for men; ii) men and women differed on the relationship between social comparison and anxiety. The papers discuss the findings from the perspective of evolutionary theory.

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CHAPTER 1

INTRODUCTION

Major Depressive Disorder

The effects of depressed mood on people have been a cause for concern for thousands of years (Jackson, 1986). Recent estimates of depression indicate that 9%-10% of North Americans will be diagnosed with Major Depressive Disorder per year (Kessler, McGonagle, Swartz, Blazer, & Nelson, 1993; NIMH, 2001). Lifetime estimates exceed 17% on average in adulthood (Kessler et al., 1993), and many more will demonstrate undiagnosed depressive symptoms (Horwath, Johnson, Klerman, & Weissman, 1992; Judd, Akiskal, & Paulus, 1997). Thus, it is recognized that many people with depressed mood may not reach the intensity or duration required for a *formal* diagnosis in spite of the experienced social, biological, and psychological symptoms. Furthermore, many people do not seek professional help (e.g., Marcus, Flynn, Blow, & Barry, 2003; Wang, 2004) or they self-medicate (e.g., Breslau, Peterson, Schultz, Chilcoat, & Andreski, 1998; Miller, 1994). These individuals may not be included in standard estimates of the prevalence of this disorder. Although there is no universal agreement about the definition of depression (Kendler, Neale, Kessler, Heath, & Eaves, 1992), the basic factors underlying this disorder tend to be a sustained dysphoric mood, an inability to experience pleasure, lethargy, and a sense of worthlessness.

Recent studies indicate that the impact of depression in society is very pronounced across several important social and economic domains including the financial costs of treatment, mortality costs arising from depression-related suicides, and the costs associated with depression in the workplace (Greenberg et al., 2003; Wang, Simon, Kessler, 2003). Furthermore, depression has been shown to be the leading cause of disability and has accounted for substantial losses in

productivity throughout North America (Murray & Lopez, 1996; NIMH, 2001). On a personal level, depression has consistently been linked with diminished functioning and quality of life (Jacob, Frank, Kupfer, Carpenter, 1987; Klerman & Weissman, 1992).

Theories of Depression

Depression has received an immense amount of attention from clinicians and researchers in all areas of mental health. From these investigations three major models have emerged in mainstream psychology to explain the etiology and maintenance of this mood disorder. The *biological* models have focused on genetic and neurobiological factors in the genesis of depression. The *social and interpersonal* models have explored how the overt behaviours (e.g., excessive reassurance seeking) of an individual and the rejection by significant others can prime a person to experience a bout of depression. The *cognitive* models have been concerned with the negative schemas created in early years that can distort a depressed person's perspective on themselves and on life. A large volume of research has supported these models in specific contexts such as neurotransmitter dysregulation (Baldwin et al., 2005; Gilliam, Kanner, & Sheline, 2006; Shaffery, Hoffman, & Armitage, 2003), marriage and relational disruptions (Coyne, 1999; Johnson & Jacob, 2000; Joiner, 1997), and distortions in thought and poor coping (Beck, 1974; 1976; Beck, Rush, Shaw, & Emery, 1979; Dobson & Shaw, 1981; Warren, Stake, & McKee, 1982). However, one major criticism of each of these conceptualizations of depression is that they stress or explain some aspects of depression but lack universal findings.

Most studies in the social sciences that target depression focus on *proximate causation* (or the current precipitating factors) without considering how *ultimate causation* over the course of human history has evolved to sustain this disorder. Tinbergen (1996) declared that four components are needed in order to completely understand a biological phenomenon: 1)

mechanism, 2) development, 3) function, and 4) phylogeny. Proximate explanations focus on the mechanism and development, but fall short in explaining the function of a mechanism and why it has survived over the course of human evolution. In other words, these theories of depression do not provide an overarching explanatory framework which can account for the frequency and universality of depressed mood as a functional or adaptive state.

Evolutionary Psychology

A branch of psychology has recently emerged which seeks to provide a foundational model of human nature, highlighting those universal characteristics that have allowed our species to adapt in the face of problems and challenges posed throughout human evolutionary history. This new field of study is often called *evolutionary psychology*. From an evolutionary perspective, psychological disorders originated and survived because mild versions of these disorders had adaptive value in the human struggle to flourish and procreate (Nesse, 2005). Many evolutionary models have tried to explain how mild to moderate levels of depression have served to promote human survival; however, not all of these explanations allow for empirical validation and testing. One exception is a clearly outlined and theoretically plausible model of depression called the *social risk hypothesis* (Allen & Badcock, 2003).

Social Risk Hypothesis

The *social risk hypothesis* contends that humans are exceptionally sensitive to the social position they hold within a group and the strength of the bonds they have with family and close relations. Strong social connections and the availability of social support were required for successful living in our evolutionary past. Thus, when a person's social value (gauged by social rank and attachment to important others) is compromised they develop a depressed mood, and this depression provides them with a period of time where additional care and attention is

available from significant others while they recuperate. Allen and Badcock (2003) suggest that our species has evolved a mechanism to gauge an individual's worth or status in social groupings, a mechanism referred to as *social investment potential* (i.e., the ratio of one's social value versus social burden in the group). When this ratio reaches a point where one's social value and social burden are nearing equivalence, the individual is in danger of exclusion from social contexts that have been critical to fitness over the course of human evolution (Allen & Badcock, 2003; Buss, 2008). Therefore, critically low *social investment potential* prompts depressed mood which inhibits those socially risky behaviours that are dangerous when one's value and worth in the group have come into question. The major premise behind this hypothesis is that a depressed person is depressed in large part because they are not highly valued in their social group (something that is necessary for survival and reproduction), and therefore it is essential that they only take minimal social risks in order to slowly bolster their position (i.e., social rank) and closeness (i.e., attachment) to the group. Consequently, the *social risk hypothesis* views mild to moderate depression to be adaptive in light of the evolutionary challenges that required successful group living and cooperation. The depression mechanism minimized the likelihood of exclusion by inducing: (i) cognitive hypersensitivity to indicators of social risk/threat; (ii) signaling behaviours that reduce social threat and elicit social support; and (iii) a generalized reduction in an individual's propensity to engage in socially risky, appetitive behaviours.

Rationale for this research

The *social risk hypothesis* of depression has received some empirical support; however only portions of this model have been tested. For instance, Badcock and Allen (2003) provided support for the prediction that depressed states would activate psychological mechanisms for the

detection of social threat. In that study, participants in an induced depressed mood showed a greater tendency to reason appropriately about risks related to social competition compared to those in a neutral mood. These findings are consistent with a long line of research that has found individuals with mild to moderate depression are more sensitive (i.e., attentional bias) to social information, especially indicators of social threat (e.g., Allen et al., 2001; Edwards & Weary, 1993; Flett, Blankstein, Occhiuto, & Koledin, 1994; Mathews, Rideway, & Williamson, 1996). Also, in three separate studies Allen and Badcock (2006) examined segments of the *social risk hypothesis*. In Study 1 they failed to find support for the prediction that clinically depressed and clinically anxious participants would differ in their selection of risk-averse options on indicators of attachment and social competition. However, the depressed participants did differ significantly on risk-aversion when compared to the control group thereby providing partial support for the hypothesis. In Study 2 they found supporting evidence to suggest that an individual's *social investment potential* (measured by self-esteem) moderates the relationship between depressed mood (measured by low positive affect) and social risk taking. Lastly, in Study 3 Allen and Badcock (2006) induced depressed mood using music and compared social risk taking propensity with participants in a neutral mood, but no differences arose and the authors concluded that experimental manipulations of depression were not appropriate to test their model. Thus, these individual studies provide some corroborating evidence for parts of the *social risk hypothesis*, but none of these research projects were attempted in order to comprehensively test all the major components in this model. Instead, these studies only demonstrate support for small portions of a very large and complex model.

The *social risk hypothesis* is a sophisticated algorithmic model of depression where risk taking represents only one portion of the evolutionary explanation. According to Allen and

Badcock's (2003) formulation, the depressive mechanism is triggered when certain evolutionarily relevant social aspects are present. In particular, a depressed person is hypothesized to experience elevated defeat coupled with low social comparison/rank (e.g., Allan & Gilbert, 1995; Gilbert & Allan, 1998; Gilbert, Price, & Allan 1995). As well, damaged social relations (low secure attachment) contribute to the development of depression (Bowlby, 1980). These three preconditions are integral to this evolutionary explanation of depression, and yet no study has sought to encompass all of these components in a single research endeavour. A full test of the *social risk hypothesis* would also indicate that depression leads not only to reduced social risk taking, but also a hypersensitivity to indicators of social threat (high interpersonal sensitivity) and signals of withdrawal or submission in competitive encounters (Allen & Badcock, 2003). Once again, such links have yet to be united in a single research design. Thus, a full and comprehensive test of the *social risk hypothesis* requires more than just assessing individual links between variables of interest (e.g., Allen & Badcock, 2006; Badcock & Allen, 2003); instead it will be necessary to simultaneously measure and analyze all of the pathways in this complex model within one heterogeneous sample to determine if this proposed depression mechanism *actually* functions in modern day humans. As such, it will be necessary to employ a type of analysis specifically designed for the measurement of causal models in order to effectively test the various relationships in the *social risk hypothesis* concurrently. A thorough examination of this evolutionary model could very well provide support for a shift in the way depression is understood, a move away from the predominant pathology conceptualization fostered by the medical community.

Format of the Dissertation

This dissertation is written in a paper format consisting of five chapters. Chapter 1 consists of a general introduction to the dissertation. A brief literature review of the theories of depression, essential features of the disorder, and the applicability of an evolutionary explanation of depression (i.e., the *social risk hypothesis*) are presented as well as the purpose and goals of the dissertation. It is followed by three chapters outlining in each an empirical investigation undertaken to test the *social risk hypothesis* as an explanation for depression (Chapter 2) and anxiety (Chapter 3). Additionally, gender differences stemming from the depression and anxiety models are explored in Chapter 4. The format for the individual papers consists of a Literature Review, Methods, Results, and Discussion sections. Since each paper represents a single investigation, the Discussion section provides a subsection for the Conclusions and Limitations that are specific to each study.

The algorithmic model of depression proposed by Allen and Badcock (2003) consists of numerous linear (or causal) relationships that are thought to occur over the course of some unspecified timeframe. For example, the experience of defeat leads to the development of depression which would cause a person to become more submissive; however, this progression does not occur simultaneously and is therefore extremely difficult to empirically assess in a single individual. Therefore it is more realistic to examine many individuals at various stages in this progression through statistical analyses. Structural equation modeling (SEM) represents a sophisticated mode of analysis that can examine correlational data in an implied causal model (Hayduk, 1987) much like the algorithmic design forwarded in the *social risk hypothesis*. As such, SEM was used to analyze the data in all three studies as well a series of hierarchical regression analyses performed to determine whether self-esteem (i.e., *social investment potential*) served as a moderator between the three latent variables (i.e., defeat, social

comparison, and secure attachment) and depression as suggested by Allen and Badcock (2003). The sample for this research endeavour consisted of full-time working adults selected from a variety of vocational fields in the city of Edmonton, Alberta and surrounding areas. Working adults from a range of different professions (e.g., welding, janitorial, medicine, education) were used in this study as opposed to the usual college/university student samples in order to avoid making conclusions about a very limited subsection of the adult population (Sears, 1986). The overuse of college students has been noted as a particular problem in depression research (Coyne & Gotlib, 1983; Gotlib, 1984). Therefore, extending depression research to participants in the workforce with varying degrees of education, various ages, and potentially more diverse social environments provides the opportunity for greater generalizability of these findings (cf. Tennen, Hall, & Affleck, 1995).This dissertation attempted to address aspects of the *social risk hypothesis* and evolutionary psychology in the genesis and treatment of depression in three separate studies. As well, the viability of anxiety within the *social risk hypothesis* model was examined in Studies 2 and 3. The data for all three studies was generated from a single data collection.

The first study, in Chapter 2, was conducted to assess all of the major psychosocial components of the *social risk hypothesis* in a single study, rather than emulating previous research that has explored only specific elements of this evolutionary model of depression (e.g., Allen & Badcock, 2006; Badcock & Allen, 2003). It was essential to investigate the *social risk hypothesis* as a fully operational model thereby enabling researchers and clinicians to better understand if depressed mood can be plausibly explained as an evolutionarily adaptive mechanism that promoted our survival as a species.

One of the major tenets in the *social risk hypothesis* claims that fluctuations in social risk taking behaviours (i.e., submission, interpersonal sensitivity, and risk taking) are exclusive to depressed mood, rather than other evolutionarily adaptive disorders. To explore this claim, the second study (Chapter 3) measured how well anxiety fits into the model compared to depression. Anxiety symptoms have long been viewed as a by-product of adaptation (Nesse, 2005) and often co-occur with depression (Kessler et al., 1996). Furthermore, many evolutionary views of depression are thought to apply equally well to anxiety (e.g., Price, Gardner, Jr., & Erickson, 2004; Sloman, 2008; Sloman, Farvolden, Gilbert, & Price, 2006). Therefore, the results of this study will shed some light on the exclusivity of the *social risk hypothesis* to depression.

And, in Chapter 4, Study 3 examined the influence of gender in both the depression and anxiety models of the *social risk hypothesis* theory. Although Allen and Badcock (2003) have acknowledged that depression afflicts women at higher rates than men (American Psychiatric Association, 2000), they have not specified how these differences will influence their model. Therefore, it will be important to explore the potential effect that gender may play in the *social risk hypothesis*. Examining the moderating effect of gender on the link between both depression and anxiety within the context of this evolutionary model may provide a clearer picture of the observed differences in the prevalence of both depression and anxiety for men and women.

Lastly, in Chapter 5, a summary of the findings from the previous chapters are complied together. In particular, the results from all three studies are compared to Allen and Badcock's (2003) original conceptualization. As well, the implications of the findings are discussed within the context of treatment interventions.

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CHAPTER 2

THE SOCIAL RISK HYPOTHESIS OF DEPRESSION: A STRUCTURAL EQUATION MODELING ANALYSIS

Introduction

Depression is one of the most pervasive and destructive psychological disorders (Fava & Kendler, 2000). This mood disorder can affect people in all walks of life irrespective of culture, gender, age, or one's social and economic status; worse yet, global tracking has demonstrated an increase in depression over recent generations (Cross-National Collaborative Group, 1992; Klerman & Weissman, 1989; Ustun et al., 2004). As a result, depression has received an immense amount of attention in all areas of mental health. The traditional biological, cognitive, and social/interpersonal explanations of depression have spurred vast quantities of research on the topic of depression and its origins (e.g., Blazer, 2005; Flett, Besser, Davis, & Hewitt, 2003; Krishnan, 2002; Kupfer & Ellen, 1997). The bulk of this research argues for a cause emanating from several factors such as neurobiological deficits, uncontrollable/negative events, poor social support, and cognitive distortions occurring at different levels. It is not surprising then that depression is pervasive in both men and women, in developing and developed nations, and in all age ranges (Murray & Lopez, 1996). The ubiquitous nature of depression indicates that this mood state has developed and survived throughout human history and pre-history, perhaps extending back to the Pleistocene period (or earlier) of human development (Gilbert, 1992). This view is consistent with the emergence of a new field of study called *evolutionary psychology* (EP) which seeks to provide a universal model of human nature, highlighting those characteristics that have allowed our species to adapt in the face of problems and challenges posed throughout human evolutionary history. From an evolutionary perspective, psychological

disorders originated (and survived) because mild versions of them had adaptive value in the struggle of individuals to flourish and procreate (Nesse, 2005).

Review of the Literature

The view that psychopathology may have adaptive features at lower levels of intensity has been espoused through the merging of two proliferating conceptualizations of psychological health: biopsychosocial approaches and evolutionary theory (e.g., Cacioppo, 2002; Cacioppo, Berston, Sheridan, & McClintock, 2000; Gilbert, 1995; 2002a; 2002b; Henriques, 2004). Paul Gilbert and his colleagues are among the forerunners of this movement in depression research and treatment. They have argued that a fuller understanding of depression can be attained by appreciating the biological, psychological, and social significance of these explanations of depression through an evolutionary lens (Allen, Gilbert, & Semedar, 2004; Gilbert, 1992, 1995, 2001, 2004, 2006a). Paramount in this conceptualization of depression is the functional/adaptive role that depression provided to humans in our evolutionary past that may have influenced our phenotypic (the interaction between genes and the environment) variations (Gilbert, 2004, 2006a). Although many of the depressive challenges facing modern humans have changed, our genes are still being altered in reaction to current and early stressful environments (Caspi et al., 2003). Hence our genes continue to be altered and/or passed on to suit the particular social climate (nurturing and caring *versus* neglectful or abusive) and physical ecologies (e.g., food availability, threat from predators) that ensure our survival rather than good mental health (Allan & Badcock, 2003; Gilbert, 2001; 2004; 2006a; Nesse, 2000, 2005). It has even been postulated that individual depressive symptoms have developed to address specific social situations in the course of human evolution (Keller & Nesse, 2006). Thus, the importance of both proximal mechanisms (i.e., reactions to current environmental, biological, and social challenges) and distal

goals (i.e., survival and reproduction) in the development of depression are pivotal to our understanding of this universal mood disorder.

Important questions are still left largely unanswered by psychology's mainstream models of depression. For example, if natural selection *selects* for the most propitious genetic features, then why has a painful and distressing state like depression survived through human ancestral history? Does depressed mood provide some kind of adaptive information to humans in the same way that physical pain has been acknowledged as an appropriate means of avoiding tissue damage? These gaps have opened the door to new and innovative theories of depression and its etiology from the field of evolutionary psychology. To date, evolutionary theorists and researchers have embarked on a full range of investigations in areas of cognition, biology, and human behaviour. These areas include the examination of how elevations in stress hormones and other physiological changes, social interactions, and the value of negative cognitive distortions can operate as mechanisms that maintained depression for purposes of survival in our evolutionary past *and* future (e.g., Allen & Badcock, 2003; Gilbert, 1992; 2001; 2004; Irons & Gilbert, 2005; Keller & Nesse, 2005; Martin, 2002; Nesse, 1999, 2000; Nettle, 2004; Price, Sloman, Gardner, Gilbert, & Rohde, 1994; Sloman, 2008; Watson & Andrews, 2002; Welling, 2003).

Adaptation and mal-adaptation

Human beings are among the most social of animals. Many of our selective pressures relate to adaptations that have evolved to promote social relations, and of course ultimately solve problems of survival and reproduction (Buss, 1990, 2001). Group membership has always been a necessary component in the survival and flourishing of the human race, and can thus be viewed as a motivating force (Gilbert & Trower, 1990). The importance of social relationships has implications for virtually all human activity. Among these are protection from predators, food

distribution, incest avoidance, favouritism toward kin members over non-kin members, sanctions for crimes against the collectivity, reciprocity in relationships, sexual jealousy, the emotion of love, and the list goes on (Brown, 1991; Pinker, 1997). The necessary interplay between people, has in effect *adapted* us to a hypersensitivity to many social indicators such as social rank/status (Gilbert, 1992; Price et al., 1994), dominance/submission, (Allan & Gilbert, 1997; Gilbert, 2000), attachment (Bowlby, 1988), and numerous other relational cues. These socially adaptive cues will be discussed more fully later in this review; for now we will return to the mechanisms of adaptation.

Although adaptations are meant to help "solve problems of survival and reproduction better than alternative designs in the population" (Buss, 2008, p. 39), this does not answer the question: Why do humans incur so many deleterious physical and mental vulnerabilities? To address this question, Nesse (2005) has postulated six explanations for the seemingly poor fit between the body and mind that he based on prior research and theory. First, there may be a *mismatch* between our physiology and the environment that we live in. For example, our prehistoric brain has primed humans to crave fatty foods; however in modern society this adaptation has led to increased heart failure and obesity. The second explanation involves *infection and coevolution*. Infections have been problematic in our evolutionary advances because pathogens like bacteria and viruses often evolve faster than we can adapt to them. Coevolution, stemming from competition amongst humans, can favour increasingly more extreme traits such as status-striving that can give rise to psychological suffering for the losers of these events (Gilbert, Price, & Allan, 1995). Third, as evolving organisms, we must concede to *trade-offs* between characteristics or traits because the environment demands such changes. For instance, humans could have less fear of heights, but more people would then fall from cliffs or tall buildings. The

fourth explanation involves *constraints* within our biological design such as our need to sleep and the associated lost productivity for this lengthy period of time. The fifth explanation is an important one that is often overlooked and it is the idea that *selection is for reproductive success, not health*. Nesse (2005) points out that a gene may decrease one's health, longevity, or even cooperativeness, but it will proliferate if it increases reproductive success. It is quite possible that many of our socially less desirable traits such as aggression, envy, jealousy, and an insatiable sexual appetite may have been passed on for this very reason (Buss, 2000). The sixth and last explanation for the troublesome adaptations outlined by Nesse (2005) relates to our many built-in *defenses*. These defenses (e.g., anxiety) are often confused with diseases and defects in the medical community and have been rightly called "The Clinician's Illusion" (Nesse & Williams, 1994). These defenses may cause distress, but this very distress is an adaptive signal which promotes safety-seeking behaviour.

In summary, evolutionary approaches to mental disorders can be conceptualized as originating from one or more of these six possible explanations (although others may exist). However, it is likely that the most comprehensive understanding of depression within an evolutionary framework will include multiple explanations as is found in the biopsychosocial approach (e.g., Gilbert, 2001; Weiner, 1998). For example, Allen and Badcock (2003) have embraced this biopsychosocial perspective in their evolution-based explanation of depression.

Social Risk Hypothesis

Although many EP theorists have postulated some adaptive functions in depressive states (e.g., Bowlby, 1980; Glantz & Pearce, 1989; Nesse 2000; Price et al., 1994; Sloman, 2008; Watson & Andrews, 2002), only a select few have provided researchers with a well-structured and testable model of depression which is recognized as a precondition for fruitful and

meaningful explanations of mental disorders (Preti & Miotto, 2006). One of the most compelling of these EP models of depression, formulated by Allen and Badcock (2003), is called the *social-risk hypothesis*. Like some other theorists that have emphasized the role of risk management in depression (e.g., Leahy, 1997; Loewenstein, Weber, Hsee, & Welch, 2001), Allen and Badcock argue that mild to moderate depression (not severe depression) served an adaptive purpose in our evolutionary history (it is noteworthy that Allen and Badcock believe that their model would account for the occurrence of severe depression, although it would no longer be operating effectively). These authors theorize that depression in prehistoric times served to decrease the likelihood of exclusion from the group. Depression was thought to activate cognitive hypersensitivity to indicators of social risk, signal behaviours that would reduce social threat and elicit social support, and lastly, this mood was believed to have caused a general reduction in an individual's propensity to engage in socially risky (e.g., confident, acquisitive) behaviours.

The *social risk hypothesis* is an integrative evolutionary theory of depression that has relied heavily on the theoretical and empirical findings from the three major Darwinian conceptualizations of depression (i.e., resource conservation, social competition, and attachment). Each of these three evolutionary models of depression emphasizes the adaptive nature that this mood state served in the human species' early development.

Resource Conservation

The *resource conservation* theories suggest that depressed mood was an adaptive response to environmental and social situations where exerting excess energy would be futile. Instead, an individual would conserve their resources (or assume a depressed mood) until a propitious or productive opportunity arose that would be worthy of their energy or investment. Several well-known theories fit this category including Seligman's (1975) *learned helplessness theory* (when

interpreted from an evolutionary perspective), Nesse's (2000) *resource allocation theory*, Klinger's (1975) *incentive disengagement theory*, and Leahy's (1997) *sunk costs* model which all account for the diminished or inhibited behaviours toward seeking what seems to be unobtainable incentives or goals. Allen and Badcock (2003) have incorporated these views in their model by asserting that depressed states embody a risk-management strategy that inhibits risk taking in low pay-off and high-threat environments.

Social Competition

Unlike the resource conservation accounts of depression, the *social competition* theories acknowledge that individuals' reproductive opportunities are strongly related to their relative position or rank among their conspecifics (e.g., Price, 1989; Price et al., 1994). Social status was determined by competitive encounters (e.g., fighting) that would undoubtedly end with a winning and a losing party. The winning contestant would often adopt an escalating strategy that indicated a willingness to re-engage in aggressive acts given his or her successful history, whereas the loser adopted a deescalating strategy (subordination or yielding behaviour) to decrease the likelihood of further physical and social losses. Thus, from a social competition view of depression, this mood state is an evolved, involuntary deescalating strategy (Price et al., 1994). However, according to Gardner and Price (1999) this deescalating strategy depends on several factors including the importance of the resource being fought over, the sense of ownership for this resource, and each competitor's current status/rank in the group called *resource holding potential* (RHP). A similar theory was put forth by Gilbert and his colleagues (Gilbert, 1997; Gilbert, Price, & Allan, 1995) called *social attention holding power* (SAHP) that instead of "resources," refers to one's ability to elicit positive attention and social benefits such as respect, desire, praise, and approval. In both cases, depression occurs as a result of low levels

of RHP or SAHP, and these individuals assume a posture of social defeat and enforced subordination. The *social risk hypothesis* acknowledges the evolutionary importance of social competition in the development of depressed mood. However, Allen and Badcock (2003) assert that changes in the diversity of human social environments and social cognition call for a more complex account of depression than these two rank-oriented strategies alone could provide.

Attachment

Attachment theory is one of the principal psychological frameworks developed in the past fifty years touching on every aspect of human social life (Carvallo & Shira, 2006). It is about the earliest relationships developed with caretakers and provides an evolutionary perspective from which to understand their significance. From this perspective, John Bowlby was able to construct an understanding of grief, loss, and depression (see Bowlby, 1967, 1973, 1980).The attachment theory of depression is also paramount in the *social risk hypothesis* due to the many important affective laden social activities found in our evolutionary past such as mate retention, alliance formation, and coalition building, all of which are grounded in the importance of close relations (Buss, 1991). Attachment theory is rooted in the bonds and interactions that develop between parent and child. From this viewpoint, secure affective bonding ensures that a parent will care for and protect his or her offspring, thereby safeguarding their children's survival and allowing for reproductive success which will also perpetuate the parents' genes. Thus, staying in close proximity to one's caregivers will promote survival.

The attachment model attributes depressed mood to the loss or disintegration of significant interpersonal relationships. Although there is no consensus about the adaptive function of depressed mood in circumstances of interpersonal loss, several interpretations have been constructed. For example, depression is thought to inhibit risk taking or exploration when a

secure attachment is absent (Gilbert, 1992), serve as a distress call (Frijda, 1994), promote searching behaviours for the lost relation (Averill, 1968), or motivate the depressed individual to avoid further dissolution of previously held bonds (Ingram, Miranda, & Segal, 1998). In the *social risk hypothesis*, attachment security is viewed as an important indicator of how valued an individual is in their social environment. Allen and Badcock (2003) contend that humans are very sensitive to threats of rejection and ostracism from social relationships; therefore, poor affiliations with others will operate as a potential predictor of depression.

Social Investment Potential

A central concept in the *social risk hypothesis* is that of *social investment potential*. Previous research has indicated that members of our species possess the ability to gauge their worth or status in a social environment (Gilbert, 2000; 2001; Gilbert & Allan, 1994). As well, humans demonstrate a strong need to feel a sense of belonging and social support (Baumeister & Leary, 1995; Bowlby, 1969, 1973, 1980). Uniting these two ideas, Allen and Badcock suggest that social comparison and perceived security are fused in an individual's determination of an appropriate risk strategy and corresponding mood. The strategy that one develops will adhere to the tenets of resource conservation theories that emphasize the need to inhibit one's appetitive drives (e.g., pleasure-seeking and energy output) in times of low reward or control (Klinger, 1975; Nesse, 2000; Seligman, 1975). Specifically, the *social-risk hypothesis* predicts that those people with low social rank, high perceived defeat, and threatened attachment will have a low *social investment potential* (i.e., the ratio of social value versus social burden within the group). Allen and Badcock (2003) simply define *social value* as "the resources that are provided to others as a result of one's participation" and the *social burden* is conceptualized as "the cost to others (i.e., loss of current or potential resources) of one's participation in the relationship" (p.

891). Thus, these individuals will take on the characteristics (i.e., submissive, yielding, assurance-seeking) that are associated with the depressed state and take fewer social risks, which in turn, may provide them with small but steady increases in *social investment potential* (SIP).

These incremental increases in SIP can be achieved through the individual's reduction in appetitive behaviours (i.e., decreased social burden) and increased social value from the extra attention, care, and protection they hope to receive from relatives. As a depressed individual's SIP slowly rebounds, they will exhibit a proportional decrease in depressed mood and increase in confidence. Conversely, members of the group who enjoy a high rank or security (and no depression) will take greater social risks in order to maximize their potential for increased social rewards. Obviously this high-risk strategy has the potential of either producing success or failure. In the case of success, these individuals will increase their SIP and/or garner additional social resources or favour. However, when a person experiences losses from failed high-risk social venture(s) (i.e., this may be a culmination of several failures or a single catastrophic one), they will be viewed as a greater burden to the group, as reflected in their SIP. If these social failures occur, then these people will develop a depressed mood and alter their strategy to a risk-averse approach.

Consistent with the *sociometer* mechanism proposed by Leary, Tambor, Terdal, and Downs (1995), the *social-risk hypothesis* is rooted in the innate fear people have of being excluded from the group. People's estimation of their status given the urgency of this fear, is reflected at any particular moment in their feelings of self-esteem. Self-esteem serves as a vital indicator for people to choose the most propitious self-enhancement strategy in a social comparison context. According to Baumeister, Tice and Hutton (1989), both low and high self-esteem people are interested in self-enhancement but for different reasons. Individuals with low self-esteem strive

for self-protection so as to prevent further losses in self-esteem. These people are cautious and will try to minimize their weaknesses by avoiding challenges even when rewards seem attainable (Schlenker, Weigold, & Hallam, 1990). On the other hand, individuals with high self-esteem strive for self-enhancement that will continue to increase their self-esteem. They behave in a brazen manner by taking more risks to maximize attention and social approval. The associated depression that may arise when self-esteem is low can instead be explained as a strategy that functions by avoiding further ostracism in the group context (Allen & Badcock, 2003).

As sensitive as people are to social rejection, it can be hard to imagine how for countless eons rejection by one's group was tantamount to a death sentence. In the Pleistocene period, human groups provided the basis for plentiful reproductive resources in the form of potential mates, kin and nonkin resource exchanges, and the opportunity for reciprocal altruism between kin (Batson & Shaw, 1991; Buss, 1990). Conversely, social exclusion would have compromised all the necessary resources for human survival such as pooled knowledge, protection from predators, and foraging for food that are inherent in a group formation (Brown, 1991). Recent research has also emphasized that our species is highly sensitive to how we are perceived and valued by our social networks (Baumeister & Leary, 1995; Tooby & Cosmides, 1996). Thus, Allen and Badcock contend that self-esteem is the central active agent in estimating one's own perceived SIP. They state that "an individual's estimation of his or her own SIP may be reflected at a phenomenological level by self-esteem" (Allen & Badcock, 2003, p. 892).

Previous Research on the Social Risk Hypothesis

A thorough search of the literature shows that few attempts have been made to provide supporting evidence for the *social risk hypothesis*. Badcock and Allen (2003) examined the effects of experimentally induced depressed mood on undergraduate students' reasoning about

social risk through the use of a modified version of the *Wason card selection task* (Wason, 1966; Wason & Johnson-Laird, 1972). Using the *Wason* selection tasks as a measure of social reasoning, the authors found that participants in the induced depressed mood reasoned more incisively about risks related to social competition (i.e., they were able to detect violations of the rule "*if* I invest the resources in competing, *then* I will be successful") than did those in a neutral mood state. As predicted by the *social risk hypothesis*, this mood facilitated effect was not observed when reasoning about other types of content.

In a series of three coordinated studies, Allen and Badcock (2006a) attempted to test specific portions of the *social risk hypothesis*. In Study One, they extended the research of Badcock and Allen (2003) by comparing the *Wason selection task* responses of clinically depressed participants (n = 27) with those of anxious (n = 15) and non-psychiatric community controls (n = 31) on attachment, competition, and social risk tasks. The results failed to support the hypothesis that a greater proportion of depressed participants would select the correct attachment task card combination than anxious or control groups. Also, no differences were found between the three groups in terms of correct versus incorrect responses on the social competition task. The hypothesis that only depressed participants would be low on positive affect based on findings from previous research (Clark & Watson, 1991; Depue & Iacono, 1989; Joiner, Catanzaro, & Laurent, 1996) compared to anxious participants was also not supported in this study. However, the authors call into question whether this study had sufficient statistical power to differentiate between the groups using the chi square analysis. The depressed group did display a greater number of risk-averse options for the attachment and social competition measures compared to the control group, providing some partial support for the hypothesis. In Study Two, Allen and Badcock (2006a) compared the relationship between mood (positive and

negative affect) and risk propensity. In addition, the study sought to determine if the relationship between positive affect (thought to be specific to depressive symptoms) and social risk taking would be moderated by self-esteem. Since the *social risk hypothesis* asserts that the depression mechanism is only activated when an individual's perceived ability to successfully negotiate socially vital challenges is critically low, self-esteem would be expected to be a moderator in this relationship. The *Risk Scenarios Questionnaire* and the *Risk Propensity Questionnaire* (Rohrmann, 2004) were used to measure four risk taking factors (social, financial, accident-related risks, and health-related risks) and the *Positive Affect Negative Affect Schedules* (PANAS; Watson, Clark, & Tellegen, 1988) measured mood in a sample of undergraduate students (N = 153). Allen and Badcock reported that positive affect predicted participants' social risk taking responses and that this relationship was moderated by the levels of self-esteem reported. This finding is consistent with predictions about the SIP mechanism in the *social risk hypothesis*, and thereby supports their model of depression (Allen & Badcock, 2003). Unfortunately, the authors failed to report specific figures relating to this finding (i.e., the significance level; the strength of the relationship between positive affect and each form of risk taking), and the measures of risk taking lacked evidence of reliability and validity. Study Three in Allen and Badcock's (2006a) report focused on the influence of state and trait depressed mood on risk taking propensity. In this study, a musical mood induction was used to assist participants to get into a depressed or neutral mood and then the participants were tested on their level of risk taking (Martin, 1990). The results supported the hypothesis that individual differences in self-rated positive affect at the beginning of the experiment had a significantly positive and unique association with participants' social risk taking propensity compared to financial, accident-related and health-related risk taking. However, there was no support for the depressed mood

condition exhibiting lower mean scores on measures of social risk taking propensity than those in the neutral mood condition. In sum, the results of Study Three are inconsistent with Allen and Badcock's (2003) *social risk hypothesis*. The authors conclude that an experimental mood manipulation does not represent effective means of extrapolating an empirical test of the *social risk hypothesis*.

The recent attempts by Allen and Badcock to provide empirical support for their *social risk hypothesis* produced mixed results. The research ventures demonstrated some support for the association between depressed mood and the tendency to approach attachment and social competition situations with risk-averse strategies. The moderating effect of self-esteem as a measure of *social investment potential* (SIP) in the relationship between positive affect and social risks also supports the model's predictions. However, the collective research did not succeed in differentiating the risk approaches of depressed compared to anxious individuals, nor did the *social risk hypothesis* operate in a clinically depressed sample as the model would suggest. Also, the research indicates that experimentally induced depressed mood is not sufficient to demonstrate the mechanisms in the *social risk hypothesis*. In summary, there exists some supporting evidence for the *social risk hypothesis*. However, Allen and Badcock have only managed to demonstrate partial support for specific aspects of their theory of depression and they have never attempted to test all the relationships predicted by their model in one complete study.

Rationale for the Present Study

Allen and Badcock (2003) have put forth a potentially valuable theory of depressed mood. They have cogently argued that mild to moderate depression need not be viewed as inherently pathological, but instead indicates that an individual is not feeling socially valued by those close to them. Persons not feeling valued in their social world will be less likely to take risky social

ventures because their depressed mood informs them that their current SIP is critically low. Understanding how the mechanisms found in the *social risk hypothesis* operate in depression can help researchers and practitioners to develop more effective means of understanding and treating this common mood disorder. For instance, psychotherapy that is understood from the viewpoint of evolutionary psychology can help guide therapists to more accurately conceptualize the key operating mechanisms in many psychological disorders, including depression.

But, as valuable as this theory appears to be it has never been properly tested as a complete and integral model. Piecemeal analyses of specific aspects of the model contributes partial support for the *social risk hypothesis* (e.g., Allen & Badcock, 2006a; Badcock & Allen, 2003); however, these studies still lack the empirical might necessary to make any substantive statements about the veracity of the overall proposed depressive mechanism. A comprehensive test is still required to encompass all of the vital aspects of this theoretical mechanism, and in doing so, determine if the model is supported in full.

The present study set out to test all the psychosocial components in the theorized model using structural equation modeling in a broad sample of working adults from a variety of occupational fields. These participants allowed for a more heterogeneous sample, and thus increased the potential for more generalizable findings (cf. Tennen, Hall, & Affleck, 1995). The over used college/university student population (Sears, 1986) especially in depression research can limit the applicability of many psychological theories (Coyne & Gotlib, 1983; Gotlib, 1984). Likewise, even the use of broad-based internet sampling techniques often end up with a skewed sample in important areas such as socioeconomic status, age, education, and ethnicity (Beddows, 2008; Best & Krueger, 2004; Duff, 2002). The working adults sampled in the present study were

from a wide range of vocations thereby creating diversity among participants that is rarely found in psychological research.

In the present study, structural equation modeling and multiple regression allowed for an analysis of the mediating and moderating pathways, respectively, as constructed in Allen and Badcock's (2003) formulation of the depressive process (see Figure 2 – 1). Specifically, this study will measure how secure attachment, defeat, and social rank/competition predict depressed mood. Next, depressed mood (a mediator) will be used to predict social risk taking behaviours, interpersonal sensitivity, and submissive behaviours. And lastly, the moderating effects of *social investment potential* (as measured by self-esteem) on the latent variables connecting to depression will be assessed using interaction equations. This structural equation model and interaction effects will effectively measure all of the psychosocial constructs in Allen and Badcock's (2003) *social risk hypothesis*.

Based on previous research (see Allan & Badcock, 2003) it is hypothesized that high defeat, low secure attachment, and low social rank/comparison will each separately predict high depressed mood and these relationships will be moderated by self-esteem. In other words, self-esteem will affect the magnitude of the relationships that defeat, attachment, and social rank/comparison have on depressed mood. High depressed mood should serve as a mediator by predicting fewer social risk taking behaviours, greater interpersonal sensitivity, and more submissive behaviours.

Method

Participants

The participants in this study were full-time working adults selected from a variety of vocational fields in the city of Edmonton and surrounding area. A *full-time worker* was defined

as an employee who works a minimum of 25 hours per week in one position. From the 1000 potential participants who received survey packages, 409 working adults responded. The response rate to the survey package was 40.9%. Of this total, 12 were removed because of missing data. The total number of participants in the final analyses was thus reduced to 397 (268 women and 125 men; 4 participants did not indicate their gender). As this was an anonymous survey there was no information available pertaining to the number of men and women who received questionnaire packages, and thus no analysis could be done on the response rate of each gender. The age of female respondents ranged from 18 to 65 years (M = 43.48, SD = 10.75) and male respondents ranged from 22 to 78 years of age (M = 48.25, SD 10.36). The majority of respondents were married (68.4%), with 13.2% being single, 8.4% being divorced, 9.4% in long-term relationships, and 0.5% were widows and widowers. 89.3% described themselves as Caucasian, 4.3% Asian, 2.0% Aboriginal, 1.5% East Indian, 0.8% Middle Eastern, 0.8% Hispanic, and 1.3% indicated that none of the abovementioned categories represented their ethnicity. It is noteworthy that the ethnicity in this sample was quite representative of the demographic information reported by Statistics Canada for the city of Edmonton, Alberta (see Statistics Canada, 2001). The vocational fields consisted of administration (19%), nursing-related positions (18.8%), professors/teachers (15.9%), mental health professionals (9.5%), management (7.5%), clerical (5.1%), industrial trades (4.4%), computer technology (3.9%), doctors (3.6%), lawyers (1.5%), manual labor positions (1.5%), and 9% fell into a variety of other fields not previous mentioned. No personally indentifying information was requested on the survey and to preserve confidentiality and anonymity surveys were not labeled by the researcher with any sort of code numbering system that could be used to identify specific participants.

Measures

Below is an in-depth description of the measures used in the present study; however, a condensed overview of the constructs and corresponding instruments can be found in Table 2 – 1.

Depression Anxiety Stress Scales 21 (DASS-21; Lovibond & Lovibond, 1995). The DASS-21 is a shortened version of the original 42-item *Depression Anxiety Stress Scales* (DASS; Lovibond & Lovibond, 1995) that contains 21 items relating to depression and dysphoric mood (depression subscale), symptoms of fear and autonomic arousal (anxiety subscale), and symptoms of general nervousness and agitation (stress subscale). A Likert-type scale is used to rate items according to symptoms experienced in the past week, ranging from 0 (not at all) to 3 (most of the time). Factor analytic studies with both clinical and nonclinical samples have shown that the DASS-21 items can be reliably grouped into three scales with high internal consistency (e.g., Antony, Bieling, Cox, Enns, & Swinson, 1998; Henry & Crawford, 2005).

The measure has been found to differentiate between symptoms of anxiety and depression, as well as between symptoms of physical arousal and symptoms of general anxiety such as tension (Antony et al., 1998; Henry & Crawford, 2005). The Depression subscale is composed of 7 items that measure symptoms associated with depressed mood (e.g., sadness, worthlessness), whereas the 7 items of the Anxiety subscale are related to symptoms of physical arousal, panic attacks, and fear (e.g., trembling, faintness). The last 7 items that comprise the Stress subscale measure symptoms such as tension, irritability, and a tendency to overreact to stressful events.

Only the Depression ($\alpha = .90$) subscale was used in this study. The recommendations of Russell, Kahn, Spoth, and Altmaier (1998) were followed in order to create two observed indicators for the latent variable of depression; however, instead of using factor analyses for this

small 7-item unidimensional subscale, the unique variance was determined for each item. The items were then rank ordered according to the magnitude of the contributing variance and successively assigned to pairs comprising the highest and lowest ranking items to equalize the average variance of each parcel. The two parcels for this subscale served as measured variables in the structural equation analysis.

Preliminary evidence suggests that the full-length DASS possesses adequate concurrent and discriminant validity in samples drawn from normal non-clinical samples (Crawford & Henry, 2003; Lovibond & Lovibond, 1995). In a sample of non-clinical and clinical participants, Antony et al. (1998) demonstrated concurrent validity for the DASS-21 by correlating the subscales with established measures. The DASS-21 Depression subscale correlated highly (r = .79 with the *Beck Depression Inventory* (BDI; Beck, Rush, Shaw, & Emery, 1979), the DASS-21 Anxiety subscale correlated highly (r = .85) with the *Beck Anxiety Inventory* (BAI; Beck & Steers, 1990), and the DASS-21 Stress subscale correlated highly (r = .68) with another measure of stress, the *State-Trait Anxiety Inventory* (STAI-T; Spielberger, 1983). Lovibond and Lovibond (1995) maintain that doubling the DASS-21 scores is directly equivalent to the derived scores from the full version. More recently, however, Henry and Crawford (2005) provided normative data for the DASS-21 from a large non-clinical adult British sample (N = 1,794). Confirmatory factor analysis once again supported the three-factor structure (Depression, Anxiety, and Stress) of the full length DASS. Furthermore, the three-factor structure has effectively differentiated between depressed and anxious patients (Clara, Cox, & Enns, 2001). Overall, the DASS-21 has a number of advantages over the DASS including having fewer items, a cleaner factor structure, and small inter-factor correlations (Antony et al., 1998; Henry &Crawford, 2005).

Risk Behavior Scale (RBS; Weber, Blais, & Betz, 2002). The RBS is a 40-item scale that measures an individual's perceived likelihood of engaging in specific risk-taking behaviours. Responses are measured on a 5-point Likert scale ranging from 1 (*Very Unlikely*) to 5 (*Very Likely).* Normative data was established in a sample of male and female undergraduate students (N = 560). Factor analysis produced five factors of risk-taking behaviour: social (8 items), recreational (8 items), health/safety (8 items), financial (8 items), and ethical (8 items). The coefficient alpha reliability across all 40 items was .88 (Weber et al., 2002). Test-retest reliabilities over a one-month interval produced respectable correlations for the *Health/Safety*, *Ethics*, and *Recreational* subscales (.75, .72, and .80, respectively), but the *Financial* and *Social* subscales (.44 and .58, respectively) were somewhat lower.

Convergent and discriminant validities were demonstrated by comparing the RBS with other established instruments. Specifically, Budner's (1962) *Scale for Intolerance of Ambiguity* (SIA), and Zuckerman's (1994) *Sensation-seeking Scale* (SS). As predicted, the SIA correlated significantly with the RBS's *Social* and *Recreational* subscales (r = -.30 and r = -.42, respectively). Also as predicted, the subscales of the SS correlated with all of the domains on the RBS. In addition, self-reported frequencies of past risky behaviours in the five domains correlated with the behavioural intentions for behaviours in the same domain (i.e., the RBS subscale scores) (Weber et al., 2002).

In the present study, only the *Social* subscale was of interest. The reliability for the risk-taking *Social* subscale (α = .68) in the present study was similar to the reliability estimate found by Weber and her colleagues. This Cronbach's alpha coefficient, much like the one obtained by Weber et al. (2002) is approaching the .60 range suggesting that the instrument may have poor reliability (see Thorndike, 1997). The 8 items of this subscale were divided into two parcels

using the rank order method. These two parcels were to serve as measured variables in the structural equation analysis.

Social Comparison Scale (SCS; Allan & Gilbert, 1995). The SCS is composed of 11 social comparison dimensions (Inferior-Superior, Incompetent-Competent, Unlikeable-Likeable, Leftout-Accepted, Different-Same, Untalented-More Talented, Weaker-Stronger, Unconfident-More Confident, Undesirable-More Desirable, Unattractive-More Attractive, Outsider-Insider) which an individual uses to rate themselves in relation to other people, using a 10-point Likert scale. Normative data were based on both undergraduate and clinical samples (Allan & Gilbert, 1995). The SCS was based on an earlier five-item version (Gilbert & Allan, 1994); however unlike the earlier scale, the current *Social Comparison Scale* contains three factors of social comparison (i.e., social rank, attractiveness, and social group fit). The *Social Rank* factor consists of the Inferior-Superior, Incompetent-More Competent, Untalented-More Talented, Weaker-Stronger, and Unconfident-More Confident items, the *Attractiveness* factor contains Unlikeable-Likeable, Undesirable-More Desirable, and Unattractive-More Attractive, and the *Social Group Fit* factor contains the remaining three items.

The Cronbach alpha for the 11 item scale was .91 in a student population and .88 in a clinical population (Allan & Gilbert, 1995). The reliabilities among the subscales for the present study were as follows: *Rank* (α = .84), *Group Fit* (α = .86), and *Attractiveness* (α = .84). These three subscales served as measured variables of social comparison in the structural equation analysis. The discriminant validity for the *Social Comparison Scale* was established with the *Symptom Checklist-90-Revised* (SCL-90-R; Derogatis, 1983) on clinical and non-clinical samples (Allan & Gilbert, 1995; Gilbert, Price, & Allan 1995). Overall, the magnitude of the correlations increased between social comparison and psychopathology in the clinical groups

compared to the student group. Interestingly, the social comparison of the *Social Group Fit* factor was not significant in the patient sample, although most of the SCL-90-R subscales were in the student group. Allan and Gilbert (1995) attribute this deviation to the group environment of a hospital setting where fitting in may not be desirable.

Submissive Behaviour Scale (SBS; Allan & Gilbert, 1997; Gilbert & Allan, 1994). The SBS is a 16-item unidimensional questionnaire in which respondents rate a series of statements on a 5-point scale (ranging from 0 to 4) where higher scores indicate more submissive behaviours. The scale was developed from the work of Buss and Craik (1986) and it seeks to differentiate between assertiveness and submissiveness in social interactions. The scale is designed to focus on social behaviours and also contains indicators of anxiety and depression (Allan & Gilbert, 1997). The scale has good internal and test-retest reliability. In a sample of undergraduate students, Gilbert et al. (1995) found a Cronbach's alpha of .89 and test-retest reliability over a four month period of .84. The Cronbach's alpha found in the present study (α = .87) was very similar to Gilbert et al.'s. Concurrent validity of the SBS was established by its satisfactory correlation (r = .73) with the nonassertive measure of the *Inventory of Interpersonal Problems* (Horowitz, Rosenberg, Baer, Ureno, & Vallasenor, 1988) in a group of female undergraduate students (Gilbert, Allan, & Goss, 1996). Using the rank order method, three parcels were created to serve as measured variables in the structural equation analysis.

State Self-Esteem Scale (SSES; Heatherton & Polivy, 1991). The SSES was developed as a measure of *state* rather than trait self-esteem. Heatherton and Polivy (1991) created the scale because of the insensitivities and minimal variability in responses of more traditional assessments of self-esteem (e.g., *Rosenberg's Self-Esteem Scale*; Rosenberg, 1965) that tended to only measure stable self-esteem. The SSES consists of 20 items that tap momentary fluctuations

in self-esteem. The scale has good internal consistency (α = .92) and it is responsive to temporary changes in self-evaluation (see Crocker, Cornwell, & Major, 1993).

According to Heatherton and Polivy (1991) three factors exist within the SSES and these include a six-item *Appearance* subscale (α = .77), a seven-item *Performance* subscale (α = .76), and a seven-item *Social* subscale (α = .81). In the present study, the Cronbach's alpha coefficient for the Total SSES scale was identical (α = .92) to the one found by Heatherton and Polivy (1991). In addition, all of the subscales were very similar ranging from .83 to .87: *Attractiveness* (α = .83), *Performance* (α = .83), and *Social* (α = .87).

Based on their five studies, Heatherton and Polivy (1991) concluded that the SSES is psychometrically sound and has a high degree of construct and discriminant validity. They compared the SSES with other established measures of self-esteem, and found moderate to high correlations with each assessment tool [*Rosenberg Self-Esteem Scale, r* = .72 and *Janis-Field Feelings of Inadequacy Scale* (JFS; Janis & Field, 1959), *r* = .76]. Also, measures of depression, anxiety, hostility, and physical appearance were compared to the three subscales. This examination revealed that the *Performance* factor was most highly related to overall self-esteem, trait anxiety, and depression, but not social desirability, physical appearance, and hostility. The *Social* factor was most highly associated with trait social self-esteem (on the JFS) but less related to hostility and physical appearance. As expected, the *Appearance* factor was most highly related to physical appearance, depression, and overall self-esteem (on the *Rosenberg Self-Esteem Scale*), but was unrelated to social desirability. Discriminant validity of the SSES and its subscales was established by measuring changes in self-esteem between Day 1 and subsequent time periods. For example, Heatherton and Polivy (1991) found a drop in *Performance* state self-esteem on Day 2 when participants were told that they were going to take a difficult exam,

whereas no statistically significant differences were observed on the *Social* and *Appearance* subscales. The Total SSES scale was used in the analysis of moderation in the current study. Moderation was assessed using the hierarchical regression analyses as outlined by Baron and Kenny (1986) in order to determine whether *social investment potential* was sensitive to fluctuations in the exogenous variables (i.e., defeat, social comparison, and secure attachment) leading to depression.

Attachment Style Questionnaire (ASQ; Feeney, Noller, & Hanrahan, 1994). The ASQ is a 40-item, Likert-type, self-administered questionnaire designed to measure five dimensions central to Hazan and Shaver's (1987) and Bartholomew's (Bartholomew & Horowitz, 1991) conceptualizations of adult attachment. The *Confidence* scale contains eight items relating to secure attachment behaviours, such as trust in others and belief in one's self-worth. There are two scales measuring preoccupied attachment behaviours: *Preoccupation with Relationships* (8 items) characterizes the anxious reaching out to other in order to fulfill dependency needs, and *Need for Approval* (7 items) reflects the individual's need for others' acceptance and confirmation. There are also two scales that measure dismissing attachment behaviours: *Relationships as Secondary* (7 items) contains items which describe the individual as protecting themselves against hurt and vulnerability by emphasizing achievement and independence. *Discomfort with Closeness* (10 items) relates to feeling uncomfortable with intimacy and closeness.

Respondents are asked to rate items on a 6-point scale ranging from *totally agree* to *totally disagree*. The scales have good internal and test-retest reliability (coefficient alpha of .74 over a 10-week period) with university and secondary school student samples, and the items also loaded appropriately on Hazan and Shaver's (1987) forced-choice attachment measure (Feeney et al.,

1994). Feeney et al. (1994) gave the *Attachment Styles Questionnaire, the Intimacy, Conflict, and Parenting Style* (ICPS) *Family Functioning Scales* (Noller, Seth-Smith, Bouma, & Schweitzer, 1992), and/or the *Junior Eysenck Personality Questionnaire* (JEPQ) (Eysenck & Eysenck, 1975) to a sample of eighth graders. They found that perceptions of high family intimacy, democratic parenting, and low levels of family conflict on the ICPS were associated with high scores on *Confidence* and low scores on the scales measuring aspects of insecure attachment. On the JEPQ, *Neuroticism* was correlated with *Preoccupation with Relationships* and *Need for Approval*, while *Extroversion* was correlated with *Confidence* and with low levels of *Discomfort with Closeness* and lack of emphasis on *Relationships as Secondary*. Feeney et al. (1994) reported Cronbach alphas for the five scales as: *Confidence* (α = .78), *Discomfort with Closeness* (α = .86), *Need for Approval* (α = .77), *Preoccupation with Relationships* (α = .74), and *Relationships as Secondary* (α = .72). In the present study, only the *Confidence* subscale (α = .82) was collected to function as a measure of secure attachment. Using the rank order method of parceling, two parcels were created to function as measured variables in the structural equation analysis.

Interpersonal Sensitivity Measure (IPSM; Boyce & Parker, 1989). The IPSM consists of 36-items that were developed to measure both the over sensitivity to social interactions and cognitive distortions common in depression-prone individuals (Boyce & Mason, 1996; Boyce & Parker, 1989) and it has been termed the measure of "interpersonal rejection sensitivity" (see Harb, Heimberg, Fresco, Schneier, & Liebowitz, 2002). Each item is scored on a 4-point Likert scale (1 = very like me; 2 = moderately like me; 3 = moderately unlike me; and, 4 = very unlike me), allowing total scores on the instrument to range from 36 to 144. Although participants are usually asked to respond based on how they *generally* feel consistent with a more stable

personality trait (Boyce et al., 1992), in the present study respondents were asked how they felt at the time they completed the questionnaire.

The scale measures five components of interpersonal sensitivity: 1) *Interpersonal Awareness,* referring to the way an individual appraises and attributes meaning to a situation; 2) *Need for Approval*, assessing the extent to which an individual needs to be approved of by others; 3) *Separation Anxiety*, assessing any undue anxiety about possible separation from a significant other; 4) *Timidity*, focusing on behavioural aspects of depression-prone characteristics, particularly the inability to behave assertively; and 5) *Fragile Inner Self*, which identifies difficulty with self-disclosure for fear of being rejected or ridiculed.

Boyce and Parker (1989) reported that the IPSM demonstrated satisfactory internal consistency in both a depressed (α = .86) and non-clinical sample (α = .85). The instrument was found to be moderately stable over time in a non-clinical group (test-retest coefficient = .70). However, the IPSM does show sensitivity to current mood in depression and those recovering from depression (Boyce & Parker, 1989). In fact, elevated scores on the IPSM in a sample of non-depressed women over a six month period were predictive of increased risk of depression (Boyce, Parker, Barnett, Cooney, & Smith, 1991).

Boyce and Parker (1989) demonstrated concurrent validity by comparing the scores on the IPSM from nearly 500 participants (depressed patients and non-clinical students) with psychiatric interviews from clinicians (r = .72). Also, convergent validity was demonstrated by the moderately high correlation (r = .66) between the IPSM and the *Neuroticism* subscale of the *Eysenck Personality Inventory* (Eysenck & Eysenck, 1975). Shortened versions of the IPSM have been utilized in previous studies (e.g., Gillespie, Johnstone, Boyce, Heath, & Martin, 2001; Todd, Boyce, Heath, & Martin, 1994). In the present study, the *Separation Anxiety* subscale was

excluded from the analysis due to the direct overlap with the questions of the DASS depression variable. Fifteen items were selected (see Appendix I) from the other four subscales [*Interpersonal Awareness* (α = .79), *Need for Approval* (α = .61), *Timidity* (α = .75), and *Fragile Inner-Self* (α = .79)]. These items were selected based on face validity (i.e., interpersonal awareness and social risk taking) prior to conducting any analysis. Using Allen and Badcock's (2003) algorithmic model (see Figure 2, page 897 of their article), items that encapsulated attending to socially threatening information and interpreting social situations as threatening were selected. Three equal sized parcels were created using the rank order method which served as measured variables in the structural equation analysis.

Defeat Scale (DS; Gilbert & Allan, 1998). According to Gilbert and Allen (1998) the DS is the first and only self-report measure of subjective experiences of defeat. The *Defeat Scale* is designed to measure a sense of personal failure and the loss of social rank. The measure consists of 16 items to which participants are asked to respond on a 5-point Likert scale indicating the extent to which each item describes their feelings (0 = never; 1 = rarely; 2 = sometimes; 3 = mostly; 4 = always/all the time). Using a large sample of non-clinical university students and a group of clinically depressed patients, the authors reported Cronbach's alpha as .94 for the student group and .93 for the depressed participants. High internal consistency was also observed between the sexes, the alpha for females being .94 and male .93 for both student and the depressed groups.

Factor analysis of the scale items revealed that all items possessed a loading of at least .45 or higher, indicated the unidimensionality of the construct. Concurrent validity for the *Defeat Scale* was established using the BDI and *Beck Hopelessness Scale* (BHS; Beck, Weissman, Lester, & Trexler, 1974). In each case high correlations were reported suggesting the DS is

measuring a construct related to depression and hopelessness, but the scale is also deemed to be distinct from these two measures and other rank-oriented scales (Gilbert & Allan, 1998). The Cronbach's alpha coefficient for the entire *Defeat Scale* in the present study was .95. This scale was split into 3 parcels using the rank order method. These parcels were used as the measured variables in the structural equation analysis.

Procedures

A mail-out survey package was sent to the work addresses through the company mail system of all potential participants at each selected worksite over the winter of 2006/2007. Individual worksites were selected based on the heterogeneity of the vocational positions at each company. In other words, a conscientious effort was made to sample a wide range of professions. An information letter accompanied the survey that described depression and social interactions as focal dimensions of interest and indicated that participation was strictly voluntary; however, a $5 donation would be made to a charity of their choice with each returned package. Furthermore it was communicated that all questionnaires would be stored safely in a locked file cabinet for a period of 7 years, after which time all data will be shredded. Potential participants were asked to ensure no identifying information (e.g., names) was recorded on the package; instead, they were informed that only researcher assigned numbers would be used to identify individual responses. Estimated completion time of the questionnaire package was between 20-30 minutes. Returning the questionnaire package constituted consent to participate in the study, and anonymity was assured by sending identical packages. Approval for the project was obtained from the University of Alberta's ethics review committee.

Results

Preliminary Analyses

Means, standard deviations, and correlations for the 19 measured variables are shown in Table 2 – 2. It was evident after looking at the very low (and near zero) correlations of the two parcels of the *Social* subscale from the RBS and most of the other measured variables that there were some serious problems with this instrument. Previous research has established that strong associations do exist between social risk taking and the other variables in this study (see Allan & Badcock, 2003; 2006a; 2006b) suggesting some psychometric and/or construct-related problems with this scale. As already mentioned, the *Social* subscale of the RBS only had a Cronbach's alpha coefficient of .68 indicating somewhat weak reliability. As such, it was decided that this unreliable measure would be removed all together from subsequent analyses.

Allen and Badcock's (2003) conceptualization of social risk taking involves a heightened expectation of failure, decreased expectations of success, not appreciating positive outcomes, and overvaluing negative outcomes. Many of these aspects were captured in some of the items from the IPSM. For instance, the item "I avoid saying what I think for fear of being rejected" on the IPSM is demonstrative of expecting social failure, and thus a person avoiding social risks would score high on this item. It is important to keep in mind that at its core the *social risk hypothesis* predicts that depression will lead to alterations in several socially relevant areas that are encapsulated in the outcome variables. And thus, increases in both submissive behaviours and interpersonal sensitivity are expressions of lowering one's social risk taking.

The remaining data were checked for normality. Both of the parcels on the *Depression* subscale of the DASS-21 and all three parcels of the *Defeat Scale* had skewness values that approached or exceeded 2 and/or kurtosis values that approached or exceeded 7 (see Curran,

West, & Finch, 1996). It should be noted that, just as the rate of depression in the general population is negatively skewed (i.e., approximately 9% – 10%) so too was the rate measured in this sample. These measured variables were subjected to square-root transformations that resulted in skewness values of 1 or less and kurtosis values of 1 or less. The transformed values were used in subsequent analyses. The multivariate normality of the data was assessed using Mardia's coefficient of multivariate kurtosis (see Byrne, 2001) and a value of 23.98 (critical ratio of 9.95) was obtained. This result implies multivariate non-normal data. Lei and Lomax (2005) have found that parameter estimates and most model fit indices are robust to non-normality given maximum likelihood estimation and a sample size of 100 or more participants. Nonetheless, an additional measure of model fit (the Bollen-Stine bootstrap chi-square) was employed which compared bootstrapped parameter estimates to estimates from a maximum likelihood procedure (see Nevitt & Hancock, 2001; Yung & Bentler, 1996). In all cases, the statistical significance value for the Bollen-Stine bootstrap chi-square and the bootstrapped parameter estimates produced results comparable to those from the maximum likelihood procedure.

Measurement Model

Structural equation modeling of the covariance matrix was conducting using AMOS 16.0 with maximum likelihood estimation. Structural equation analysis followed the recommendations of Anderson and Gerbing (1988) to test first the measurement model and then the structural model. For both the measurement and structural models, a number of statistics were used to evaluate the fit between the model of interest and the data. The overall chi-square statistic is a popular statistic but is influenced by sample size (see Byrne, 2001; Kline, 1998). A χ^2 / df ratio of less than 3 is indicative of good fit (Kline, 1998). Two fit indices that evaluate the improvement in fit between the null model of independence and the proposed model but take

into account sample size are the normed fit index (NFI) and the comparative fit index (CFI); values for both indices should exceed a recommended cut-off value of .90 (Byrne, 2001). The goodness of fit index (GFI) is equal to the proportion of variability in the covariance matrix explained by the model; values greater than .90 indicate a reasonable fit of the model to the data. The root mean square error of approximation (RMSEA) is a measure of fit that is sensitive to the number of estimated parameters in the model; a value less than .08 indicates a good fit (Byrne, 2001).

To assess whether the measurement model was an acceptable fit to the data, all latent variables were correlated to all other latent variables. The fit for the measurement model was acceptable; χ^2 (89, N = 397, p < .001) = 196.16, χ^2 / df = 2.20, NFI = .953, CFI = .974, GFI = .941, RMSEA = .055 (90% CI: .045, .066). Examination of modification indices, a univariate form of the Lagrange multiplier tests in AMOS, suggested no major changes to the measurement model to improve fit. All measured variables loaded on their respective latent variables (p < .001) and standard errors were appropriate (Table 2 – 3). The correlations among the latent variables are reported in Table 2 – 4. All of the relationships between the latent variables were statistically significant (p < .01).

Structural Model

The second step of the analysis was to test a structural model or the paths between the latent factors. The initial test produced a model that was an acceptable fit to the data; χ^2 (96, N = 397, p < .001) = 291.34, χ^2 / df = 3.03, NFI = .931, CFI = .952, GFI = .911, RMSEA = .072 (90% CI: .062, .081). However, based on the Modification Indices feature of the AMOS 16.0 program there was some indication that correlating the error terms on the two parceled indicators for the DASS-21 *Depression* subscale may improve fit on both theoretical and practical grounds.

In particular, factor analysis by Henry and Crawford (2005) indicated that this 7-item scale was unidimensional, and thus not only would the predictive power in measuring depressive symptoms with these two parcels be correlated but so would the unmeasured variance (i.e., error terms). When correlating error terms for a single latent variable (or even between latent variables, see Keith, 2006, p. 353), a researcher is basically saying that the unique variances of the associated indicators overlap; that is, they measure something in common other than the latent construct that is represented in the model. Byrne and Watkins (2003) have gone further, and suggest that even error terms of single items (within a latent construct) can be correlated in a model. One likely possibility stems from the fact that these two indicators are from the same self-report scale, and are thus both susceptible to some response set or lack of reliability in measurement. Furthermore, Stan Maliuk, a noted SEM scholar, argues that latent variables with fewer than four indicators may lead to underidentification of a fitting model (Hayduk & Glasser, 2000). As such, correlating the two error terms for these indicators would constitute theoretical and practical "data constraints" and would aid in the avoidance of underidentification where unique variances could not be appropriately estimated (c.f. Hayduk, 1987, p. 140). Therefore, this change to the structural model was made after correlating the error terms on the two indicators from the depression latent variable.

The analysis was repeated. The second test produced a model that was a better fit to the data; χ^2 (95, N = 397, p < .001) = 234.58, χ^2 / df = 2.47, NFI = .944, CFI = .966, GFI = .930, RMSEA = .061 (90% CI: .051, .071). All paths were statistically significant (p < .05; see Figure 2 – 2) suggesting that there was no need to alter this model any further. For this model, 23.1% of the variance in interpersonal sensitivity and 24.5% of the variance in submissive behaviour was explained by the combination of secure attachment, social comparison, defeat, and depression.

Bootstrap Procedure for the Significance Level of Indirect Effects

Mediational analyses followed the recommendation of Shrout and Bolger (2002) to employ the bootstrap procedure available in AMOS to test indirect effects (see also MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002). There were three potential mediation paths through depression with two outcome variables (i.e., interpersonal sensitivity and submissive behaviour), and thus each relationship was examined individually. For example, the indirect effect of defeat to interpersonal sensitivity mediated by depression, the standard estimate of the indirect effect, and the statistical significance of the indirect effect were estimated from 5000 random samples generated from the data set (N = 397). The indirect effect between defeat and interpersonal sensitivity mediated by depression, β = .38, was statistically significant ($p < .001$). The indirect effect between social comparison and interpersonal sensitivity mediated by depression, β = -.10, was statistically significant ($p < .05$). The indirect effect between secure attachment and interpersonal sensitivity mediated by depression, β = -.12, was statistically significant ($p < .05$). In the same vein, the indirect effect of defeat and submissive behaviour mediated by depression, β = .37, was statistically significant ($p < .001$). The indirect effect of social comparison and submissive behaviour mediated by depression, β = -.10, was statistically significant ($p < .05$). And lastly, the indirect effect of secure attachment and submissive behaviour mediated by depression, β = -.12, was statistically significant ($p < .05$). The indirect effect and the 95% CIs for the indirect effect are reported in Table 2 – 5. If zero does not fall with the 95% CI, then the indirect effect is statistically significant ($p < .05$). Thus, depression mediated all relationships in the structural model (see Figure 2 – 2).

Test for Moderation

A series of hierarchical regression analyses (see Baron & Kenny, 1986; Frazer, Tix, & Barron, 2004) were performed to determine whether self-esteem (i.e., *social investment potential*) functioned in the role of a moderator as suggested by Allen and Badcock (2003). Before the analyses, all measured variables were standardized to make it easier to plot (and understand) significant moderator effects (see Frazer et al., 2004). Next, the values of the standardized measured variables were multiplied by the corresponding standardized weights from the final structural model (see Figure 2 – 2). In other words, the standardized factor scores of the indicator variables were used to create their respective latent variables. The products from these simple equations became the latent variables for use in the moderation analyses. Two separate sets of analyses were conducted to allow for submissive behaviour and interpersonal sensitivity to serve as separate dependent variables. In Step 1 of the analyses, defeat, social comparison, secure attachment, and depression were all placed in a predictor block which was entered first in the regression equation allowing for all of the main effects to be controlled for before testing interaction effects. Table 2 – 6 shows that these variables combined to account for 25% of the variance in the submissive behaviour scores, $F(4, 392) = 32.21$, $p < .001$. In Table 2 – 7, it can be seen that 23% of the variance in the interpersonal sensitivity scores is accounted for by these four variables, $F(4, 392) = 29.30$, $p < .001$.

Two-way interactions. In Step 2, the self-esteem variable was combined into three separate interaction terms with defeat, social comparison, and secure attachment, respectively, as additional predictors of submissive behaviour (see Table 2 – 6) and interpersonal sensitivity (see Table 2 – 7). These three two-way interactions were tested while controlling for the main effects of all the predictor variables in separate analyses for both dependent variables. Each interaction term was incrementally partitioned to determine the variance accounted for over and above the

main effects for submissive behaviour and interpersonal sensitivity. Based on the recommendations of other researchers (e.g., Metalsky & Joiner, 1992), the effect of each interaction term was tested separately and then again while controlling for the effects of the other interaction terms. As such, the three interaction terms were combined into the second block to assess the unique contributions of each interaction term in predicting the dependent variable (i.e., interpersonal sensitivity and submissive behaviours) controlling for the other two interaction terms.

In Table 2 – 6, each interaction term is separately analyzed for the final dependent variable, submissive behaviour. There were no statistically significant interaction terms for self-esteem with any of the independent variables (i.e., defeat, social comparison, and secure attachment) in predicting depression. Similarly, when all three interaction terms were placed in Step 2, no statistically significant results were obtained. However, when interpersonal sensitivity served as the final dependent variable (see Table 2 – 7), self-esteem interacted with defeat on the pathway leading to depression; F (1, 391) = 4.74, $p < .05$, to predict 1% of unique variance in the interpersonal sensitivity score. Consistent with the recommendations of Jaccard, Turrisi, and Wan (1990), the slope of the significantly interacting terms were interpreted at each level of the independent variable. These simple slopes were defined as one standard deviation below the mean score and one standard deviation above the mean to provide for low and high levels, respectively. As shown in Figure 2 – 3, there was a statistically significant relation between defeat and depression for individuals with both low and high levels of self-esteem. These statistically significant findings were for individuals low in self-esteem (slope = 0.20, $t(393) = 8.57$, $p < .001$) and those with high levels of self-esteem (slope = -0.32, $t(393) = 6.26$, $p < .001$). Thus, when an individual is high in perceived defeat, low self-esteem will magnify (i.e., a

positive slope) their experience of depression. Whereas, a person with high perceived defeat but high self-esteem will have their depressed mood assuaged (i.e., a negative slope).

As well, when all three interaction terms were put in the second block (see Table 2 – 7) both defeat, F (3, 389) = 7.34, $p < .01$, and social comparison, F (3, 389) = 4.67, $p < .05$, interacted to predict 2% of the unique variance in the interpersonal sensitivity score. This suggested that when defeat and social comparison are together, there is some shared variance that is magnified when combined. When interpersonal sensitivity is the final outcome variable, this relationship functions to allow self-esteem to interact in predicting depression.

Discussion

The main purpose of the present study was to test all of the components included in the *social risk hypothesis*. In this study, measures of secure attachment, social comparison, defeat, self-esteem, depression, submissive behaviours, social risk taking, and interpersonal sensitivity were used. Using structural equation modeling, the pathways specified by the *social risk hypothesis* were tested; as well the moderating effects of self-esteem (i.e., *social investment potential*) on the relationships between secure attachment, social comparison, and defeat in predicting depression were tested using multiple regression analyses (see Baron & Kenny, 1986; Frazer et al., 2004).

The present study contributes impressive empirical support for Allen and Badcock's (2003) *social risk hypothesis* model of depression. This evolutionary theory of adaptive depression has received partial empirical support (see Allen & Badcock, 2006a) of specific mechanisms operating in an algorithmic model; however, prior to the present study no research has attempted to test the model in its entirety.

Allen and Badcock (2003) posited that socially relevant features of agency and affiliation are the determinants of whether a depressive mechanism is activated or not. When this depressive mechanism is activated, a person will adopt a risk-averse strategy to social aspects of living in order to avoid ostracism from a valued group. However, a high-risk strategy in the social domain would be adopted if a person was enjoying success in areas of belonging (i.e., secure attachment) and status (i.e., perceived defeat and social comparison), and thus no depression would be present. The social risks identified by Allen and Badcock (2003) involved attending to indicators of social threat, threat signals to conspecifics, and behavioural risk propensity which were assessed by measure of interpersonal sensitivity (IPSM), submissive behaviours (SBS), and the *Social* scale from the *Risk Behavior Scale*, respectively. Unfortunately, the poor psychometric properties of the *Social* scale of the RBS necessitated its removal from the model leaving only two remaining measures of social risk taking (i.e., IPSM and SBS) that were utilized in the SEM model. It is noteworthy that some of the items within the IPSM used in the present study do measure features of behavioural social risk taking (e.g., "I avoid saying what I think for fear of being rejected"), and thus Allen and Badcock's notion of social risk taking may still be represented in the overall model.

In the present study, the results of SEM analyses indicated that depression fully mediated all of the relationships outlined by Allen and Badcock's (2003) *social risk hypothesis* model of depression. Consistent with previous research the present study found that depression leads to submission (e.g., Allan & Gilbert, 1997; Sloman & Gilbert, 2000) and a sensitivity to how one is perceived by others (e.g., Sakado et al., 1999; Wilhelm, Boyce, Brownhill, 2004). In Allen and Badcock's (2003) model they identified submissive behaviours as an outcome of depression; however, other research supports it's positioning as a precursor to depression rather than an end

product (e.g., Gilbert & Allan, 1998; Sloman, 2000). Similarly, interpersonal sensitivity is often regarded as an antecedent to depression (e.g., Boyce & Mason, 1996; Boyce et al.,1991) rather than an outcome. The change in sequencing of these two variables is important in the *social risk hypothesis* because they depict an almost cyclical feedback loop that operates to gradually bolster one's *social investment potential* (or self-esteem) within a group atmosphere. Allen and Badcock argue that one's ratio of social value to social burden is the internalized mechanism that gauges when he or she can change their strategy from risk-averse to a more lucrative one. These unique relationships in the proposed model allow mild to moderate depression to function as an adaptive primitive program operating within all human beings.

From an evolutionary perspective, the experience of depressed mood promotes the activation of a deescalating strategy whereby appetitive drives are all but inhibited. In doing so, a depressed person discourages any unwanted confrontation from conspecifics that are stronger and/or more highly valued by the immediate social group. Natural strivings for the largest portion of the kill or the most desirable mate would not take place during a depressive state. Likewise in the modern day, a depressed person may be far less likely to confront a co-worker with whom they disagree or to demand an increase in wages from a boss, or to approach someone new to go out on a date. Important in the *social risk hypothesis* is the impact that rejection would have on a person who is already feeling that their self-worth (or self-esteem) is low. Allen and Badcock (2003) argue that from a larger evolutionary point of view that these are risks best avoided. Throughout much of the evolutionary history of human beings this failed attempt could lead to ostracism from the group and almost certain death without the shared resources of kin (e.g., food, shelter, protection from predators or other group members, potential mates). Kessler (1997) found that the most influential stressors related to depression are life

events that involve forms of rejection, including the loss of personal relationships, marital difficulties, and job loss, although many others exist in modern times (e.g., Kendler, Hettema, Butera, Gardner, & Prescott, 2003). Furthermore, isolation or "social death" comes with its own catastrophic effects such as increased suicide risk and a lack of intimate relationships (see Williams, Forgas, & von Hippel, 2005), representing survival and reproduction, respectively.

Depression was also found to increase a person's interpersonal sensitivity in the present study suggesting a process which is potentially adaptive. Such a finding adds credence to the *social risk hypothesis*, in that a depressed mood primes a cognitive hypersensitivity to indicators of social risks and threats. This propensity to "walk on eggshells" around higher status individuals would prevent unwanted confrontations, and again reduce the chances of rejection or personal harm. Evidence that depressed people tend to be more realistic in their social judgments (Weary & Edwards, 1994; Yost & Weary, 1996) occurs in large part because of their attention to human behavioural nuances that are often overlooked when we remain self-focused and elated in mood.

The *social risk hypothesis* model of depression places facets of social rank and affiliation as causative factors of depression. In the present study, defeat served as the strongest predictor of depression with a standardized regression weight of .65 compared to social comparison (-.17) and secure attachment (-.22). This finding suggests that it is the losses occurring in agonistic-like challenges, whether symbolic or real, that are most detrimental to a person's social value (and mental health). The experience of defeat relates to the loss of control over goal-directed ventures, loss in interpersonal conflicts, and the general sense of failure. For modern humans, the perception of defeat is not so much related to failed aggression in combat, but is more indicative of unsuccessful attempts at social approval and personal betterment (Gilbert, 2000). Research has

identified numerous evolutionarily relevant defeat situations related to depression including loss of control in one's status or prestige (Gilbert, 1992), feeling undermined or marginalized (Brown & Harris, 1978), financial setbacks (Ganzani, McFarland, & Cutler, 1990), and public shaming or criticism (Hooley & Teasdale, 1989). Each of these experiences embodies a "social burden" that can trigger a state of depression.

Furthermore, with regard to the role of experiences of defeat in depression, the results of the present study are consistent with other research findings. In their structural equation model, Gilbert, Allan, Brough, Melley, and Miles (2002) found that defeat had a stronger association with depression than social comparison, entrapment, or shame. Also, Gilbert et al. (2002) found that social comparison was a unique predictor of depression (albeit a marginal χ^2 change), much as in the present study. Social comparison and defeat have been linked to the *involuntary defeat strategy* (Sloman, 2000) and *social competition hypothesis* of depression (Price et al. 1994). The dyad of defeat and social comparison are most representative of the social rank theories (e.g., Gilbert, 1992; Gilbert et al., 2002; Price & Sloman, 1987; Price et al., 1994) and have received an immense amount of support in the field of evolutionary research.

However, Allen and Badcock's (2003) *social risk hypothesis* was proposed as an integrative theory of depression that also considers one's attachments to be vital to the development of depression (Bowlby, 1980). And, as predicted, secure attachment was a significant and unique predictor of depression. This finding adds support to the recent work of Sloman and his colleagues (Sloman, 2008; Sloman, Gilbert, & Hasey, 2003) who acknowledge not only the operation of social rank in depression but also the protective function of an attachment system which promotes closeness and proximity, sensitivity to distress as well as the obvious survival benefits of a secure attachment. The acuity humans have evolved for attending to threatening

stimuli is most pronounced in depressed individuals when the content is socially relevant (Mathews, Ridgeway, & Williamson, 1996). Human beings seem to possess a hypersensitivity to their relative positioning in a given social group, to experience a downward mood when they feel conquered, and to struggle to function when their affiliative bonds are damaged.

Social isolation, feelings of being unloved, fears of abandonment, and general negative relational patterns in the social realm have clearly demonstrated a strong association between attachment style and depressive symptomatology in a broad range of directed research (e.g., Beatson & Taryan, 2003; Cawthorpe, West, & Wilkes, 2004; Irons & Gilbert, 2005; Roberts, Gotlib, & Kassel, 1996; Safford, Alloy, Crossfield, Morocco, & Wang, 2004; Shaver, Schachner, & Mikulincer, 2005; Williams & Risking, 2004). Similarly, the results of the present study indicate that strong affiliative bonds are linked to an absence of depressive features. This finding is commensurate with the seminal work of John Bowlby (1967, 1973, 1980) who found that individuals who experienced a secure attachment were well adjusted socially and emotionally whereas those who lacked this type of attachment with a caregiver were far more prone to developing depression. It is the negative responses by others that play a key role in the maintenance of depression (Coyne, 1976, 1999). Thus, the consistency of the strong association between secure attachment and depression in a variety of samples suggests that it will be vitally important to repair ailing relationships in order to assuage the depressive symptoms.

Self-esteem as a Moderator

The significance of self-esteem in the cycle of depression has sparked several decades of research emphasizing the detrimental impact of a perceived sense of worthlessness (e.g., Becker, 1979; Coopersmith, 1967; Drake, Price, & Drake, 1996; Flett et al., 1994; Joiner, Alfano, & Metalsky, 1992). In evolutionary terms, self-esteem provides valuable information, especially in

the social domain (e.g., Baumeister, Dori, & Hastings, 1998; Harter, 1993; Joiner & Metalsky, 1995). In humans, the *sociometer* has been used to describe an internal apparatus developed in our distant past which provides immediate feedback (and monitoring) about the chance of being attacked or banished from our social cohort (Leary et al., 1995). Allen and Badcock (2003) hypothesized that critically low self-esteem (or *social investment potential*) would activate the depressive mechanism. In the present study support for this proposition was only found for the pathway from defeat to depression when interpersonal sensitivity was the final outcome measure (as compared to submissive behaviours). Interestingly, moderation took place at both low and high levels of self-esteem in this relationship. A look at the slope (see Figure 2 – 3) reveals a buffering effect of self-esteem when it is high (i.e., a negative slope), but when self-esteem is low, the impact of depression is magnified in those who are experiencing defeat in the social realm. Furthermore, when secure attachment, social comparison, and defeat were place in the second block together, there was a statistically signification interaction with the latter two on the interpersonal sensitivity path (see Table 2 – 7). This again underscores the close relationship between defeat and social comparison that other researchers have surmised (e.g., Sloman & Gilbert, 2000).

Previous research focused on the impact that social comparisons have on self-esteem and depression have generally found that low self-esteem, as opposed to high self-esteem, is more strongly associated with the development of depressive symptoms (see Wood & Lockwood, 1999 for a review). Central to these findings are the cognitive and emotional alterations in one's self-worth that occurs when an individual feels an *upward comparison* (comparisons to others who are superior in some attribute currently focused upon) take place. The association between the *upward comparisons* and a person's mood is often magnified when self-esteem is low

(Major, Testa, & Bylsma, 1991). However, in the case of high self-esteem buffering the social comparison-depression link (as found in the present study), much less research has been supportive of this finding. For instance, most research in this area has found that depressed mood leads to more social comparisons (e.g., Weary, Elbin, & Hill, 1987) rather than the reverse direction tested in the present study. Hence, the findings in the present study suggest that the direction of the relationship between social comparison and depression may need to be reconsidered in future research.

Failure to find moderation on the secure attachment path in the present study may related to the nature of attachment as predominately stable (Ainsworth, Blehar, Water, & Wall, 1978; Bowlby, 1969, 1973, 1980) and less likely to be influenced by rising and falling self-worth at any given moment. It may be the case that fluctuations in social rank were more prevalent in our *environment of evolutionary adaptation* (EEA; Tooby & Cosmides, 1992) than affiliation bonds which tend to be more resistant to the vicissitudes of a life in hunter-gatherer society. Another possible explanation stems from the *hawk or dove* strategies observed in the animal kingdom which represent escalating and de-escalating risk strategies, respectively (Caryl, 1988; Maynard Smith, 1982). In the wild, hawks will fight to the death in a competition over resources creating a high risk scenario with all-or-none payoffs. On the other hand, doves may display a protest behaviour but largely avoid conflict and ensure that they are not harmed by fleeing or breaking off contact with an aggressor (i.e., submission). With these strategies in mind, Gilbert (2000) proposed that it is social comparison and its ability to evaluate competencies and worth that possesses an internal gauge informing appropriate risk strategies. It seems possible that one's self-worth is intimately wrapped up in one's presumed attractiveness/ability (i.e., social comparison) or *social investment potential*. As well, one can't help but consider the possibility

that self-esteem is not the modern equivalent of *social investment potential*; perhaps SIP is implicit in the constructs of defeat, secure attachment, and social comparison. Perhaps it cannot be fully separated and quantified?

Conclusion

The present study provided substantial empirical support for an adaptive depressive mechanism called the *social risk hypothesis* (Allen & Badcock, 2003). Using structural equation modeling the basic algorithmic model was tested and the data provided a good fit with all pathways being statistically significant and depression mediating each linear relationship. Partial support was provided for the operation of self-esteem (i.e., *social investment potential*) as a moderator in the *social risk hypothesis*. Interaction was found for both low and high levels of self-esteem in the defeat – depression relationship when interpersonal sensitivity was the final outcome variable. None of the other relationships were moderated by self-esteem. It is possible that self-esteem does not fully capture the *social investment potential* construct, thereby accounting for these null results.

Limitations and Directions for Future Research

Although the empirical findings in the present study have provided convincing support for the *social risk hypothesis*, a number of cautions should be exercise in the interpretation of these data. First, the primary measure of social risk taking performed poorly and could not be included in the structural equation modeling (i.e., *Social* scale from the RBS). Use of a psychometrically sound measure of social risk taking is required; however, it may be the case that paper questionnaires will never truly assess the social risk that face humans on a daily basis. Second, in the present study the IPSM was used as a state measure rather than a stable measure originally intended by the authors (see Boyce & Parker, 1989), and thus it may not be sensitive to ongoing

changes in interpersonal sensitivity required by *social risk hypothesis*. A third limitation relates to Allen and Badcock's (2003) conceptualization of *social investment potential* as modern day self-esteem which may not fully capture the social value over social burden ratio. Perhaps other measure(s) will be developed that incorporate a more accurate appraisal of this ratio although this may require self-reports being contrasted with the appraisals of outside observers to provide a more accurate tally of SIP (although this research scenario is fraught with logistical problems). Fourth, this study used a cross-section and correlational design that only reflected associations and predictions; therefore, no causal relations among variables could be inferred. Although the directionality of the pathways were based on Allen and Badcock's (2003) theoretical model, it is possible that the variables could fit better in a different location. For instance, submission could operate as a latent variable rather than as a dependent variable (see Sloman & Gilbert, 2000) as well high interpersonal sensitivity has been found to predict depression (e.g., Boyce et al., 1991; Boyce & Mason, 1996) which is more indicative of a latent variable. Fifth, Allen and Badcock have argued that the *social risk hypothesis* is exclusive to depression, thus it would be informative to test this model with the inclusion of an anxiety variable. Given that there is ample evidence to suggest that anxiety and depression share more in common than they differ (e.g., Murphy et al., 2004; Sanderson, Beck, & Beck 1990; Tyrer, 2001) it only seems prudent to test such a model. And lastly, a validation sample would have further corroborated the measurement and structural models.

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Figure 2 - 1

The structural model hypothesized to relate the defeat, social comparison, secure attachment, depressed mood, interpersonal sensitivity, and submissive behaviours as well as self-esteem as a moderator in the proposed model.

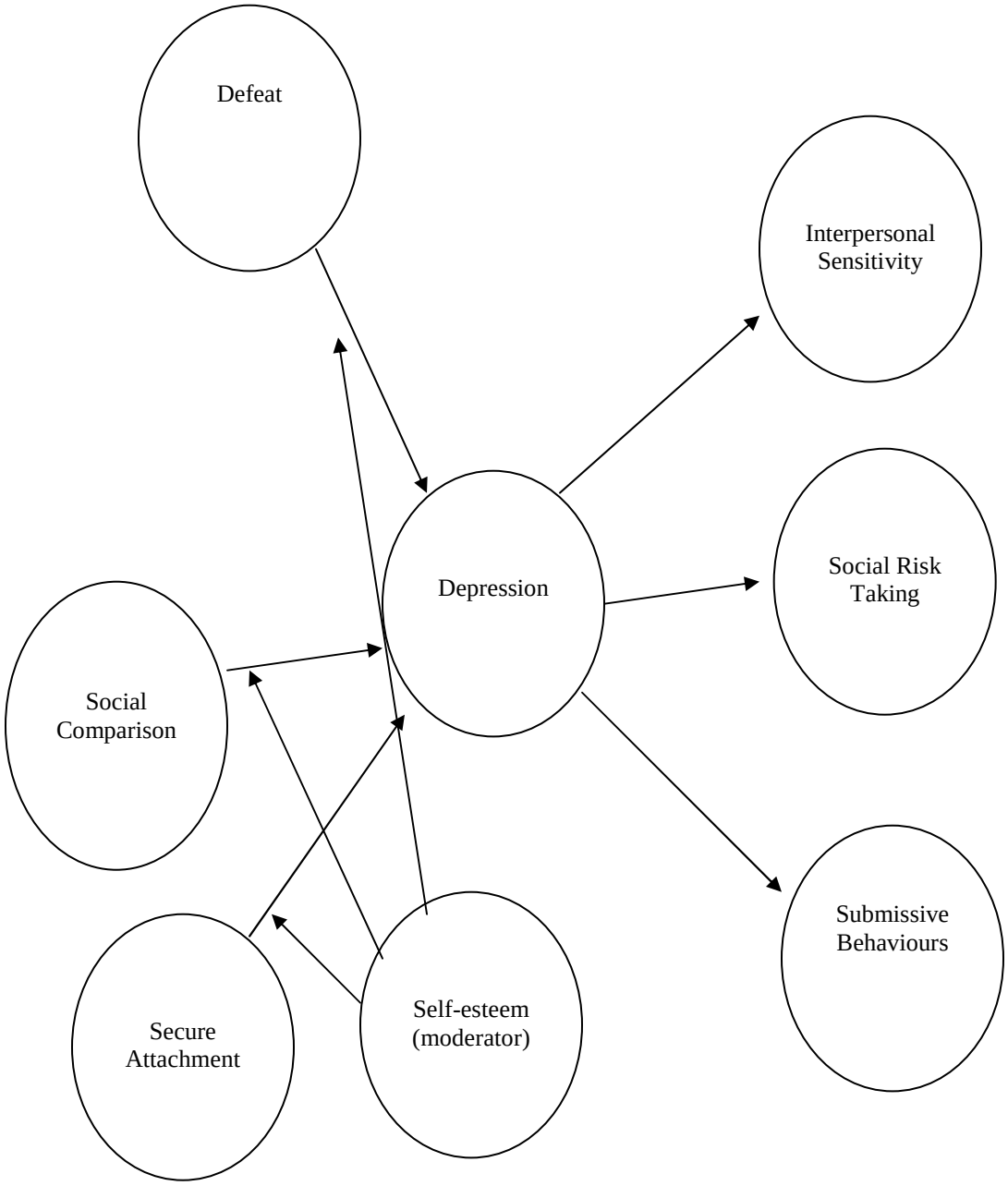

Figure 2 - 2

The mediated structural model of the relationship between the defeat, social comparison, and secure attachment in predicting interpersonal sensitivity and submissive behaviours.

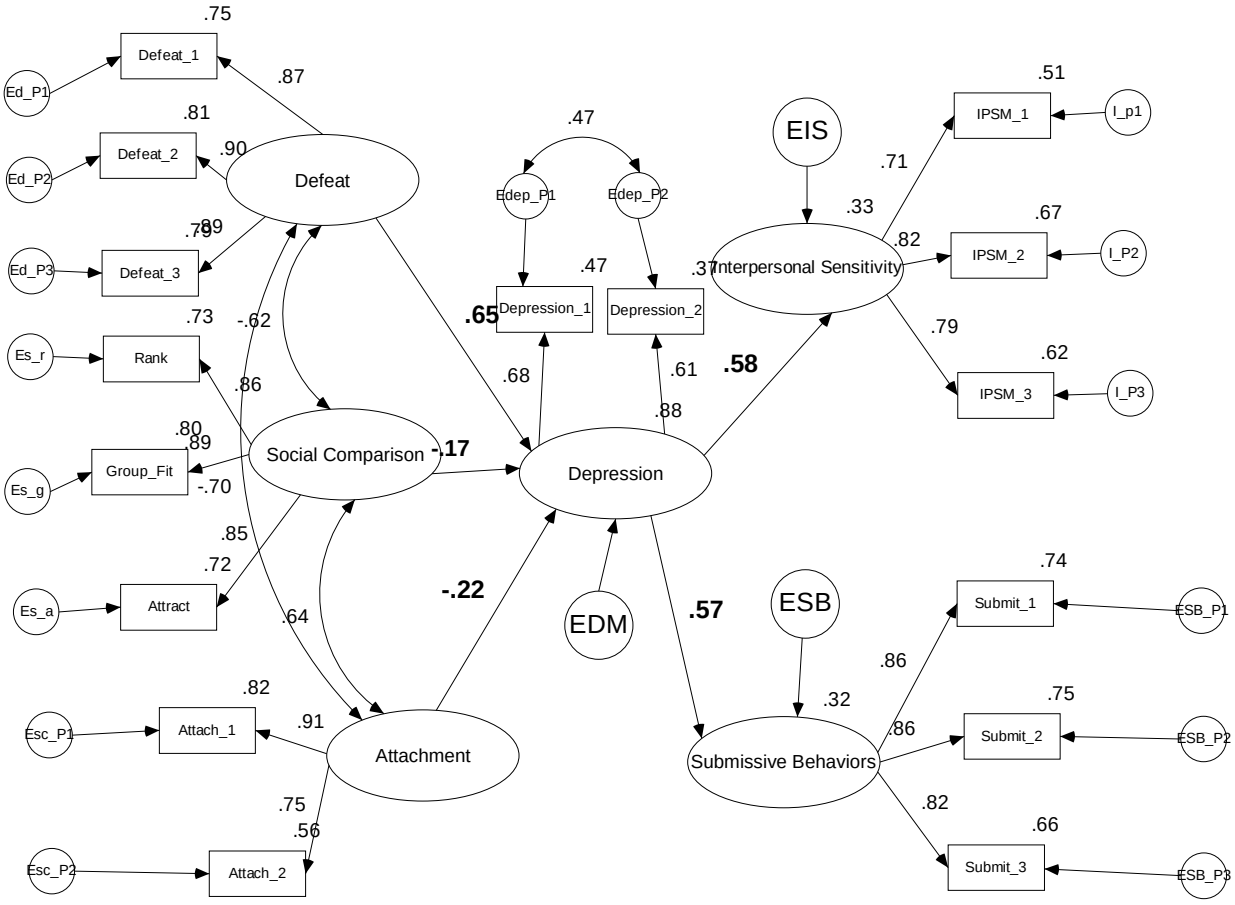

Figure 2 - 3

Two-way interaction between self-esteem and defeat predicting depression when interpersonal sensitivity is the end product. Values of self-esteem and defeat are plotted using low (one standard deviation below the mean) and high (one standard deviation above the mean) values of self-esteem and defeat.

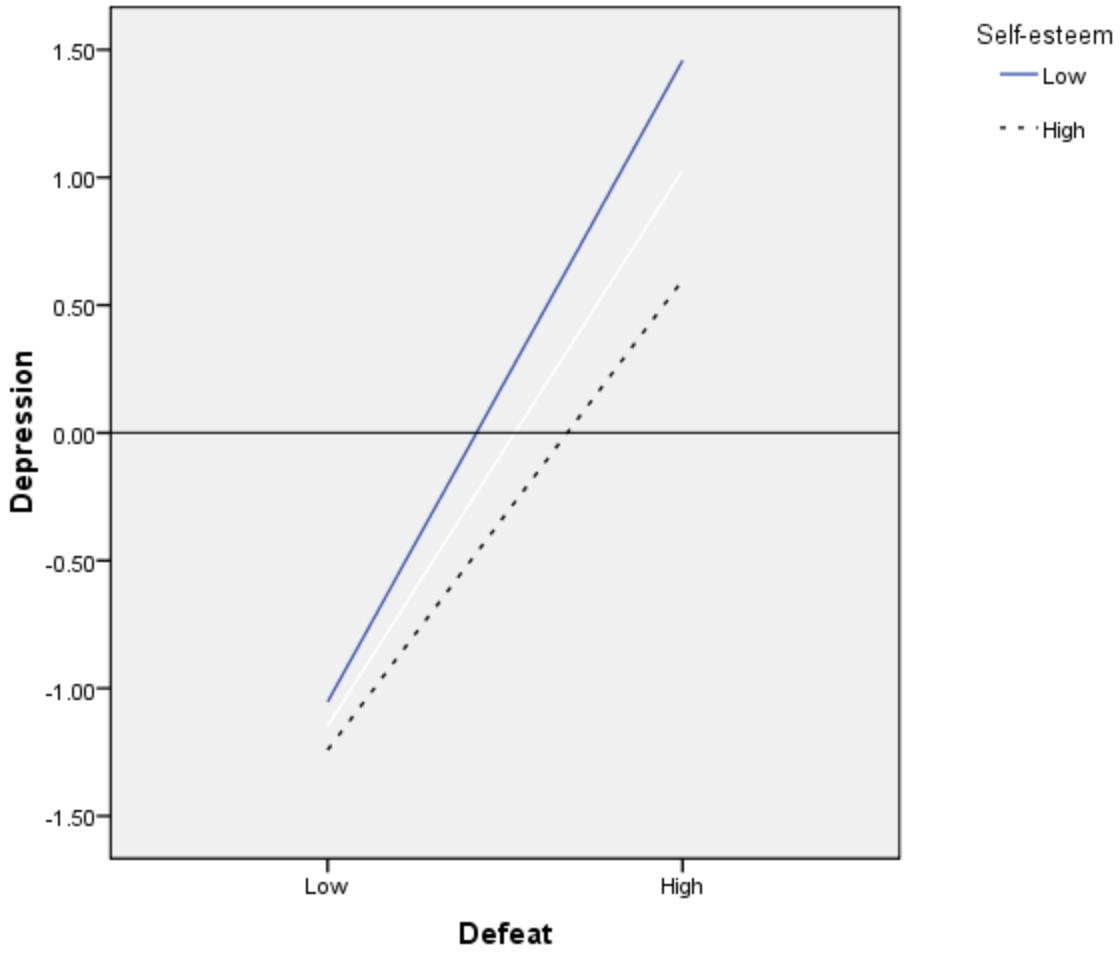

Table 2 – 1

Constructs Measured and the Corresponding Instruments and Subscales

Construct	Instrument	Subscales
Defeat	Defeat Scale	Total DS: Parcel – 1
		Total DS: Parcel – 2
		Total DS: Parcel – 3
Social comparison	Social Comparison Scale	Social Rank
		Attractiveness
		Social Group Fit
Secure attachment	Attachment Style Questionnaire	Confidence: Parcel – 1
		Confidence: Parcel – 2
Depression	Depression Anxiety Stress Scales 21	Depression: Parcel – 1
		Depression: Parcel – 2
Social Investment Potential	State Self-Esteem Scale	Total SEES score
Submissive behaviour	Submissive Behaviour Scale	Total SBS: Parcel – 1
		Total SBS: Parcel – 2
		Total SBS: Parcel – 3
Interpersonal sensitivity	Interpersonal Sensitivity Measure	Total IPSM[a]: Parcel – 1
		Total IPSM[a]: Parcel – 2
		Total IPSM[a]: Parcel – 3
Social risk taking	Risk Behavior Scale	Social: Parcel - 1

Construct	Instrument	Subscales
		Social: Parcel - 2

Note.

DS = Defeat Scale; SCS = Social Comparison Scale; SEES = State Self-Esteem Scale; IPSM = Interpersonal Sensitivity Measure; SBS = Submissive Behaviour Scale.

[a] Total IPSM is composed of fifteen items (see Appendix I) that were selected from four subscales (*Interpersonal Awareness, Need for Approval , Timidity,* and *Fragile Inner-Self*).

Table 2 – 2

Means, Standard Deviations, and Correlations for the Initial Model Variables (N = 397)

Variables	*M (SD)*	1	2	3	4
1. DASS 21: Depression – P1[a]	0.83 (0.77)	–			
2. DASS 21: Depression – P2 [a]	0.93 (0.85)	.69**	–		
3. IPSM – P1[b]	12.70 (2.53)	.27**	.25**	–	
4. IPSM – P2[b]	14.38 (2.90)	.34**	.29**	.57**	–
5. IPSM – P3[b]	14.07 (2.63)	.27**	.22**	.55**	.66**
6. ASQ: Secure Attachment – P1[c]	17.31 (3.09)	-.47**	-.40**	-.38**	-.26**
7. ASQ: Secure Attachment – P2[c]	16.89 (3.17)	-.40**	-.35**	-.32**	-.20**
8. RBS: Social Risk – P1[d]	13.07 (2.86)	-.03	.05	-.19**	-.03
9. RBS: Social Risk – P2[d]	11.59 (3.00)	.03	.11*	-.25**	-.10*
10. SCS – Rank[e]	24.53 (6.57)	-.41**	-.41**	-.35**	-.30**
11. SCS – Group Fit[e]	19.10 (4.73)	-.37**	-.38**	-.29**	-.28**
12. SCS – Attractiveness[e]	25.96 (5.39)	-.37**	-.34**	-.34**	-.32**
13. Defeat Scale – P1	1.56 (1.06)	.58**	.51**	.39**	.38**
14. Defeat Scale – P2	1.90 (0.78)	.57**	.50**	.39**	.37**
15. Defeat Scale – P3	2.06 (0.91)	.59**	.52**	.30**	.32**
16. Submissive Behaviour – P1 [f]	7.38 (3.14)	.29**	.24**	.33**	.35**
17. Submissive Behaviour – P2 [f]	6.97 (3.17)	.28**	.27**	.41**	.31**
18. Submissive Behaviour – P3 [f]	6.18 (3.48)	.26**	.21**	.30**	.27**
19. SSES: Self-Esteem Total [g]	74.85 (12.11)	-.57**	-.50**	-.43**	-.54**

Variables	5	6	7	8	9	10
5. IPSM – P3 [b]	–					
6. Secure Attachment – P1[c]	-.29**	–				
7. Secure Attachment – P2[c]	-.16**	.68**	–			
8. RBS: Social Risk – P1[d]	-.07	.07	. 13**	–		
9. RBS: Social Risk – P2[d]	-.13*	.12*	.17**	.58**	–	
10. SCS – Rank[e]	-.28**	.58**	.44**	.04	.02	–
11. SCS – Group Fit[e]	-.28**	.49**	.37**	.07	.11*	.77**
12. SCS – Attractiveness[e]	-.36**	.48**	.37**	.10*	.17**	.70**
13. Defeat Scale – P1	.36**	-.53**	-.45**	-.06	-.09	-.49**
14. Defeat Scale – P2	.33**	-.55**	-.51**	-.11*	-.13*	-.50**
15. Defeat Scale – P3	.27**	-.59**	-.50**	-.06	-.08	-.49**
16. Submissive Behaviour – P1 [f]	.36**	-.34**	-.27**	-.14**	-.18**	-.29**
17. Submissive Behaviour – P2 [f]	.32**	-.46**	-.40**	-.09	-.17**	-.33**
18. Submissive Behaviour – P3 [f]	.31**	-.41**	-.32**	-.11*	-.13**	-.30**
19. SSES: Self-Esteem Total [g]	-.49**	.56**	.50**	-12*	.17	.51**

Variables	11	12	13	14	15	16	17
11. SCS – Group Fit[e]	–						
12. SCS – Attractiveness[e]	.78**	–					
13. Defeat Scale – P1	-.43**	-.48**	–				
14. Defeat Scale – P2	-.45**	-.50**	.78**	–			
15. Defeat Scale – P3	-.46**	-.52**	.76**	.80**	–		
16. Submissive Behaviour – P1[f]	-.31**	-.36**	.32**	.36**	.36**	–	
17. Submissive Behaviour – P2[f]	-.31**	-.31**	.35**	.35**	.39**	.74**	–
18. Submissive Behaviour – P3[f]	-.30**	-.35**	.36**	.35**	.34**	.70**	.70**
19. SSES: Self-Esteem Total[g]	.56**	.62**	-.65**	-.67**	-.67**	-.45**	-.46**

Variables	18
18. Submissive Behaviour – P3 [f]	–
19. SSES: Self-Esteem Total [g]	-.45**

*$p < .05$

**$p < .01$

Note.

P1 = parcel 1

P2 = parcel 2

P3 = parcel 3

[a] Depression Anxiety Stress Scales 21

[b] Interpersonal Sensitivity Measure

[c] Attachment Style Questionnaire

[d] Risk Behavior Scale

[e] Social Comparison Scale

[f] Submissive Behaviour Scale

[g] State Self-Esteem Scale

Table 2 – 3

Unstandardized and Standardized Pattern Coefficients for the Measurement Model

Measure and Variable	Unstandardized	*SE*	*CR*	Standardized
Defeat				
Defeat-Parcel 1	1.14	.05	23.74	.87
Defeat-Parcel 2	.87	.03	25.74	.90
Defeat-Parcel 3	1.0			.89 [a]
Social Comparison				
SCS-Group Fit	.92	.04	22.23	.89
SCS-Rank	1.22	.06	21.03	.86
SCS-Attractiveness	1.0			.85 [a]
Secure Attachment				
ASQ-Confidence-Parcel 1	1.18	.08	15.09	.90
ASQ-Confidence-Parcel 2	1.0			.75 [a]
Depression				
DASS-21-Depression-Parcel 1	1.0			.88 [a]
DASS-21-Depression-Parcel 2	.97	.07	14.92	.78
Interpersonal Sensitivity				
IPSM-Parcel 1	1.0			.71 [a]
IPSM-Parcel 2	1.31	.10	13.70	.82
IPSM-Parcel 3	1.15	.09	13.50	.79

Submissive Behaviour				
SBS-Parcel 1	1.0			.85 [a]
SBS-Parcel 2	1.03	.05	20.13	.87
SBS-Parcel 3	1.06	.06	18.73	.81

Note. *N* = 397. Defeat = Defeat Scale; both Social Comparison and SCS = Social Comparison Scale; both Secure Attachment and Confidence = the Confidence subscale from the ASQ; ASQ = Attachment Style Questionnaire; Depression = Depression subscale from the DASS-21; DASS-21 = Depression Anxiety Stress Scales 21; both Interpersonal Sensitivity and IPSM = Interpersonal Sensitivity Measure; and, both Submissive Behaviour and SBS = Submissive Behaviour Scale. CR is the *z* score that results from dividing the unstandardized estimate by the estimate of its standard error.

[a] All standardized pattern coefficients were statistically significant at $p < .001$ except for those coefficients fixed at 1.0 and not tested.

Table 2 – 4

Correlation Among Latent Variables for the Measurement Model and Moderation

Variables	1	2	3	4	5	6	7
1. Defeat	---						
2. Social Comparison	-.59**	---					
3. Secure Attachment	-.62**	.55**	---				
4. Self-Esteem	-.73**	.61**	.58**	---			
5. Depression	.68**	-.44**	-.46**	-.57**	---		
6. Interpersonal Sensitivity	.39**	-.40**	-.34**	-.57**	.31**	---	
7. Submissive Behaviours	.40**	-.38**	-.44**	-.50**	.29**	.43**	---

Note. $N = 397$.

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

Table 2 – 5

Bootstrap Analysis of Indirect Effects – Depression as a Mediator

Mediated Effect	β (standardized path coefficient and product)	Indirect effect (B)[a]	*SE*[a]	95% CI for indirect effect[a]
Defeat →Interpersonal Sensitivity	(.65) x (.58) = .38	.85	.15	.589 to 1.150***
Social Comparison →Interpersonal Sensitivity	(-.17) x (.58) = -.10	-.04	.02	-.077 to -.007*
Secure Attachment →Interpersonal Sensitivity	(-.22) x (.58) = -.12	-.10	.04	-.186 to -.017*
Defeat →Submissive Behaviour	(.65) x (.57) = .37	1.24	.17	.929 to 1.597***
Social Comparison →Submissive Behaviour	(-.17) x (.57) = -.10	-.06	.03	-.106 to -.009*
Secure Attachment →Submissive Behaviour	(-.22) x (.57) = -.12	-.14	.06	-.271 to -.022*

Note. N = 397. CI = confidence interval.

[a]These values are based on the unstandardized path coefficients.

*This 95% confidence interval excludes zero and is statistically significant ($p < .05$).
**This 95% confidence interval excludes zero and is statistically significant ($p < .01$).
***This 95% confidence interval excludes zero and is statistically significant ($p < .001$).

Table 2 – 6

Hierarchical Regression Analyses with Defeat, Social Comparison, Secure Attachment, Depression, and the Interaction Effects of Self-Esteem as Predictors of Submissive Behaviour

Variable	β	F	ΔR^2
Step 1			.25***
Defeat	.18	7.29**	
Social Comparison	-.13	5.66*	
Secure Attachment	-.26	18.86***	
Depression	.02	.00	
Step 2			.01
Defeat x Self-Esteem	.07	2.37	
Step 2			.00
Social Comparison x Self-Esteem	-.02	.19	
Step 2			.00
Secure Attachment x Self-Esteem	-.05	1.18	

Variable	β	F	ΔR^2
Step 2			.01
Defeat x Self-Esteem	.12	2.13	
Social Comparison x Self-Esteem	.07	1.01	
Secure Attachment x Self-Esteem	-.01	.03	

* $p < .05$. ** $p < .01$. *** $p < .001$.

Table 2 – 7

Hierarchical Regression Analyses with Defeat, Social Comparison, Secure Attachment, Depression, and the Interaction Effects of Self-Esteem as Predictors of Interpersonal Sensitivity

Variable	β	F	ΔR^2
Step 1			.23***
Defeat	.25	13.29***	
Social Comparison	-.20	12.27**	
Secure Attachment	-.04	.00	
Depression	.08	2.03	
Step 2			.01*
Defeat x Self-Esteem	.10	4.74*	
Step 2			.00
Social Comparison x Self-Esteem	-.00	.01	
Step 2			.00
Secure Attachment x Self-Esteem	-.06	1.55	

Variable	β	F	ΔR^2
Step 2			.02*
Defeat x Self-Esteem	.21	7.34**	
Social Comparison x Self-Esteem	.15	4.67*	
Secure Attachment x Self-Esteem	.00	.00	

* $p < .05$. ** $p < .01$. *** $p < .001$.

CHAPTER 3

CAN THE SOCIAL RISK HYPOTHESES EXPLAIN ANXIETY?

Introduction

Anxiety-related disorders affect 1 in 4 adults in North American society which is more than any other DSM diagnosis (Kessler et al., 2005). The experience of anxiety often manifests as an unpleasant interplay of emotional, cognitive, and physiological markers that lead people to fear and avoid certain situations or objects, but can also be applied to more global scenarios. People struggling with anxiety find themselves in either an inhibited or heightened state of reactivity to looming dangers that are, in reality, less intense or in some cases may not even be present (American Psychiatric Association, 2000). Theories surrounding the developmental underpinnings of this debilitating mental state by and large lean towards early learning and reinforcement (Mineka & Zinbarg, 2006), social cognitive theory (Bandura, 1989), and genetic transmission (Hettema, Neale, & Kendler, 2001). All of these explanations have empirical support, but which one is correct?

When the evolutionary history of the human genus is considered, understanding how people survived and reproduced is key, and invariably, the notion of *functionality* needs to be probed (Buss, 2005). What function could anxiety serve to aid in our propagation as a species? When prehistoric people were pulled away from the cliffs edge and underwent a severe reprimand from a conspecific, they learned to avoid long falls. Thoughts and awareness of these and other dangerous environmental conditions solidified allowing these individuals to survive (and reproduce). This genetic transmission of adaptive knowledge spread and persisted all the way into the modern age. Although the controversy over evolutionary explanations run deep (for a review, see Gannon, 2002) some investigators fail to appreciate that evolution is about selective

advantage to new challenges, rather than contentment and emotional health (Nesse, 1998). Anxiety and fear in the face of potential dangers is painful and unpleasant but it can also trigger behaviour that saves one's life. For humans, some of the greatest risks are related to threats to social status and acceptance, and some of the deepest fears are social in nature.

Review of the Literature

Anxiety is commonly held to be the psychological disorder most demonstrative of an adaptive evolutionary mechanism (Gilbert, 2001a; Gilbert & Towers, 1990; Hofer, 1995; Nesse, 1990; Pine & Shapiro, 2006; Price, 2003). Such a mechanism offers an adaptive solution to social and environmental conditions which serves to augment one's inclusive fitness, thereby increasing the chance to pass on one's genes to successive generations (Hamilton, 1964). The development of social anxiety can be viewed as a form of preparedness that allowed an individual to cope with distress that arose in response to actual or threatened exclusion from important social groups (Baumeister &Tice, 1990). Accordingly, a person's anxiety can serve to trigger hypersensitivity (in the face of social judgment) to group exclusion for reasons of incompetence, rule breaking, or unattractiveness. Likewise, there is a selective advantage to become over-aroused in the face of danger as the chances of escape increases (Nesse, 1999). The social challenges faced in human communities may have changed over history, but the functionality of such mechanisms still remains (Allan & Badcock, 2003; Gilbert, 2001a; 2004; 2006; Nesse, 2000, 2005; Pinker, 1997).

With the exception of specific phobias and the challenges posed by predators and natural dangers, social and interpersonal challenges seem to weave through most evolutionary explanations of anxiety. Furthermore, it is not just any social group that provokes heightened sensitivity (and resulting anxiety), but it is kin members whose behaviour is under the greatest

scrutiny for group exclusion (e.g., theft, infidelity, or murder) because expulsion would lead to a decrease in survival and reproductive success (Buss, 1990). According to evolutionary analysis, then, it is the manifestation of social anxiety that operates in large part to keep appetitive drives in-check and maintains closeness and protection from nonspecific aggressors when the social context is replete with conflict and/or adversity. Thus, the evolutionary significance of social anxiety is that it provides a complex response to social environments that are perceived as tenuous and threatening to survival and reproduction in early humans (Gilbert, 2001a; Gilbert & Trowers, 1990; Hofman, Moscovitch, & Heinrichs, 2004). In the case of separation anxiety and panic disorder, when the mother of a primate infant leaves his or her proximity a protest response is triggered in order to keep the mother close by as the threat of attack, starvation, and exposure to the elements all increase exponentially. The priming of this attachment arousal system is demonstrative of the anxiety mechanism operating to allow for the ongoing survival of an infant (Sloman, Farvolden, Gilbert, & Price, 2006).

There is little debate about why evolutionary explanations of anxiety would predominantly target the interpersonal (versus the intrapersonal) domain as the primary spawning grounds. And so, it is no surprise that other forms of psychopathology might also emerge from similar socially adaptive challenges as means of responding to losses and threats (see Gilbert, 2001a). However, the most prevalent co-occurring (comorbid) mental disorder with anxiety in our species' propagation, was as it is today, depression (Price, 2003; Sloman, Farvolden, Gibert, & Price, 2006; also see Hettema, 2008).

Depression and anxiety are more likely to occur together than either condition by itself (Sanderson, Beck, & Beck 1990), and may even represent a single diagnosis (Tyrer, 2001). The lifetime comorbidity of depression with anxiety is reported to be as high as 8.6% in diagnosed

patients (Kessler et al., 1996). Depression can come to resemble anxiety in the adult years (Murphy et al., 2004). As well, anxiety disorders can evolve into depressive or comorbid states over time (Angst, Vollrath, Merikangas, & Ernst, 1990; Hagnell & Grasbeck, 1990). These findings suggest that many of the mechanisms operating in depressed mood are similar to those that operate in anxiety. It has been identified that an underlying feature in both depression and anxiety is the occurrence of *stressful life events* that precipitate both conditions (Kendler, Karkowski, & Prescott, 1998). Similarly, some personality traits in both popular literature (Alford & Gerrity, 2003; Clark, Watson, & Mineka, 1994; Cox et al., 2000) and evolutionary theorizing (Millon, 1990) have been identified as vulnerability factors to the development of depression *and* anxiety, thereby highlighting the overlap between these two disorders. Rightly so, one would expect that the evolutionary explanations and theories tend to apply equally well to both sets of psychological symptoms.

The Similarities of Evolutionary Explanations for Anxiety and Depression

The overlap between depression and anxiety in evolutionary terms has been a topic of investigation dating back over four decades ago (Price, 1967). In his social rank theory, Price argued that depression and anxiety functioned in a complementary (or adaptive) fashion to ameliorate conflict within the social hierarchies of our humanoid descendants. More recently, scholars have posited that the depression and anxiety mechanisms may actually function *more* efficiently in conjunction with each other (e.g., Price, 2003; Sloman et al., 2006). According to this line of research, the functional roots of Generalized Anxiety Disorder (GAD), Separation Anxiety, Social Anxiety, and Panic Attacks have evolved as a way of controlling stressful conflict interactions. For example, an agonistic encounter may involve a confrontation by a dominant conspecific which will arouse one of the body's physiological defenses of fight, flight,

fright, or freeze (Bracha, Ralston, Matsukawa, Williams, & Bracha, 2004) and the subsequent behavioural changes. In this struggle for top position in the social structure the losing opponent may seek reconciliation following the conflict. When the losing party engages in reassurance seeking from the victorious opponent this helps to assuage the anxiety in the subordinate while decreasing the potential for subsequent hostility. In this situation, mild depression would function to curtail the need for retribution or retaliation, while anxiety communicates that there is no longer a threat to the former rival by an appropriate act of submission (Sloman et al., 2006).

The relatedness of evolutionary theories for depression (see Gilbert, 2006; Nettle, 2004) and anxiety are held by most evolutionary psychology researchers. Overall, research suggests that the mechanisms of social rank and attachment seem to function equally well within the wide variety of proposed frameworks for depression and anxiety (e.g., Gilbert, 2000; Gilbert, Allan, Brough, Melley, & Miles, 2002; Sloman, 2008). Interestingly, one line of evolution-based research has argued strongly against the inclusion of anxiety in their comprehensive model of adaptive depression (Allen and Badcock, 2003).

In their *social risk hypothesis*, Allen and Badcock (2003) emphasize the role of risk management in depression (e.g., Leahy, 1997; Loewenstein, Weber, Hsee, & Welch, 2001) and argue that mild to moderate depression (not severe depression) served an adaptive purpose in our evolutionary history. These authors theorize that depression in prehistoric times served to decrease the likelihood of exclusion from the group. Depression was thought to activate cognitive hypersensitivity to indicators of social risk, signal behaviours that would reduce social threat and elicit social support, and lastly, this mood was believed to have caused a general reduction in an individual's propensity to engage in socially risky (e.g., confident, acquisitive) behaviours.

The *social risk hypothesis* is an integrative evolutionary theory of depression that has relied heavily on the theoretical and empirical findings from the three major Darwinian conceptualizations of depression (i.e., resource conservation, social competition, and attachment). Each of these three evolutionary models of depression emphasizes the adaptive nature that this mood state served in the human species' early development.

The *resource conservation* theories suggest that depressed mood was an adaptive response to environmental and social situations where exerting excess energy would be futile. Instead, an individual would conserve their resources by adopting a depressed mood until a propitious or productive opportunity arose that would be worthy of their energy or investment. Several well-known theories under this veil include Seligman's (1975) *learned helplessness theory* (when interpreted from an evolutionary perspective), Nesse's (2000) *resource allocation theory*, Klinger's (1975) *incentive disengagement theory*, and Leahy's (1997) *sunk costs* model which all account for the diminished or inhibited behaviours toward seeking what seems to be unobtainable incentives or goals. Accordingly, Allen and Badcock (2003) have incorporated these views in their model by asserting the notion that depressed states embody a risk-management strategy that inhibits risk taking in low pay-off and high-threat environments.

Unlike the resource conservation accounts of depression, the *social competition* theories acknowledge that individuals' reproductive opportunities are strongly related to their relative position or rank among their conspecifics (e.g., Price, 1989; Price, Sloman, Gardner, Gilbert, & Rhode, 1994). Social status was determined by competitive encounters (e.g., fighting) that would undoubtedly end with a winning and a losing party. The winning contestant would often adopt an escalating strategy that indicated a willingness to re-engage in aggressive acts based on a successful history, whereas the loser adopts a deescalating strategy (subordination or yielding

behaviour) to decrease the likelihood of further physical and social losses. Thus, from a social competition view of depression this mood state is an evolved, involuntary deescalating strategy (Price et al., 1994). However, according to Gardner and Price (1999) this deescalating strategy depends on several factors including the importance of the resource being fought over, the sense of ownership for this resource, and each competitor's current status/rank in the groups which they collectively termed *resource holding potential* (RHP). A similar theory was put forth by Gilbert and his colleagues (Gilbert, 1997; Gilbert, Price, & Allan, 1995) called *social attention holding power* (SAHP) that instead of "resources," refers to one's ability to elicit positive attention and social benefits such as respect, desire, praise, and approval. In both cases depression occurs as a result of low levels of RHP or SAHP, and subsequent subordinate roles and perceived social defeat are assumed by these individuals. In a sample of college students and depressed patients, Gilbert (2000) found that both anxiety and depression had a similar association with two types of social rank, namely social comparison and submission. As expected, the results revealed that social comparison had a negative association when predicting anxiety and depression, while submissive behaviours had a positive relationship with the two mental disorders. Also, Iron and Gilbert (2005) found that social comparison predicts anxiety whereby those individuals who feel they rank higher than others tend to have significantly fewer anxiety symptoms. Such findings further accentuate the similarities between these two disorders. The *social risk hypothesis* acknowledges the evolutionary importance of social competition in the development of depression and locates this variable as one of the antecedents in this model of adaptive depression. However, Allen and Badcock (2003) assert that changes in the diversity of human social environments and social cognition call for a more complex account of depression than these two rank-oriented strategies.

The attachment theory of depression is also paramount in the *social risk hypothesis* because of the many important affect laden social activities found in our evolutionary past such as mate retention, alliance formation, and coalition building (Buss, 1991). Bowlby (1969, 1973, 1980) is among the most influential proponents of an evolutionary argument that accounts for depression. Central in this model of depression are the interactions between parent and child. From this perspective, secure affective bonding ensures that a parent will care for and protect his or her offspring, thereby safeguarding their children's survival and allowing for reproductive success which will also perpetuate the parents' genes. Thus, staying in close proximity to one's caregivers will promote survival. In the case of depression, the attachment model attributes the onset of this mood state to the loss or disintegration of significant interpersonal relationships. Although there is no consensus about the adaptive function of depressed mood in circumstances of interpersonal loss, several interpretations have been put forth. For example, depression is thought to inhibit risk taking or exploration when a secure attachment is absent (Gilbert, 1992), serve as a distress call (Frijda, 1994), promote searching behaviours for the lost relation (Averill, 1968), or motivate the depressed individual to avoid further dissolution of previously held bonds (Ingram, Miranda, & Segal, 1998). In the *social risk hypothesis* attachment security is viewed as an important indicator of how valued an individual is in their social environment. Allen and Badcock (2003) contend that humans are very sensitive to threats of rejection and ostracism from social relationships; and, therefore poor affiliations with others serves as a predictor of depression.

The relationship between affiliation bonds and anxiety seems to operate much like Allen and Badcock have outlined for depression. Irons & Gilbert (2005) found that for both males and females secure attachment had a negative association in predicting anxiety symptoms. They

surmised that a secure bond acted as a protective factor in the development of anxiety disorders. Recent investigations have looked into how the human attachment system is linked to indicators of anxiety by studying the release of the stress hormone cortisol. Tops, Van Peer, Korf, Wijers, and Tucker (2007) found that cortisol levels increased when attachment security was low and this led to an increase in anxiety symptoms. The relationship between attachment security and anxiety symptoms has been established in a wide variety of studies including children (Brumariu & Kerns, 2008), adolescents (Austin, Jamieson, Richards, & Winkelman, 2006), adults (Quirin, Pruessner, & Kuhl, 2008), nonclinical samples (Watt, McWilliams, & Campbell, 2005), and clinical samples (Eng, Heimberg, Hart, Schneier, & Liebowitz, 2001). There is also some indication that poor attachment and the negative thinking that results may be more associated with anxiety than depression. Safford, Alloy, Crossfield, Morocco, and Wang (2004) found that both depression and anxiety were significantly associated with negative cognitive style and insecure attachment. However, negative cognitive style and insecure attachment appeared to be independently and uniquely associated with negative affect, an indicator of anxiety (see Clark & Watson, 1991). Taken together, there is a substantial amount of research to suggest that poor attachment can lead to the development of depressive *or* anxious symptomatology (Bowlby, 1988).

Allen and Badcock (2003) contend that the *social risk hypothesis* is a plausible model in which to understand the evolutionarily adaptive mechanism behind the survival of depressed mood in human functioning and development. They argue that only depression is associated with a cognitive arousal system (or attentional bias) sensitive to alterations in human bonds, social competition, and experiences of defeat. Integral to the development of depressed mood is the mechanism which biases an individual's attention in order to make inferences about social value

and social burden, a ratio referred to as *social investment potential* (see Allen & Badcock, 2003). Anxiety is acknowledged by Allen and Badcock as having important evolutionary value, but they tend to view anxious symptoms as stemming from responses to physical threats rather than *socially* threatening stimuli which they attribute to depression exclusively (e.g., Beck, Rush, Shaw, & Emery, 1979; Mathews, Ridgeway, & Williamson, 1996). On this premise, Allen and Badcock (2003) argue that the *social risk hypothesis* is specific to depressed mood rather than operating in both depression and anxiety.

Anxiety disorders span a wide range of symptoms but have long been considered to fall into either *harm* or *shame* categories (Basowitz, Persky, Korchin, & Grinker, 1955). Despite this differentiation, interpersonal events or situations have been found to be more strongly associated with a variety of anxiety disorders (phobias, panic disorder, generalized anxiety disorder) compared to fears over death and physical injury, physical confinement, or physical threats by animals (Arrindell, Oei, Evans, Van der Ende, 1991) as the harm/shame categorization would suggest. In evolutionary times, the discrimination between anxiety and depression in a social context would often be moot as most EP researchers regard the functionality of each to be virtually synonymous (e.g., Gilbert, 2000; Gilbert et al., 2002; Irons & Gilbert, 2005; Sloman, 2008). There is a growing body of research to indicate the adaptive nature of anxiety as a mechanism that provides valuable information about the relative status and affiliation that an individual holds in relation to others (e.g., Gilbert, 2001b; Gilbert & Towers, 1990).

The purpose of the present study was to test the complete *social risk hypothesis* as an evolutionary model that explains anxiety. Exploring the evolutionary mechanisms behind anxiety disorders in this highly complex model can offer researchers and clinicians a more complete understanding of the adaptive significance of this long surviving physiological and behavioural

system. It was hypothesized that anxiety would operate in much the same way as depression was specified in Allen and Badcock's (2003) conceptualization of the *social risk hypothesis*. In particular, anxiety would mediate the relationships between secure attachment and both interpersonal sensitivity and submissive behaviours where low attachment would predict increases in the two outcome variables. Similarly, mediation would take place between high defeat and high scores in both interpersonal sensitivity and submissive behaviours. Lastly, anxiety was predicted to mediate the relationship between low social comparison and high interpersonal sensitivity and submissive behaviours. Given the extensive research linking anxiety and self-esteem (a measure of *social investment potential*), it was predicted that self-esteem would moderate each of the above mentioned relationships (see Figure 3 – 1).

Method

Participants

The participants in this study were full-time working adults selected from a variety of vocational fields in the city of Edmonton and surrounding area. A *full-time worker* was defined as an employee who works a minimum of 25 hours per week in one position. From the 1000 potential participants who received survey packages, 409 working adults responded. The response rate to the survey package was 40.9%. Of this total, 12 were removed because of missing data. The total number of participants in the final analyses was thus reduced to 397 (268 women and 125 men; 4 participants did not indicate their gender). As this was an anonymous survey there was no information available pertaining to the number of men and women who received questionnaire packages, and thus no analysis could be done on the response rate of each gender. The age of female respondents ranged from 18 to 65 years (M = 43.48, SD = 10.75) and male respondents ranged from 22 to 78 years of age (M = 48.25, SD 10.36). The majority of

respondents were married (68.4%), with 13.2% being single, 8.4% being divorced, 9.4% in long-term relationships, and 0.5% were widows or widowers. With regard to ethnicity, 89.3% described themselves as Caucasian, 4.3% Asian, 2.0% Aboriginal, 1.5% East Indian, 0.8% Middle Eastern, 0.8% Hispanic, and 1.3% indicated that none of the abovementioned categories represented their ethnicity. It is noteworthy that the ethnicity in this sample was quite representative of the demographic information reported by Statistics Canada for the city of Edmonton, Alberta (see Statistics Canada, 2001). The vocational fields consisted of administration (19%), nursing-related positions (18.8%), professors/teachers (15.9%), mental health professionals (9.5%), management (7.5%), clerical (5.1%), industrial trades (4.4%), computer technology (3.9%), doctors (3.6%), lawyers (1.5%), manual labor positions (1.5%), and 9% fell into a variety of other fields not previously mentioned. No personally indentifying information was requested on the survey, nor were surveys labeled by the researcher with any sort of code numbering system that could be used to identify specific participants.

Measures

Depression Anxiety Stress Scales 21 (DASS-21; Lovibond & Lovibond, 1995). The DASS-21 is a shortened version of the original 42-item *Depression Anxiety Stress Scales* (DASS; Lovibond & Lovibond, 1995) that contains 21 items relating to depression and dysphoric mood (depression subscale), symptoms of fear and autonomic arousal (anxiety subscale), and symptoms of general nervousness and agitation (stress subscale). A Likert-type scale is used to rate items according to symptoms experienced in the past week, ranging from 0 (not at all) to 3 (most of the time). Factor analytic studies with both clinical and nonclinical samples have shown that the DASS-21 items can be reliably grouped into three scales with high internal consistency (e.g., Antony, Bieling, Cox, Enns, & Swinson, 1998; Henry & Crawford, 2005).

The measure has been found to differentiate between symptoms of anxiety and depression, as well as between symptoms of physical arousal and symptoms of general anxiety such as tension (Antony et al., 1998; Henry & Crawford, 2005). The Depression subscale is composed of 7 items that measure symptoms associated with depressed mood (e.g., sadness, worthlessness), whereas the 7 items of the Anxiety subscale are related to symptoms of physical arousal, panic attacks, and fear (e.g., trembling, faintness). The last 7 items that comprise the Stress subscale measure symptoms such as tension, irritability, and a tendency to overreact to stressful events.

Only the Anxiety subscale ($\alpha = .77$) was used in this study. The recommendations of Russell, Kahn, Spoth, and Altmaier (1998) were followed in order to create two observed indicators for the latent variable of anxiety; however, instead of using factor analyses for this small 7-item unidimensional subscale the unique variance was determined for each item. The items were then rank ordered according to the magnitude of the contributing variance and successively assigned to pairs comprising the highest and lowest ranking items to equalize the average variance of each parcel. The two parcels for this subscale served as measured variables in the structural equation analysis.

Preliminary evidence suggests that the full-length DASS possesses adequate concurrent and discriminant validity in samples drawn from normal non-clinical samples (Crawford & Henry, 2003; Lovibond & Lovibond, 1995). In a sample of non clinical and clinical participants, Antony et al. (1998) demonstrated concurrent validity for the DASS-21 by correlating the subscales with established measures. The DASS-21 Depression subscale correlated highly ($r = .79$) with the *Beck Depression Inventory* (BDI; Beck et al., 1979), the DASS-21 Anxiety subscale correlated highly ($r = .85$) with the *Beck Anxiety Inventory* (BAI; Beck & Steers, 1990), and the DASS-21 Stress subscale correlated highly ($r = .68$) with another measure of stress, the

State-Trait Anxiety Inventory (STAI-T; Spielberger, 1983). Lovibond and Lovibond (1995) maintain that doubling the DASS-21 scores is directly equivalent to the derived scores from the full version. More recently, however, Henry and Crawford (2005) provided normative data for the DASS-21 from a large non-clinical adult British sample (N = 1,794). Confirmatory factor analysis once again supported the three-factor structure (Depression, Anxiety, and Stress) of the full length DASS. Furthermore, the three-factor structure has effectively differentiated between depressed and anxious patients (Clara, Cox, & Enns, 2001). Overall, the DASS-21 has a number of advantages over the DASS including having fewer items, a cleaner factor structure, and small inter-factor correlations (Antony et al., 1998; Henry &Crawford, 2005).

Risk Behavior Scale (RBS; Weber, Blais, & Betz, 2002). The RBS is a 40-item scale that measures an individual's perceived likelihood of engaging in specific risk-taking behaviours. Responses are measured on a 5-point Likert scale ranging from 1 (*Very Unlikely*) to 5 (*Very Likely).* Normative data was established in a sample of male and female undergraduate students (N = 560). Factor analysis produced five factors of risk-taking behaviour: social (8 items), recreational (8 items), health/safety (8 items), financial (8 items), and ethical (8 items). The coefficient alpha reliability across all 40 items was .88 (Weber et al., 2002). Test-retest reliabilities over a one-month interval produced respectable correlations for the *Health/Safety, Ethics,* and *Recreational* subscales (.75, .72, and .80, respectively), but the *Financial* and *Social* subscales (.44 and .58, respectively) were somewhat lower.

Convergent and discriminant validities were demonstrated by comparing the RBS with other established instruments, specifically Budner's (1962) *Scale for Intolerance of Ambiguity* (SIA), and Zuckerman's (1994) *Sensation-seeking Scale* (SS). As predicted, the SIA correlated significantly with the RBS's *Social* and *Recreational* subscales (r = -.30 and r = -.42,

respectively). Also as predicted, the subscales of the SS correlated with all of the domains on the RBS. In addition, self-reported frequencies of past risky behaviours in the five domains correlated with the behavioural intentions for behaviours in the same domain (i.e., the RBS subscale scores) (Weber et al., 2002).

In the present study, only the *Social* subscale was of interest. The reliability for the risk-taking *Social* subscale (α = .68) in the current study was similar to the reliability estimate found by Weber and her colleagues. This Cronbach's alpha coefficient, much like the one obtained by Weber et al. (2002) is approaching the .60 range suggesting that the instrument may have poor reliability (see Thorndike, 1997). The 8 items of this subscale were divided into two parcels using the rank order method. These two parcels were to serve as measured variables in the structural equation analysis.

Social Comparison Scale (SCS; Allan & Gilbert, 1995). The SCS is composed of 11 social comparison dimensions (Inferior-Superior, Incompetent-Competent, Unlikeable-Likeable, Leftout-Accepted, Different-Same, Untalented-More Talented, Weaker-Stronger, Unconfident-More Confident, Undesirable-More Desirable, Unattractive-More Attractive, Outsider-Insider) which an individual uses to rate themselves in relation to other people, using a 10-point Likert scale. Normative data were based on both undergraduate and clinical samples (Allan & Gilbert, 1995). The SCS was based on an earlier five-item version (Gilbert & Allan, 1994); however unlike the earlier scale, the current *Social Comparison Scale* contains three factors of social comparison (i.e., social rank, attractiveness, and social group fit). The *Social Rank* factor consists of the Inferior-Superior, Incompetent-More Competent, Untalented-More Talented, Weaker-Stronger, and Unconfident-More Confident items, the *Attractiveness* factor contains Unlikeable-

Likeable, Undesirable-More Desirable, and Unattractive-More Attractive, and the *Social Group Fit* factor contains the remaining three items.

The Cronbach alpha for the 11 item scale was .91 in a student population and .88 in a clinical population (Allan & Gilbert, 1995). The reliabilities among the subscales for the present study were as follows: *Rank* (α = .84), *Group Fit* (α = .86), and *Attractiveness* (α = .84). These three subscales served as measured variables of social comparison in the structural equation analysis. The discriminant validity for the *Social Comparison Scale* was established with the *Symptom Checklist-90-Revised* (SCL-90-R; Derogatis, 1983) on clinical and non-clinical samples (Allan & Gilbert, 1995; Gilbert, Price, & Allan 1995). Overall, the magnitude of the correlations increased between social comparison and psychopathology in the clinical groups compared to the student group. Interestingly, the social comparison of the *Social Group Fit* factor was not significant in the patient sample, although most of the SCL-90-R subscales were in the student group. Allan and Gilbert (1995) attribute this deviation to the group environment of a hospital setting where fitting in may not be desirable.

Submissive Behaviour Scale (SBS; Allan & Gilbert, 1997; Gilbert & Allan, 1994). The SBS is a 16-item unidimensional questionnaire in which respondents rate a series of statements on a 5-point scale (ranging from 0 to 4) where higher scores indicate more submissive behaviours. The scale was developed from the work of Buss and Craik (1986) and it seeks to differentiate between assertiveness and submissiveness in social interactions. The scale is designed to focus on social behaviours and also contains indicators of anxiety or depression (Allan & Gilbert, 1997). The scale has good internal and test-retest reliability. In a sample of undergraduate students, Gilbert et al. (1995) found a Cronbach's alpha of .89 and test-retest reliability over a four month period of .84. The Cronbach's alpha found in the present study (α = .87) was very

similar to Gilbert et al.'s. Concurrent validity of the SBS was established by its satisfactory correlation (r = .73) with the nonassertive measure of the *Inventory of Interpersonal Problems* (Horowitz, Rosenberg, Baer, Ureno, & Vallasenor, 1988) in a group of female undergraduate students (Gilbert, Allan, & Goss, 1996). Using the rank order method, three parcels were created from the SBS to serve as measured variables in the structural equation analysis.

State Self-Esteem Scale (SSES; Heatherton & Polivy, 1991). The SSES was developed as a measure of *state* rather than trait self-esteem. Heatherton and Polivy (1991) created the scale because of the insensitivities and minimal variability in responses of more traditional assessments of self-esteem (e.g., *Rosenberg's Self-Esteem Scale*; Rosenberg, 1965) that tended to only measure stable self-esteem. The SSES consists of 20 items that tap momentary fluctuations in self-esteem. The scale has good internal consistency (α = .92) and it is responsive to temporary changes in self-evaluation (see Crocker, Cornwell, & Major, 1993).

According to Heatherton and Polivy (1991) three factors exist within the SSES and these include a six-item *Appearance* subscale (α = .77), a seven-item *Performance* subscale (α = .76), and a seven-item *Social* subscale (α = .81). In the present study, the Cronbach's alpha coefficient for the Total SSES scale was identical (α = .92) to the one found by Heatherton and Polivy (1991). In addition, all of the subscales were very similar ranging from .83 to .87: *Attractiveness* (α = .83), *Performance* (α = .83), and *Social* (α = .87).

Based on their five studies, Heatherton and Polivy (1991) concluded that the SSES is psychometrically sound and has a high degree of construct and discriminant validity. They compared the SSES with other established measures of self-esteem, and found moderate to high correlations with each assessment tool [*Rosenberg Self-Esteem Scale*, r = .72 and *Janis-Field Feelings of Inadequacy Scale* (JFS; Janis & Field, 1959), r = .76]. Also, measures of depression,

anxiety, hostility, and physical appearance were compared to the three subscales. This examination revealed that the *Performance* factor was most highly related to overall self-esteem, trait anxiety, and depression, but not social desirability, physical appearance, and hostility. The *Social* factor was most highly associated with trait social self-esteem (on the JFS) but less related to hostility and physical appearance. As expected, the *Appearance* factor was most highly related to physical appearance, depression, and overall self-esteem (on the *Rosenberg Self-Esteem Scale*), but was unrelated to social desirability. Discriminant validity of the SSES and its subscales was established by measuring changes in self-esteem between Day 1 and subsequent time periods. For example, Heatherton and Polivy (1991) found a drop in *Performance* state self-esteem on Day 2 when participants were told that they were going to take a difficult exam, whereas no statistically significant differences were observed on the *Social* and *Appearance* subscales. The Total SSES scale was used in the analysis of moderation in the current study. Moderation was assessed using the hierarchical regression analyses as outlined by Baron and Kenny (1986) in order to determine whether *social investment potential* was sensitive to fluctuations in the exogenous variables (i.e., defeat, social comparison, and secure attachment) leading to anxiety.

Attachment Style Questionnaire (ASQ; Feeney, Noller, & Hanrahan, 1994). The ASQ is a 40-item, Likert-type, self-administered questionnaire designed to measure five dimensions central to Hazan and Shaver's (1987) and Bartholomew's (Bartholomew & Horowitz, 1991) conceptualizations of adult attachment. The *Confidence* scale contains eight items relating to secure attachment behaviours, such as trust in others and belief in one's self-worth. There are two scales measuring preoccupied attachment behaviours: *Preoccupation with Relationships* (8 items) characterizes the anxious reaching out to others in order to fulfill dependency needs, and

Need for Approval (7 items) reflects the individual's need for others' acceptance and confirmation. There are also two scales that measure dismissing attachment behaviours: *Relationships as Secondary* (7 items) contains items which describe the individual as protecting themselves against hurt and vulnerability by emphasizing achievement and independence. *Discomfort with Closeness* (10 items) relates to feeling uncomfortable with intimacy and closeness.

Respondents are asked to rate items on a 6-point scale ranging from *totally agree* to *totally disagree*. The scales have good internal and test-retest reliability (coefficient alpha of .74 over a 10-week period) with university and secondary school student samples, and the items also loaded appropriately on Hazan and Shaver's (1987) forced-choice attachment measure (Feeney et al., 1994). Feeney et al. (1994) gave the *Attachment Styles Questionnaire, the Intimacy, Conflict, and Parenting Style* (ICPS) *Family Functioning Scales* (Noller, Seth-Smith, Bouma, & Schweitzer, 1992), and/or the *Junior Eysenck Personality Questionnaire* (JEPQ) (Eysenck & Eysenck, 1975) to a sample of eighth graders. They found that perceptions of high family intimacy, democratic parenting, and low levels of family conflict on the ICPS were associated with high scores on *Confidence* and low scores on the scales measuring aspects of insecure attachment. On the JEPQ, *Neuroticism* was correlated with *Preoccupation with Relationships* and *Need for Approval*, while *Extroversion* was correlated with *Confidence* and with low levels of *Discomfort with Closeness* and lack of emphasis on *Relationships as Secondary*. Feeney et al. (1994) reported Cronbach alphas for the five scales as *Confidence* (α = .78), *Discomfort with Closeness* (α = .86), *Need for Approval* (α = .77), *Preoccupation with Relationships* (α = .74), and *Relationships as Secondary* (α = .72). In the present study, only the *Confidence* subscale (α = .82) was collected to function

as a measure of secure attachment. Using the rank order method of parceling, two parcels were created to function as measured variables in the structural equation analysis.

Interpersonal Sensitivity Measure (IPSM; Boyce & Parker, 1989). The IPSM consists of 36-items that were developed to measure both the over sensitivity to social interactions and cognitive distortions common in depression-prone individuals (Boyce & Mason, 1996; Boyce & Parker, 1989) and it has been termed the measure of "interpersonal rejection sensitivity" in assessing anxiety (see Harb, Heimberg, Fresco, Schneier, & Liebowitz, 2002). Each item is scored on a 4-point Likert scale (1 = very like me; 2 = moderately like me; 3 = moderately unlike me; and, 4 = very unlike me), allowing total scores on the instrument to range from 36 to 144. Although participants are usually asked to respond based on how they *generally* feel consistent with a more stable personality trait (Boyce et al., 1992), in the present study respondents were asked how they felt at the time they completed the questionnaire.

The scale measures five components of interpersonal sensitivity: 1) *Interpersonal Awareness*, referring to the way an individual appraises and attributes meaning to a situation; 2) *Need for Approval*, assessing the extent to which an individual needs to be approved of by others; 3) *Separation Anxiety*, assessing any undue anxiety about possible separation from a significant other; 4) *Timidity*, focusing on behavioural aspects of depression-prone characteristics, particularly the inability to behave assertively; and 5) *Fragile Inner Self*, which identifies difficulty with self-disclosure for fear of being rejected or ridiculed.

Boyce and Parker (1989) report that the IPSM has demonstrated satisfactory internal consistency in both a depressed ($\alpha = .86$) and non-clinical sample ($\alpha = .85$). The instrument was found to be moderately stable over time in a non-clinical group (test-retest coefficient = .70). However, the IPSM does show sensitivity to current mood in depression and those recovering

from depression (Boyce & Parker, 1989). In fact, elevated scores on the IPSM in a sample of non-depressed women over a six month period were predictive of increased risk of depression (Boyce, Parker, Barnett, Cooney, & Smith, 1991).

Boyce and Parker (1989) demonstrated concurrent validity by comparing the scores on the IPSM from nearly 500 participants (depressed patients and non-clinical students) with psychiatric interviews from clinicians (r = .72). Also, convergent validity was demonstrated by the moderately high correlation (r = .66) between the IPSM and the *Neuroticism* subscale of the *Eysenck Personality Inventory* (Eysenck & Eysenck, 1975). Shortened versions of the IPSM have been utilized in previous studies (e.g., Gillespie, Johnstone, Boyce, Heath, & Martin, 2001; Todd, Boyce, Heath, & Martin, 1994). In the present study, the *Separation Anxiety* subscale was excluded from the analysis due to the direct overlap with the questions of the DASS anxiety variable. Fifteen items were selected (see Appendix I) from the other four subscales [*Interpersonal Awareness* (α = .79), *Need for Approval* (α = .61), *Timidity* (α = .75), and *Fragile Inner-Self* (α = .79)]. These items were selected based on face validity (i.e., interpersonal awareness and social risk taking) prior to conducting any analysis. Using Allen and Badcock's (2003) algorithmic model (see Figure 2, page 897 of their article), items that encapsulated attending to socially threatening information and interpreting social situations as threatening were selected. Three equal sized parcels were created using the rank order method which served as measured variables in the structural equation analysis.

Defeat Scale (DS; Gilbert & Allan, 1998). According to Gilbert and Allen (1998) the DS is the first and only self-report measure of subjective experiences of defeat. The *Defeat Scale* is designed to measure a sense of personal failure and loss of social rank. The measure consists of 16 items to which participants are asked to respond on a 5-point Likert scale indicating the extent

to which each item describes their feelings (0 = never; 1 = rarely; 2 = sometimes; 3 = mostly; 4 = always/all the time). Using a large sample of non-clinical university students and a group of clinically depressed patients, the authors reported Cronbach's alpha as .94 for the student group and .93 for the depressed participants. High internal consistency was also observed between the sexes, the alpha for females being .94 and male .93 for both student and the depressed groups.

Factor analysis of the scale items revealed that all items possessed a loading of at least .45 or higher, indicated the unidimensionality of the construct. Concurrent validity for the *Defeat Scale* was established using the BDI and *Beck Hopelessness Scale* (BHS; Beck, Weissman, Lester, & Trexler, 1974). In each case, high correlations were reported suggesting the DS is measuring a construct related to depression and hopelessness, but the scale is also deemed to be distinct from these two measures and other rank-oriented scales (Gilbert & Allan, 1998). The Cronbach's alpha coefficient for the entire *Defeat Scale* in the present study was .95. This scale was split into 3 parcels using the rank order method. These parcels were used as the measured variables in the structural equation analysis.

Procedures

A mail-out survey package was sent to the work addresses through the company mail system of all potential participants at each selected worksite over the winter of 2006/2007. Individual worksites were selected based on the heterogeneity of the vocational positions at each company. In other words, a conscientious effort was made to sample a wide range of professions. An information letter accompanied the survey that described depression and social interactions as focal dimensions of interest and indicated that participation was strictly voluntary; however, a $5 donation would be made to a charity of their choice with each returned package. Furthermore it was communicated that all questionnaires would be stored safely in a locked file cabinet for a

period of 7 years, after which time all data will be shredded. Potential participants were asked to ensure no identifying information (e.g., names) was recorded on the package; instead, they were informed that only researcher assigned numbers would be used to identify individual responses. Estimated completion time of the questionnaire package was between 20-30 minutes. Returning the questionnaire package constituted consent to participate in the study, and anonymity was assured by sending identical packages. Approval for the project was obtained from the University of Alberta's ethics review committee.

Results

Preliminary Analyses

Means, standard deviations, and correlations for the 19 measured variables are shown in Table 3 – 1. It was evident after looking at the very low (and near zero) correlations of the two parcels of the *Social* subscale from the RBS and most of the other measured variables that this instrument was not reliably and validly measuring social risk taking. Previous research has established that strong associations do exist between this variable and the other variables in this study (see Allan & Badcock, 2003; 2006a; 2006b) suggesting some psychometric and/or construct-related problems with this scale. As already mentioned, the *Social* subscale of the RBS only had a Cronbach's alpha coefficient of .68 indicating somewhat poor reliability. As such, it was decided that this unreliable measure would be removed altogether from subsequent analyses. The remaining data were checked for normality. Both of the parcels on the *Anxiety* subscale of the DASS-21 and all three parcels of the *Defeat Scale* had skewness values that approached or exceeded 2 and/or kurtosis values that approached or exceeded 7 (see Curran, West, & Finch, 1996). It should be noted that, just as the rate of anxiety in the general population is negatively skewed (i.e., approximately 20% -25%) so too was the rate measured in this sample. These

measured variables were subjected to square-root transformations that resulted in skewness values of 1 or less and kurtosis values of 1 or less. The transformed values were used in subsequent analyses. The multivariate normality of the data was assessed using Mardia's coefficient of multivariate kurtosis (see Byrne, 2001) and a value of 25.63 (critical ratio of 10.64) was obtained. This result implies multivariate non-normal data. Lei and Lomax (2005) have found that parameter estimates and most model fit indices are robust to non-normality given maximum likelihood estimation and a sample size of 100 or more participants. Nonetheless, an additional measure of model fit (the Bollen-Stine bootstrap chi-square) was employed which compared bootstrapped parameter estimates to estimates from a maximum likelihood procedure (see Nevitt & Hancock, 2001; Yung & Bentler, 1996). In all cases, the statistical significance value for the Bollen-Stine bootstrap chi-square and the bootstrapped parameter estimates produced results comparable to those from the maximum likelihood procedure.

Measurement Model

Structural equation modeling of the covariance matrix was conducting using AMOS 16.0 with maximum likelihood estimation. Structural equation analysis followed the recommendations of Anderson and Gerbing (1988) to test first the measurement model and then the structural model. For both the measurement and structural models, a number of statistics to evaluate the fit between the model of interest and the data were evaluated. The overall chi-square statistic is a popular statistic but is influenced by sample size (see Byrne, 2001; Kline, 1998). A χ^2 / df ratio of less than 3 is indicative of good fit (Kline, 1998). Two fit indices that evaluate the improvement in fit between the null model of independence and the proposed model but take into account sample size are the normed fit index (NFI) and the comparative fit index (CFI); values for both indices should exceed a recommended cut-off value of .90 (Byrne, 2001). The

goodness of fit index (GFI) is equal to the proportion of variability in the covariance matrix explained by the model; values greater than .90 indicate a reasonable fit of the model to the data. The root mean square error of approximation (RMSEA) is a measure of fit that is sensitive to the number of estimated parameters in the model; a value less than .08 indicates a good fit (Byrne, 2001).

To assess whether the measurement model was an acceptable fit to the data, all latent variables were correlated to all other latent variables. The fit for the measurement model was acceptable; χ^2 (89, N = 397, p < .001) = 199.50, χ^2 / df = 2.24, NFI = .950, CFI = .971, GFI = .940, RMSEA = .056 (90% CI: .046, .066). Examination of modification indices, a univariate form of the Lagrange multiplier tests in AMOS, suggested no major changes to the measurement model to improve fit. All measured variables loaded on their respective latent variables (p < .001) and standard errors were appropriate (Table 3 – 2). The correlations among the latent variables are reported in Table 3 – 3. All of the relationships between the latent variables were statistically significant (p < .01).

Structural Model

The second step of the analysis was to test a structural model or the paths between the latent factors. The initial test produced a model that was an acceptable fit to the data; χ^2 (96, N = 397, p < .001) = 310.01, χ^2 / df = 3.23, NFI = .922, CFI = .945, GFI = .908, RMSEA = .075 (90% CI: .066, .084). However, based on the Modification Indices feature of the AMOS 16.0 program there was some indication that correlating the error terms on the two parceled indicators for the DASS-21 *Anxiety* subscale may improve fit on both theoretical and practical grounds.

In particular, factor analysis by Henry and Crawford (2005) indicated that this 7-item scale was unidimensional, and thus not only would the predictive power in measuring anxiety

symptoms with these two parcels be correlated but so would the unmeasured variance (i.e., error terms). When correlating error terms for a single latent variable (or even between latent variables, see Keith, 2006, p. 353), a researcher is basically saying that the unique variances of the associated indicators overlap; that is, they measure something in common other than the latent construct that is represented in the model. Byrne and Watkins (2003) have gone further, and suggest that even error terms of single items (within a latent construct) can be correlated in a model. One likely possibility stems from the fact that these two indicators are from the same self-report scale, and are thus both susceptible to some response set or lack of reliability in measurement. Furthermore, Stan Maliuk, a leading expert on SEM, emphatically states that latent variables with fewer than four indicators may lead to underidentification of a fitting model (Hayduk & Glasser, 2000). As such, correlating the two error terms for these indicators would constitute theoretical and practical "data constraints" and would aid in the avoidance of underidentification where unique variances could not be appropriately estimated (c.f. Hayduk, 1987, p. 140). This change to the structural model was made. Following the correlation of the error terms on the two indicators from the anxiety latent variable, the analysis was then repeated. The second test produced a model that was a better fit to the data; χ^2 (95, N = 397, p < .001) = 228.14, χ^2 / df = 2.40, NFI = .943, CFI = .966, GFI = .932, RMSEA = .059 (90% CI: .050, .069). All paths were statistically significant (p < .05; see Figure 3 – 2) suggesting that there was no need to alter this model any further. For this model, 23.3% of the variance in interpersonal sensitivity and 25.9% of the variance in submissive behaviour was explained by the combination of secure attachment, social comparison, defeat, and anxiety.

Bootstrap Procedure for the Significance Level of Indirect Effects

Mediational analyses followed the recommendation of Shrout and Bolger (2002) to employ the bootstrap procedure available in AMOS to test indirect effects (see also MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002). There were three potential mediation paths through anxiety with two outcome variables (i.e., interpersonal sensitivity and submissive behaviour), and thus each relationship was examined individually. For example, the indirect effect of defeat to interpersonal sensitivity mediated by anxiety, the standard estimate of the indirect effect, and the statistical significance of the indirect effect were estimated from 5000 random samples generated from the data set (N = 397). The indirect effect between defeat and interpersonal sensitivity mediated by anxiety, β = .34, was statistically significant (p < .001). The indirect effect between social comparison and interpersonal sensitivity mediated by anxiety, β = -.13, was statistically significant (p < .05). However, the indirect effect between secure attachment and interpersonal sensitivity mediated by anxiety, β = -.13, was not statistically significant (p < .10). The indirect effect of defeat and submissive behaviour mediated by anxiety, β = .34, was statistically significant (p < .001). The indirect effect of social comparison and submissive behaviour mediated by anxiety, β = -.13, was statistically significant (p < .05). Much like the pathway to interpersonal sensitivity, the indirect effect of secure attachment and submissive behaviour mediated by anxiety, β = -.13, was not statistically significant (p < .10). The indirect effect and the 95% CIs for the indirect effect are reported in Table 3 – 4. If zero does not fall with the 95% CI, then the indirect effect is statistically significant (p < .05). Thus, it can be seen that anxiety mediated all relationships in the structural model except those from secure attachment to the outcome variables (i.e., interpersonal sensitivity and submissive behaviours).

Test for Moderation

A series of hierarchical regression analyses (Baron & Kenny, 1986; Frazer, Tix, & Barron, 2004) were performed to determine whether self-esteem (i.e., social investment potential) functioned in the role of a moderator (as suggested by Allen and Badcock's (2003) model) over and above the variance predicted by the main effect variables. Before analyses of the data took place, all measured variables were standardized to make it easier to plot (and understand) significant moderator effects (see Frazer et al., 2004). Next, the values of the standardized measured variables were multiplied by the corresponding standardized weights from the final structural model (see Figure 3 – 2). In other words, the standardized factor scores of the indicator variables are used to create their respective latent variables. The products from these simple equations become the latent variables for use in the moderation analyses. Two separate sets of analyses were conducted to allow for submissive behaviour and interpersonal sensitivity to serve as separate dependent variables. In Step 1 of the analyses, defeat, social comparison, secure attachment, and anxiety were all in a predictor block entered first in the regression equation which allowed for all of the main effects to be controlled for before testing interaction effects. Table 3 – 5 shows these variables combined to account for 26% of the variance in the submissive behaviour scores, $F(4, 392) = 34.91$, $p < .001$. In Table 3 – 6, it can be seen that 23% of the variance in the interpersonal sensitivity scores is accounted for by these four variables, $F(4, 392) = 29.59$, $p < .001$.

Two-way interactions. In Step 2, the self-esteem variable was combined into three separate interaction terms with defeat, social comparison, and secure attachment, respectively, as additional predictors of submissive behaviour (see Table 3 – 5) and interpersonal sensitivity (see Table 3 – 6). These three two-way interactions were tested while controlling for the main effects of all the predictor variables in separate analyses for both dependent variables. Each interaction

term was incrementally partitioned to determine the variance accounted for over and above the main effects for submissive behaviour and interpersonal sensitivity. Based on the recommendations of other researchers (e.g., Metalsky & Joiner, 1992), the effect of each interaction term was tested separately and then again while controlling for the effects of the other interaction terms. As such, the three interaction terms were combined into the second block to assess the unique contributions of each interaction term in predicting the dependent variable (i.e., interpersonal sensitivity and submissive behaviours) controlling for the other two interaction terms.

In Table 3 – 5, each interaction term is separately analyzed for the final dependent variable, submissive behaviour. There were no statistically significant interaction terms for self-esteem with any of the independent variables (i.e., defeat, social comparison, and secure attachment) in predicting anxiety. Similarly, when all three interaction terms were placed in Step 2, no statistically significant results were obtained. However, when interpersonal sensitivity served as the final dependent variable (see Table 3 – 6), self-esteem interacted with defeat on the pathway leading to anxiety; F (1, 391) = 4.41, $p < .05$, to predict 1% of unique variance in the interpersonal sensitivity score. Consistent with the recommendations of Jaccard, Turrisi, and Wan (1990), the slope of the significantly interacting terms were interpreted at each level of the independent variable. These simple slopes were defined as one standard deviation below the mean score and one standard deviation above the mean to provide for low and high levels, respectively. As shown in Figure 3 – 3, there was a statistically significant relation between defeat and anxiety for individuals with low and high levels of self-esteem. These statistically significant findings were for individuals low in self-esteem (slope = 0.16, $t(393) = 4.54$, $p < .001$) and those with high levels of self-esteem (slope = -0.19, $t(393) = 3.96$, $p < .001$).

As well, when all three interaction terms were put in the second block (see Table 3 – 6) both defeat, F (3, 389) = 7.41, $p < .01$, and social comparison, F (3, 389) = 4.70, $p < .05$, interacted to predict 2% of the unique variance in the interpersonal sensitivity score. This suggested that when defeat and social comparison are together there is some shared variance that is magnified when combined. When interpersonal sensitivity is the final outcome variable, this relationship functions to allow self-esteem to interact in predicting anxiety.

Discussion

This study involved an examination of anxiety as a mediator between three independent variables (i.e., secure attachment, defeat, and social comparison) and both interpersonal sensitivity and submissive behaviours. The structural equation model produced a good fit to the data and all pathways were statistically significant. Similarly, the variance in interpersonal sensitivity (23.1% in Study 1 vs. 23.3% in Study 2) and submissive behaviours (24.5% in Study 1 vs. 25.9% in Study 2) from both the depression and anxiety models were very comparable in explanatory power. However, the results of the bootstrap procedure for indirect effects in the present study produced some discordant findings.

It was hypothesized that experiences of defeat would be mediated by an individual's level of anxiety when predicting interpersonal sensitivity and submissive behaviours. The results of the present study did indeed produce a strong association ($p < .001$) in both cases supporting the notion that an anxiety mechanism regulates the relationship between defeat and both interpersonal sensitivity and submissive behaviours. Likewise, the hypothesized relationship between social comparison and the two dependent variables (i.e., interpersonal sensitivity and submissive behaviours) was fully mediated by anxiety ($p < .05$). However, contrary to expectations anxiety did not mediate the relationship between secure attachment and either

outcome variable (i.e., interpersonal sensitivity and submissive behaviours) whereas both pathways were fully mediated in the depression model from Study 1.

Affiliation in our species development was critically important as these bonds created an environment of security for survival (e.g., protection from predators and aggressive others, food, shelter, cooperation) and reproduction (e.g., access to mates, sexual selection). There is some evidence in child samples suggesting that secure attachment is associated with lower anxiety (e.g, Wood, 2007) while others have not found this relationship (e.g., Bar-Haim, Orrie, Eshel, & Sagi-Schwartz, 2007). In adults with anxiety the attachment literature underscores a central issue surrounding secure attachment and anxiety that is not so much present in the research involving children, and that is the issue of social supports outside of the parent-child dyad. For instance, Eng and Heimberg (2006) found that adult participants with anxiety reported less secure attachment to their parents than control participants but reported similar levels of attachment to peers and perceived social support.

In the present study, there is a negative association between secure attachment and anxiety as hypothesized, but failure to find statistically significant mediation may be due to the variety of social groups available to an adult that makes the anxiety mechanism operate in a slightly different manner. As such, one possible interpretation may relate to a perceived sense of belonging among lower status conspecifics whereby affiliation with other dejected individuals is less threatened when the anxiety mechanism is triggered. It is quite likely that among a hierarchical group those who were less favoured may have created a bond with other low ranking individuals as is the case with peer groups in modern day (e.g., support groups for psychological or physical ailments).

Another possible interpretation stems from research which indicates that the nonverbal markers of anxiety are easily detected (Fluck, Harrigan, & Brindley, 2001), and so it would be easier for a cohort of anxious people to find each other and congregate, thereby forming an attachment with one another. Such a group of peers (i.e., a secure attachment base) would not be as impacted when their anxiety was, for some reason, triggered (whether adaptive or not). Whereas, encounters involving defeat or outright social comparison would be accentuated by anxiety because they entail experiences with dominant others (who are perceived as superior) as opposed to equal ranking members among a group of anxious individuals.

From an evolutionary perspective, social competition in the modern age has become more complex, but continues to have a significant impact on anxiety (and depressive) symptoms. Today, instead of the agonistic competition from days of old, humans compete for prestige through work accomplishments, a large home, fast cars, and a plump bank account (Gilbert, 1992; Stevens and Price, 2000). Much like depression, anxiety symptoms serve to communicate an appeasement display of submission (Price, Gardner, & Erickson, 2004) which in our EEA staved off unwanted challenges. In a like manner, the triggering of the anxiety mechanism would promote an increased sensitivity to one's interpersonal surroundings.

Cognitive research has firmly established that humans' facial recognition for basic emotions exists in every culture (see Ekman, 1999 for a review). Such an evolved neurocognitive system allows for rapid detection of social threats and retrieval of social information that provides a social judgment (e.g., trustworthy or not) from the facial expression of another person (Adolphs, Tranel, & Damasio, 1998; Baron-Cohen et al., 1999). It stands to reason that the adaptive significance of anxiety works to heighten this system because an individual who is lower in rank would not want to risk the chances of misreading a conspecifics intentions as this could lead to

ostracism or physical harm. The evolutionary adaptive significance of this special neural network seems to be consistent with the positioning of anxiety in the *social risk hypothesis* model (see Figure 3 – 1); however, it is important to acknowledge that this heighten perception of social threat can prompt pathological states such as those observed in paranoid schizophrenia (Green & Phillips, 2004).

More overlap between the depression model (see Study 1) and the anxiety model in the present study was found in the analysis of moderation. Self-esteem (i.e., *social investment potential*) did not moderate any of the proposed pathways when submissive behaviour was the final outcome variable. However, just as in depression model, the defeat-anxiety pathway was moderated by self-esteem when interpersonal sensitivity served as the final dependent variable. Consistent with the depression model, moderation took place at both low and high levels of self-esteem in this relationship. A look at the slope (see Figure 3 – 3) reveals a buffering effect of self-esteem when it is high (i.e., a negative slope), but when self-esteem is low, the impact of anxiety is intensified in those who are experiencing defeat in the social sphere.

Leary and his colleagues proposed that self-esteem is a vital component of an innate mechanism that indicates a self-enhancement strategy that is most beneficial in an environment of social comparison called the *sociometer* (Leary, 1990; Leary et al., 1995). According to Baumeister, Tice and Hutton (1989), both low and high self-esteem people are interested in self-enhancement, but for different reasons. Individuals with low self-esteem strive for self-protection so as to prevent further losses in self-esteem, especially in the case of anxiety (Baumeister and Tice, 1990). On the other hand, individuals with high self-esteem strive for self-enhancement that will continue to increase their self-esteem which functions to decrease overall anxiety (Greenberg et al., 1992). They behave boldly and take more risks to maximize attention and

social approval. Allen and Badcock (2003) applied the *sociometer* as a strategy among depressed individuals. They proposed that the *sociometer* provides individuals who have poor affiliation and agency the drive to avoid ostracism in the group context, but only when self-esteem is critically low.

The results from the present study are more commensurate with original conceptualization of the *sociometer* in that Leary and his colleagues placed greater significance on the adaptive nature of anxiety rather than depression (which Allen and Badcock (2003) chose to adopt). Also, the importance of defeat and social comparison in the anxiety model was emphasized by the statistically significant moderation when these two variables were placed in the same regression block (see Table 3 – 6). As mentioned above, experiences of defeat and low social comparison have good evolutionary reasons for the impact they have on anxiety, and it would seem that self-esteem (i.e., *social investment potential*) is most responsive to this relationship when interpersonal sensitivity is part of this link.

Allen and Badcock (2003) made specific predictions that their *social risk hypothesis* would not operate for an anxiety mechanism. Specifically, they argued that the *social risk hypothesis* was design to exclusively measure the down regulation in positive affect (thought to be the key ingredient in depression; see Watson, Clark, & Carey, 1988), and that it was reduced positive affect as opposed to high negative affect commonly associated with anxiety that was crucial to social engagement activities in our *environment of evolutionary adaptation* (EEA; Tooby & Cosmides, 1992). However, many of the results from the present study indicate that anxiety and depression appear to function in a similar manner. A previous attempt to differentiate anxiety and depression in the *social risk hypothesis* model was undertaken by Allen and Badcock (2006a). The authors found no differences between the clinically depressed and anxious groups

on measures of attachment and social competition in the social risk selection task. Thus, contrary to prior predictions, low positive affect (i.e., depression) was not associated with an increased cognitive perception of social risk although the small sample size and subsequent low statistical power was forwarded as a possible explanation for the null findings. The present study largely supported the applicability of the *social risk hypothesis* in explaining the adaptive function of anxiety within the EEA of the human species.

Conclusion

Severe anxiety is fraught with excessive worry, discomfort, and poor physical health (e.g., stomach ulcers, high blood pressure, high cortisol; see Tsigos & Chrousos, 1995), and is thus a debilitating condition in an individual's everyday life. However, evolutionary psychologists have suggested that anxiety can also be adaptive (e.g., Gilbert, 2001; Gilbert & Towers, 1990; Hofer, 1995; Nesse, 1990; Pine & Shapiro, 2006; Price, 2003). Recent research has found that anxious people have social attention biases to group ostracism but these anxiety symptoms can be ameliorated by a strategy of avoidance (Appelhans & Luecken, 2006) which is analogous to the submissive behaviours and interpersonal sensitivity found within the *social risk hypothesis* model.

The results of the present study are remarkably similar to those found in the depression model (see Study 1). With the exception of anxiety not mediating the secure attachment pathways to both interpersonal sensitivity and submissive behaviours, all of the findings are essentially the same. Many evolutionary models of depression are theorized to apply equally well to anxiety (e.g., Price et al., 2004; Sloman, 2008), and yet Allen and Badcock (2003) sought to buck this trend by proposing a novel and exclusive explanation of depression called the *social risk hypothesis*. However, based on the findings in this study and the substantial quantity of

evidence recognizing the many similarities between anxiety and depression, it may be prudent to consider a place for anxiety in the *social risk hypothesis*.

Limitations and Directions for Future Research

The empirical findings in the present study have provided strong support for the inclusion of anxiety within the *social risk hypothesis* as conceptualized by Allen and Badcock (2003); however, it is important to note some limitations of this study. First, the overrepresentation of women in this study (268 women vs. 125 men) may have influenced the findings. Anxiety symptoms are more prevalent in women (e.g., Kessler et al., 1994; Murphy et al., 2004); and the manifestation of anxiety in females can differ from males (e.g., Breslau, Davis, Peterson, & Schultz, 2000; Klein, 1993; Papp et al., 1997). Thus, it will be necessary to account for gender in the *social risk hypothesis* in order to shed light on the how sex differences operate in this model. Second, this study used a cross-section and correlational design that only reflected associations and predictions; therefore, no causal relations among variables could be inferred. Although the directionality of the pathways were based on Allen and Badcock's (2003) theoretical model, it is possible that the variables could fit better in a different location. For instance, submission could operate as a latent variable rather than as a dependent variable (e.g., Irons & Gilbert, 2005) as well high interpersonal sensitivity has been found to predict anxiety (Harb et al., 2002) which is more indicative of a latent variable. And lastly, a validation sample would have further corroborated the measurement and structural models.

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Figure 3 – 1

The structural model hypothesized to relate the defeat, social comparison, secure attachment, anxiety, interpersonal sensitivity, and submissive behaviours as well as self-esteem as a moderator in the proposed model.

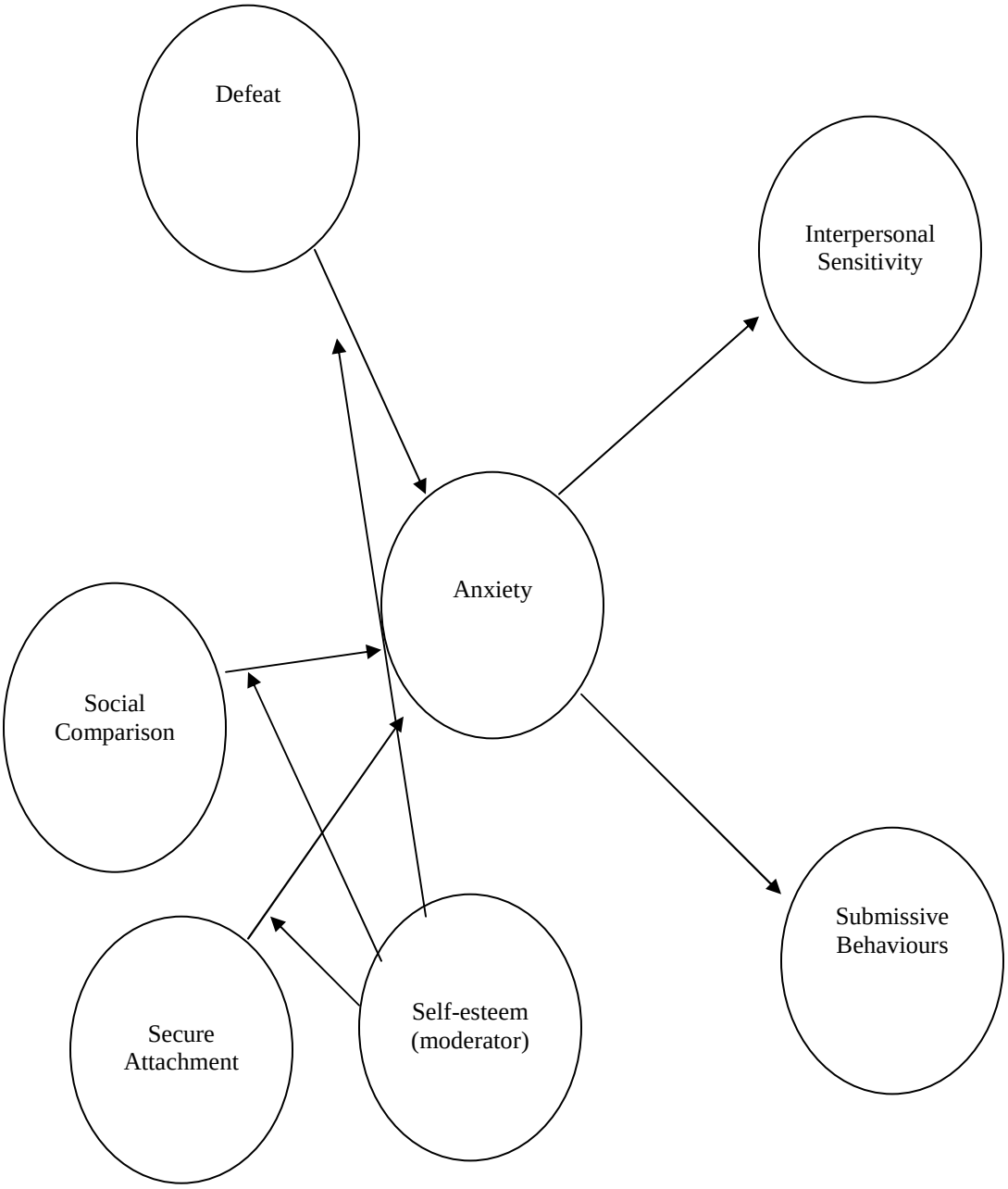

Figure 3 – 2

The mediated structural model of the relationship between the defeat, social comparison, and secure attachment in predicting interpersonal sensitivity and submissive behaviours.

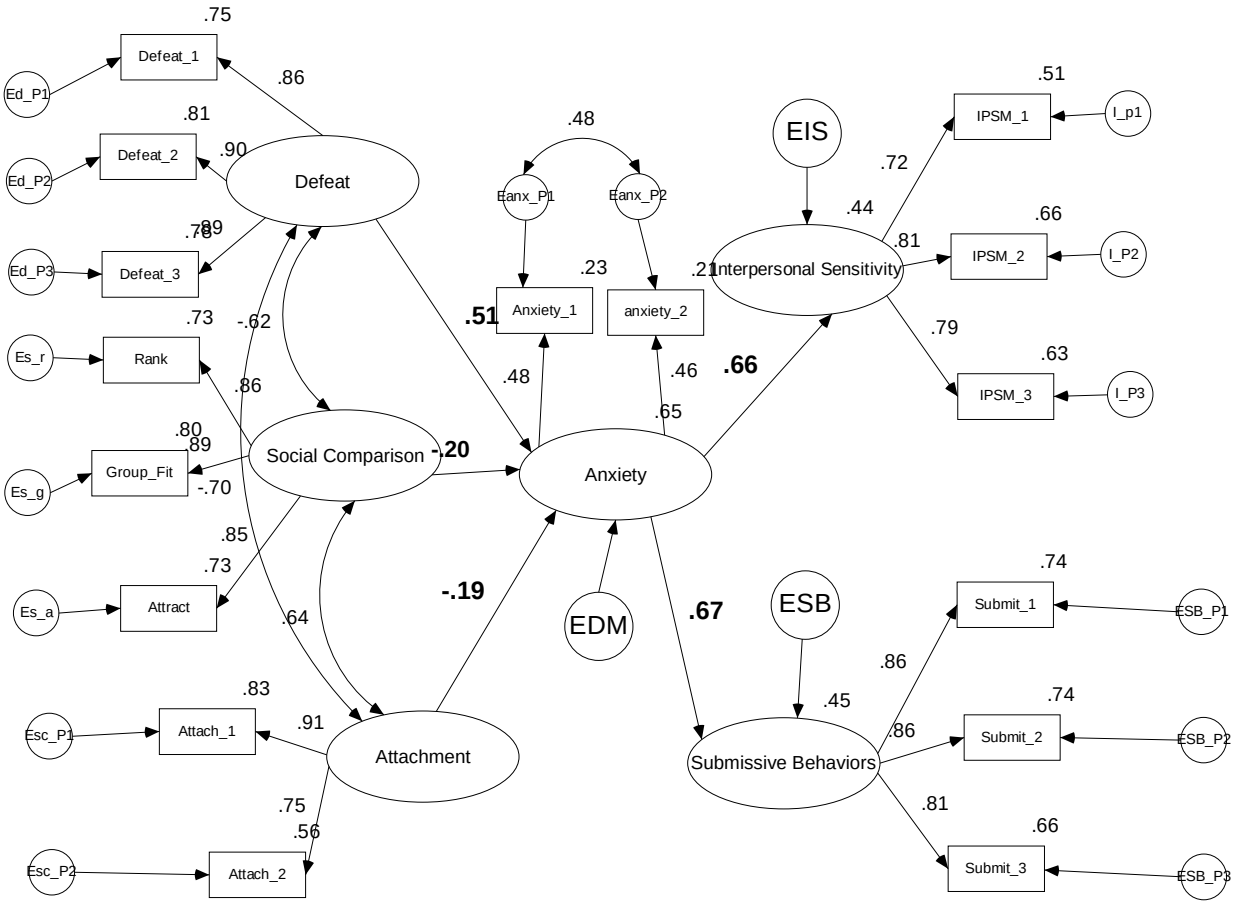

Figure 3 – 3

Two-way interaction between self-esteem and defeat predicting anxiety when interpersonal sensitivity is the end product. Values of self-esteem and defeat are plotted using low (one standard deviation below the mean) and high (one standard deviation above the mean) values of self-esteem and defeat.

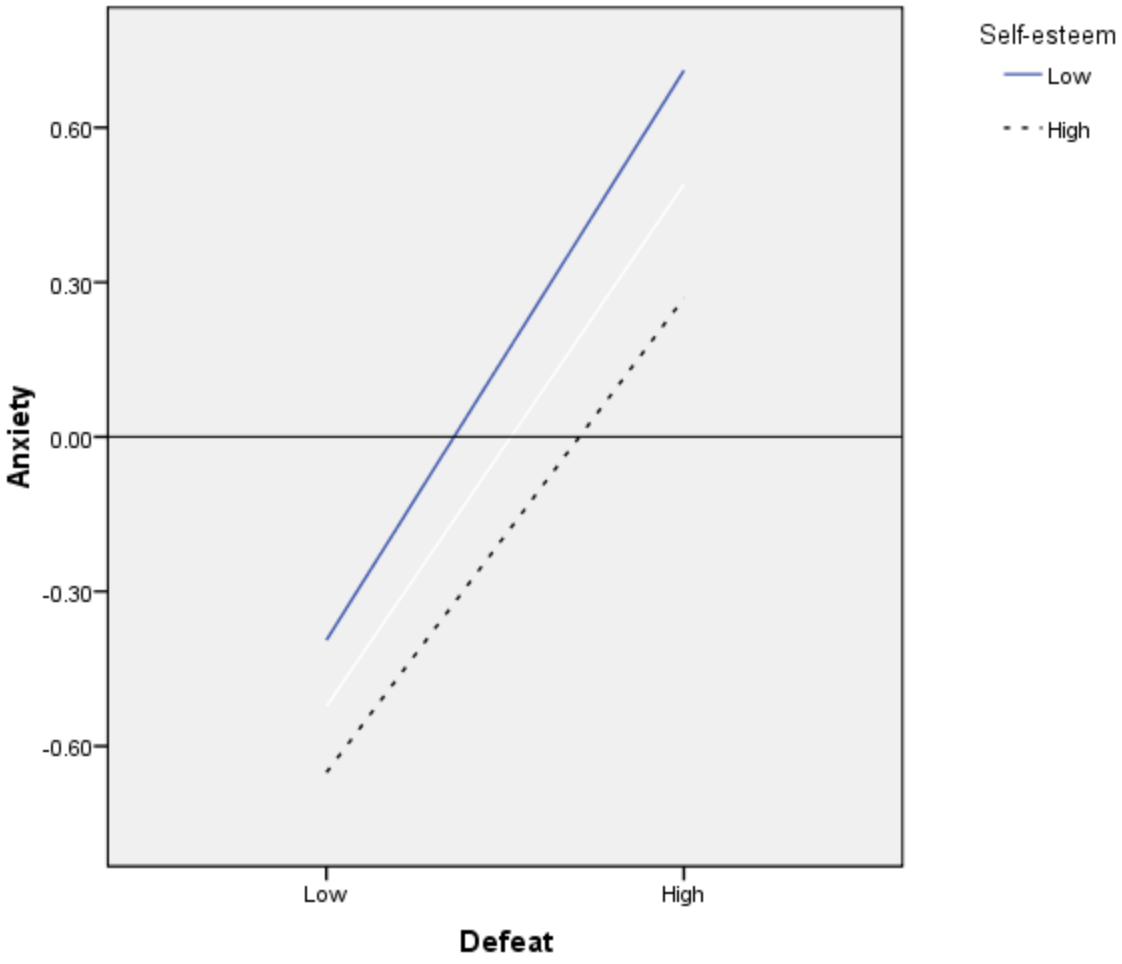

Table 3 – 1

Means, Standard Deviations, and Correlations for the Initial Model Variables (N = 397)

Variables	*M (SD)*	1	2	3	4
1. DASS 21: Anxiety – P1[a]	0.51 (0.68)	–			
2. DASS 21: Anxiety – P2 [a]	0.63 (0.77)	.59**	–		
3. IPSM – P1[b]	12.70 (2.53)	.18**	.19**	–	
4. IPSM – P2[b]	14.38 (2.90)	.21**	.21**	.57**	–
5. IPSM – P3[b]	14.07 (2.63)	.20**	.28**	.55**	.66**
6. ASQ: Secure Attachment – P1[c]	17.31 (3.09)	-.25**	-.25**	-.38**	-.26**
7. ASQ: Secure Attachment – P2[c]	16.89 (3.17)	-.22**	-.16**	-.32**	-.20**
8. RBS: Social Risk – P1[d]	13.07 (2.86)	-.06	-.04	-.19**	-.03
9. RBS: Social Risk – P2[d]	11.59 (3.00)	.02	.04	-.25**	-.10*
10. SCS – Rank[e]	24.53 (6.57)	-.24**	-.29**	-.35**	-.30**
11. SCS – Group Fit[e]	19.10 (4.73)	-.19**	-.26**	-.29**	-.28**
12. SCS – Attractiveness[e]	25.96 (5.39)	-.23**	-.28**	-.34**	-.32**
13. Defeat Scale – P1	1.56 (1.06)	.39**	.38**	.39**	.38**
14. Defeat Scale – P2	1.90 (0.78)	.39**	.37**	.39**	.37**
15. Defeat Scale – P3	2.06 (0.91)	.39**	.37**	.30**	.32**
16. Submissive Behaviour – P1 [f]	7.38 (3.14)	.30**	.23**	.33**	.35**
17. Submissive Behaviour – P2 [f]	6.97 (3.17)	.30**	.21**	.41**	.31**
18. Submissive Behaviour – P3 [f]	6.18 (3.48)	.26**	.19**	.30**	.27**
19. SSES: Self-Esteem Total [g]	74.85 (12.11)	-.39**	-.39**	-.43**	-.54**

Variables	5	6	7	8	9	10
5. IPSM – P3 [b]	–					
6. Secure Attachment – P1[c]	-.29**	–				
7. Secure Attachment – P2[c]	-.16**	.68**	–			
8. RBS: Social Risk – P1[d]	-.07	.07	. 13**	–		
9. RBS: Social Risk – P2[d]	-.13*	.12*	.17**	.58**	–	
10. SCS – Rank[e]	-.28**	.58**	.44**	.04	.02	–
11. SCS – Group Fit[e]	-.28**	.49**	.37**	.07	.11*	.77**
12. SCS – Attractiveness[e]	-.36**	.48**	.37**	.10*	.17**	.70**
13. Defeat Scale – P1	.36**	-.53**	-.45**	-.06	-.09	-.49**
14. Defeat Scale – P2	.33**	-.55**	-.51**	-.11*	-.13*	-.50**
15. Defeat Scale – P3	.27**	-.59**	-.50**	-.06	-.08	-.49**
16. Submissive Behaviour – P1 [f]	.36**	-.34**	-.27**	-.14**	-.18**	-.29**
17. Submissive Behaviour – P2 [f]	.32**	-.46**	-.40**	-.09	-.17**	-.33**
18. Submissive Behaviour – P3 [f]	.31**	-.41**	-.32**	-.11*	-.13**	-.30**
19. SSES: Self-Esteem Total [g]	-.49**	.56**	.50**	-12*	.17	.51**

Variables	11	12	13	14	15	16	17
11. SCS – Group Fit[e]	–						
12. SCS – Attractiveness[e]	.78**	–					
13. Defeat Scale – P1	-.43**	-.48**	–				
14. Defeat Scale – P2	-.45**	-.50**	.78**	–			
15. Defeat Scale – P3	-.46**	-.52**	.76**	.80**	–		
16. Submissive Behaviour – P1[f]	-.31**	-.36**	.32**	.36**	.36**	–	
17. Submissive Behaviour – P2[f]	-.31**	-.31**	.35**	.35**	.39**	.74**	–
18. Submissive Behaviour – P3[f]	-.30**	-.35**	.36**	.35**	.34**	.70**	.70**
19. SSES: Self-Esteem Total[g]	.56**	.62**	-.65**	-.67**	-.67**	-.45**	-.46**

Variables	18
18. Submissive Behaviour – P3 [f]	–
19. SSES: Self-Esteem Total [g]	-.45**

*$p < .05$

**$p < .01$

Note.

P1 = parcel 1

P2 = parcel 2

P3 = parcel 3

[a] Depression Anxiety Stress Scales 21

[b] Interpersonal Sensitivity Measure

[c] Attachment Style Questionnaire

[d] Risk Behavior Scale

[e] Social Comparison Scale

[f] Submissive Behaviour Scale

[g] State Self-Esteem Scale

Table 3 – 2

Unstandardized and Standardized Pattern Coefficients for the Measurement Model

Measure and Variable	Unstandardized	*SE*	*CR*	Standardized
Defeat				
Defeat-Parcel 1	1.14	.05	23.48	.87
Defeat-Parcel 2	.88	.04	25.24	.90
Defeat-Parcel 3	1.0			.89 [a]
Social Comparison				
SCS-Group Fit	.92	.04	22.25	.89
SCS-Rank	1.22	.06	21.04	.86
SCS-Attractiveness	1.0			.85 [a]
Secure Attachment				
ASQ-Confidence-Parcel 1	1.17	.08	15.02	.90
ASQ-Confidence-Parcel 2	1.0			.75 [a]
Anxiety				
DASS-21-Anxiety-Parcel 1	1.0			.88 [a]
DASS-21-Anxiety-Parcel 2	1.06	.11	9.47	.83
Interpersonal Sensitivity				
IPSM-Parcel 1	1.0			.72 [a]
IPSM-Parcel 2	1.30	.10	13.68	.81
IPSM-Parcel 3	1.15	.09	13.54	.79

Submissive Behaviour				
SBS-Parcel 1	1.0			.85 [a]
SBS-Parcel 2	1.03	.05	20.19	.87
SBS-Parcel 3	1.06	.06	18.74	.81

Note. N = 397. Defeat = Defeat Scale; both Social Comparison and SCS = Social Comparison Scale; both Secure Attachment and Confidence = the Confidence subscale from the ASQ; ASQ = Attachment Style Questionnaire; Anxiety = Anxiety subscale from the DASS-21; DASS-21 = Depression Anxiety Stress Scales 21; both Interpersonal Sensitivity and IPSM = Interpersonal Sensitivity Measure; and, both Submissive Behaviour and SBS = Submissive Behaviour Scale. CR is the *z* score that results from dividing the unstandardized estimate by the estimate of its standard error.

[a] All standardized pattern coefficients were statistically significant at $p < .001$ except for those coefficients fixed at 1.0 and not tested.

Table 3 – 3

Correlation Among Latent Variables for the Measurement Model and Moderation

Variables	1	2	3	4	5	6	7
1. Defeat	---						
2. Social Comparison	-.57**	---					
3. Secure Attachment	-.61**	.55**	---				
4. Self-Esteem	-.71**	.61**	.58**	---			
5. Anxiety	.46**	-.31**	-.27**	-.44**	---		
6. Interpersonal Sensitivity	.44**	-.40**	-.34**	-.57**	.28**	---	
7. Submissive Behaviours	.42**	-.38**	-.44**	-.50**	.30**	.43**	---

Note. $N = 397$.

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

Table 3 – 4

Bootstrap Analysis of Indirect Effects – Anxiety as a Mediator

Mediated Effect	β (standardized path coefficient and product)	Indirect effect (B)[a]	*SE*[a]	95% CI for indirect effect[a]
Defeat →Interpersonal Sensitivity	(.51) x (.66) = .34	.77	.18	. 442 to 1.125***
Social Comparison →Interpersonal Sensitivity	(-.20) x (.66) = -.13	-.05	.02	-.103 to -.011**
Secure Attachment →Interpersonal Sensitivity	(-.19) x (.66) = -.13	-.09	.06	-.216 to .020
Defeat →Submissive Behaviour	(.51) x (.67) = .34	1.16	.22	. 741 to 1.584***
Social Comparison →Submissive Behaviour	(-.20) x (.67) = -.13	-.08	.03	-.148 to -.017*
Secure Attachment →Submissive Behaviour	(-.19) x (.67) = -.13	-.14	.09	-.340 to .031

Note. N = 397. CI = confidence interval.

[a]These values are based on the unstandardized path coefficients.

*This 95% confidence interval excludes zero and is statistically significant ($p < .05$).
**This 95% confidence interval excludes zero and is statistically significant ($p < .01$).
***This 95% confidence interval excludes zero and is statistically significant ($p < .001$).

Table 3 – 5

Hierarchical Regression Analyses with Defeat, Social Comparison, Secure Attachment, Anxiety, and the Interaction Effects of Self-Esteem as Predictors of Submissive Behaviour

Variable	β	F	ΔR^2
Step 1			.26***
Defeat	.13	3.96*	
Social Comparison	-.13	5.13*	
Secure Attachment	-.26	20.56***	
Anxiety	.14	8.23**	
Step 2			.01
Defeat x Self-Esteem	.08	3.03	
Step 2			.00
Social Comparison x Self-Esteem	-.02	.24	
Step 2			.00
Secure Attachment x Self-Esteem	-.04	.81	

Variable	β	F	ΔR^2
Step 2			.01
Defeat x Self-Esteem	.15	3.54	
Social Comparison x Self-Esteem	.07	1.12	
Secure Attachment x Self-Esteem	.02	.07	

* $p < .05$. ** $p < .01$. *** $p < .001$.

Table 3 – 6

Hierarchical Regression Analyses with Defeat, Social Comparison, Secure Attachment, Anxiety, and the Interaction Effects of Self-Esteem as Predictors of Interpersonal Sensitivity

Variable	β	F	ΔR^2
Step 1			.23***
Defeat	.25	15.34***	
Social Comparison	-.20	12.67**	
Secure Attachment	-.05	.78	
Anxiety	.09	2.88	
Step 2			.01*
Defeat x Self-Esteem	.10	4.41*	
Step 2			.00
Social Comparison x Self-Esteem	.00	.00	
Step 2			.00
Secure Attachment x Self-Esteem	-.05	1.27	

Variable	β	F	ΔR^2
Step 2			.02*
Defeat x Self-Esteem	.22	7.41**	
Social Comparison x Self-Esteem	.15	4.70*	
Secure Attachment x Self-Esteem	.01	.02	

* $p < .05$. ** $p < .01$. *** $p < .001$.

CHAPTER 4

GENDER INVARIANCE TESTED ON THE SOCIAL RISK HYPOTHESIS FOR DEPRESSION AND ANXIETY MODELS

Introduction

Depression and anxiety, the two most common psychological disorders, occur in women at a rate of 2 to 3 times more than their male counterparts (Kessler et al., 1994; Murphy et al., 2004; Pajer, 1995; Weissman & Klerman, 1977; Zerbe, 1995) but no sufficiently compelling reason has been offered as to why this is the case. Although there is no universal agreement about the definition of depression (Kendler, Neale, Kessler, Heath, & Eaves, 1992), the basic factors underlying depression are a sustained dysphoric mood, an inability to experience pleasure, lethargy, and a sense of worthlessness. The detrimental impact of anxiety involves paralyzing (and irrational) fears, inhibited social interactions, persistent worries, acute physiological markers (e.g., palpitations, tremors, perspiration, perceived shortness of breath, chest pains, abdominal distress), and excessive stress (American Psychiatric Association, 2000). The catastrophic effects of depression and anxiety lead to a variety of relationship problems (Coyne, 1976;1999; Gotlib, 1992; Eng & Heimberg, 2006), diminished functioning and quality of life (Fagring et al., 2008; Jacob, Frank, & Carpenter, 1987; Klerman & Weissman, 1992; Schreier & Williams, 2004), expensive treatments and lost productivity (Greenberg, et al., 1999; Greenberg et al., 2003; Koerner et al., 2004; Murray & Lopez, 1996; Wang, Simon, & Kessler, 2003), and increased suicide attempts (Bjerkeset, Romundstand, & Gunnell, 2008; Fawcett, 1993; Oei, Verhoeven, Westenberg, Zwart, & van Ree, 1990; Sareen et al., 2005). Clearly these can be serious and profoundly painful and disruptive difficulties. As a result, enormous energy has gone into understanding and treating them. There is hardly a larger mystery in this field, however, than

the finding that women are so much more prone to these disorders than men. Understanding why this is the case could conceivably lead to an understanding of the basic nature of these disorders.

Sex Differences

Sex differences in depression and anxiety have fostered a variety of explanations and research findings in mainstream psychology and psychiatry. For example, some possible reasons for higher rates of panic disorder in women include differences in chemical sensitivity to carbon dioxide (Papp & Gorman, 1988; Papp et al., 1997; Sheik, Leskin, & Klein, 2002) and fluctuations in progesterone levels that can alter respiration (Klein, 1993; Perna, Brambilla, Arancio, & Bellodi, 1995). Women have been found to be more susceptible to posttraumatic stress disorder (PTSD) compared to men because of the nature of the trauma (i.e., sexual assault and rape vs. physical violence or serious accidents in men) (Breslau, Davis, Peterson, & Schultz, 2000) although women display a higher risk for PTSD across all categories of trauma (Gavranidou & Rosner, 2003).

Higher depression rates in women may be due to premenstrual dysphoric disorder (PMDD), an exclusively female depressive disorder that may also be related to anxiety levels (Bailey & Cohen, 1999; Landen & Eriksson, 2003). Similarly, postpartum depression is exclusive to females and may inflate the overall depression and anxiety rates (Coates, Schaefer, & Alexander, 2004) as it is accentuated by other predisposing factors common to both sexes (e.g., Mazzeo et al., 2006). Data from the National Survey of Psychiatric Morbidity in Great Britain suggest that the gap between men and women on depression (and mixed depression/anxiety) rates begins to close in late adulthood when a woman is no longer able to reproduce (Bebbington et al., 1998).

The *gender intensification hypothesis* suggests that depression in females does not start to differ from males until puberty hits, and instead of focusing on the physiological changes,

proponents argue that social pressures to conform to sex-role identification are the real catalysts for the prevalence invariance (Aube, Fichman, Saltaris, & Koester, 2000; Wichstrom, 1999). Also, the elevation of the hormone estrogen around puberty has been labeled a precipitator of depression in adolescent females (Angold, Costello, Erkanli, & Worthman, 1999), while increasing testosterone in teenage males is viewed as a protective factor in the development of anxiety and depression (Seeman, 1997). However, paradoxical differences have been found between men and women in the case of suicide, where men with anxiety and depression are twice as likely to commit suicide (Bjerkeset et al., 2008) although other studies have no found such differences (e.g., Sareen, Houlahan, Cox, & Asmundson, 2005). Conventional psychology has provided a great deal of information available for synthesis in the areas of depression and anxiety for women and men, but at the expense of a clear foundation from which to understand the functionality of these mental illnesses. From an evolutionary perspective, psychological disorders originated and survived because mild versions of them had adaptive value in the struggle of individuals to flourish and procreate (Nesse, 2005), and perhaps these universal variations in prevalence among men and women can be better understood from a single framework.

Sex differences permeate a wide variety of biological, psychological, and social processes in the evolutionary history of humankind. At the present day, differences exist between men and women in aggression, competition, child rearing (Daly & Wilson, 1983), guilt from infidelity (Fisher, Voracek, Rekkas, & Cox, 2008), behavioural and social-cognitive relationship styles (Rose & Rudolph, 2006), work roles and division of labour (Murdock, 1965), physical attraction (Buss & Shackelford, 2008), parental investment (Trivers, 1972; 1985), risk taking behaviours (Pawlowski, Atwal, & Dunbar, 2008), cortisol release in stressful situations (Stroud, Salavey, &

Epel, 2002), and the list goes on (see Bjorklund & Pellegrini, 2002 for a more in-depth overview). Thus, it stands to reason that evolutionary explanations of depression and anxiety would also exhibit variations between the sexes.

Evolutionary Explanations

In the case of depression and anxiety, evolutionary explanations focus on the functionality of mental states in the *environment of evolutionary adaptation* (EEA; Tooby & Cosmides, 1992). In the EEA of the human species there existed three major problems that constantly needed to be addressed, (1) access and utilization of food and water sources, (2) protection against predation and hostile conspecifics, and (3) procreation and survival of offspring (Leahy, 2002). Buss (2005) simplifies these challenges further by asserting that human evolution can be reduced to the struggles of *survival* and *reproduction*. Therefore, it follows that a great many of the evolutionary theories of depression and anxiety would entail aspects of social living that would propagate the genetic lines of those who adapted best to these group challenges. The evolutionary challenges most associated with the complexities of a community environment involved resource/energy conservation, social competition, and security/affiliation (Allen & Badcock, 2003; 2006).

Resource/energy conservation

The *resource conservation* theories suggest that depressed mood was an adaptive response to environmental and social situations where exerting excess energy would be futile. Instead, an individual would conserve their resources by adopting a depressed mood until a propitious or productive opportunity arose that would be worthy of their energy or investment. Several well-known theories under this veil include Seligman's (1975) *learned helplessness theory* (when interpreted from an evolutionary perspective), Nesse's (2000) *resource allocation theory*,

Klinger's (1975) *incentive disengagement theory*, and Leahy's (1997) *sunk costs* model which all account for the diminished or inhibited behaviours toward seeking what seems to be unobtainable incentives or goals.

Social rank

One of the earliest adaptive explanations of depression acknowledged the importance of social competition in our early human development (Price, 1967; Price, Sloman, Gardner, Gilbert, & Rohde, 1994). John Price and his colleagues proposed that depressed mood represented an adaptive strategy because it was an unconscious adoption of an involuntary losing strategy. Such a strategy would be utilized when an individual was defeated in a ritual agonistic encounter, and instead of continuing to bemoan the loss or expend additional energy in a losing battle, a depressive mechanism would be activated. The losing party would survive (to perhaps fight another day) but that individual's *resource holding power* (RHP) would be decreased within the group context. This mechanism purportedly allows an individual to accept their lower rank within the dominance hierarchy without disrupting the group as a whole. For instance, the process of sexual selection (same-sex competition for access to mates and appealing characteristics resulting in preferential mate choice) has been an integral part of our evolutionary history (Buss, 1994; 1999), and thus may adhere to the tenets of the *social competition hypothesis* of depression. Gilbert and his colleagues (Gilbert, 1997; Gilbert, Price, & Allan, 1995) put forth a similar proposal under the name *social attention holding power* (SAHP). Unlike the RHP concept, SAHP describes the positive attention and social rewards that humans compete to attain, and is seen as a marker of relative status.

Social rank can range from low to high creating either detrimental or beneficial effects for individuals and their mental functioning (Price & Sloman, 1987; Gilbert, 1992). From an

evolutionary perspective, depression has been viewed as a defensive response to low social rank or comparisons (Gilbert, 1992, Irons & Gilbert, 2005; Price et al., 1994). A multitude of indicators of social rank have been used to investigate how one's perceived position in relation to others influences depression and anxiety. Submissive behaviours, defeat, shame, subordination, and depreciating social comparisons have all consistently been associated with depression (e.g., Allan & Gilbert, 1997; Allan, Gilbert, & Goss, 1994; Brown, Hammen, Craske, & Wickens, 1995; Gilbert, 2000a). Additionally, perceived social rank has predicted social anxiety even after controlling for depression (Gilbert, 2000a).

In modern humans, the value of social status continues to influence our behaviours toward others and our psychological health. The threat of vicious animals, invading tribes, and poor access to mates has been replaced by quality of life indicators such as occupational position, possession of socially desirable products (e.g., name brand items, luxury vehicles, a large home), as well as successful marital relations and childrearing that still predispose humans to depression and anxiety (cf. Sheerman, Abrams, & Orbell, 1995; Sloman & Gilbert, 2000). Consequently, it is desirable to bolster one's social rank, thereby alleviating the associated depressed mood (Allen & Badcock, 2003) and anxiety (Price, 2003). In humans, this social comparison that relates to both depression and anxiety is often reflected in either favourable or unfavourable self-esteem (Gilbert, 2000a; Gilbert & Allan, 1994).

Attachment

Over hundreds of generations animals and humans have faced a variety of survival and reproductive challenges that have been solved through cooperation, security, altruism, genetic relatedness, and emotional connectedness provided by conspecifics (Buss, 2008; Kurzban & Neuberg, 2005). This attachment is claimed to be the basic organizational factor for any species'

social structure leading to group formation (Bowlby, 1982). John Bowlby defines attachment behaviour as “any form of behaviour that results in a person attaining or maintaining proximity to some other clearly identified individual who is conceived as better able to cope with the world” (Bowlby, 1989, p. 238). Extensive evidence indicates that a strong emotional attachment in the infant-caregiver dyad and mate relations is integral to the developmental success of humans and other mammals (Benton, 1990; Blatt, Auerbach, & Levy, 1997; Johnston & Bell, 1995; Parkes & Stevenson-Hinde, 1982; Rivinus, & Katz, 1971; Spangler & Zimmermann, 1999).

The adaptive significance of secure attachment is based on supplying offspring with resources for survival and with defenses against predators by ensuring that offspring remain in the vicinity of the parent (Bowlby, 1969). However, other valuable functions are served by attachment ties throughout the lifespan. In particular, the ability to manipulate and anticipate the behaviours of an infant’s caregiver provides the growing youngster with exposure to social acuity that will be vitally important in future relationships (Bowlby, 1969, 1973, 1980). Nevertheless, a healthy attachment bond is not always formed in early and later life.

The psychological ramifications of poor attachment for humans of all ages have been thought to play a crucial role in the formation and maintenance of numerous mental disturbances (Bowlby, 1977; Green & Goldwyn, 2002; Sroufe, Carlson, Levy & Egeland, 1999; Ungerer & McMahon, 2005). Social isolation, feelings of being unloved, fears of abandonment, and general negative relational patterns in the social realm have clearly demonstrated a strong association between attachment style and both anxious and depressive symptomatology in a broad range of directed research (e.g., Irons & Gilbert, 2005; Rapee, 1997; Safford, Alloy, Crossfield, Morocco, & Wang, 2004; Williams & Risking, 2004). The evolutionary importance of secure attachment to

mammals relates specifically to obtaining protection from predators or other aversive situations in times of danger, availability of resources (e.g., food, mates), and comfort/soothing for the group member. Therefore, it follows that anxious and depressive states are often triggered by social losses from important conspecifics (Bowlby, 1977; Kendler, Hettema, Butera, Gardner, & Prescott, 2003). This loss of vital support can leave an animal or human at an increased risk of depressed mood or anxiety.

The social risk hypothesis

Allen and Badcock (2003) have synthesized the research findings from resource/energy conservation, social competition, and attachment into a comprehensive testable theory of depression. According to the *social risk hypothesis,* an individual is equipped with an internal gauge of worth or status in their social environment called *social investment potential* (SIP, i.e., the ratio of social value vs. social burden within the group) which will trigger a depressive mechanism when they experience defeat, low social comparison (or rank), and poor affiliation with close conspecifics. This highly evolved sensitivity to threats of rejection and ostracism from social relationships will determine what is an appropriate risk strategy and corresponding mood to adopt that will maximize success in the social realm. This risk strategy will adhere to the tenets of resource conservation theories that emphasize the need to inhibit one's appetitive drives (e.g., pleasure-seeking and energy output) in times of low reward or control (Klinger, 1975; Nesse, 2000; Seligman, 1975). When the *social investment potential* is critically low individuals will take on the characteristics (i.e., submissive, yielding, assurance-seeking, increased interpersonal sensitivity) that we associate with the depressed state and take fewer social risks, which in turn, will provide them with small but steady increases in SIP. These incremental increases in SIP can be achieved through the individual's reduction of appetitive behaviors (i.e.,

decreased social burden) and increased social value from the extra attention, care, and protection from relatives. As a depressed individual's SIP slowly rebounds they will exhibit a proportional decrease in depressed mood. Conversely, members of the group who enjoy a high rank or security (and no depression) will take greater social risks in order to maximize their potential for increased social rewards. Obviously this high-risk strategy has the potential of either producing success or failure. In the case of success these individuals will increase their SIP and/or garner additional social resources or favour. However, when a person experiences losses from failed high-risk social venture(s) (i.e., this may be a culmination of several failures or a single catastrophic one) they will be viewed as a greater burden to the group, as reflected in their SIP. If these social failures occur, then these people will adopt a depressed mood and alter their strategy to a risk-averse approach.

Consistent with the *sociometer* mechanism proposed by Leary, Tambor, Terdal, and Downs (1995), the *social-risk hypothesis* has its underpinnings rooted in the innate fear people have of being excluded from the group as reflected in their self-esteem. Self-esteem serves as a vital indicator for people to choose the most propitious self-enhancement strategy in a social comparison context. According to Baumeister, Tice and Hutton (1989), both low and high self-esteem people are interested in self-enhancement, but for different reasons. Individuals with low self-esteem strive for self-protection so as to prevent further losses in self-esteem. These people are cautious and will try to minimize their weaknesses by avoiding challenges even when rewards seem attainable (Schlenker, Weigold, & Hallam, 1990). On the other hand, individuals with high self-esteem strive for self-enhancement that will continue to increase their self-esteem. They behave in a brazen manner by taking more risks to maximize attention and social approval. The associated depression that may arise when self-esteem is low can instead be explained as a

strategy that functions by avoiding further ostracism in the group context (Allen & Badcock, 2003). Allen and Badcock (2003) made no predictions as to the differential operation of this internal social value – social burden ratio in men and women. However, in a meta-analytic review of self-esteem studies, Kling, Hyde, Showers, and Buswell (1999) found that males have higher self-esteem in comparison to females suggesting that SIP may function differently between the sexes.

The present study attempts to answer this very question by testing the comprehensive *social risk hypothesis* model of depression separately for men and women. Using the same model structure, anxiety is also tested and gender differences are compared. Results from Study 1 and Study 2 indicate that Allen and Badcock's (2003) algorithmic model is supported for depression and anxiety, respectively. And yet, Allen and Badcock made no specific predictions that pertained to differences between women and men in the strength (or applicability) of the pathways in their model (*Note*: the authors did support the notion of a disproportionate representation of women entering into depressive states), so in many respects the present study is exploratory in nature.

Method

Participants

The participants in this study were full-time working adults selected from a variety of vocational fields in the city of Edmonton and surrounding area. A *full-time worker* was defined as an employee who works a minimum of 25 hours per week in one position. From the 1000 potential participants who received survey packages, 409 working adults responded. The response rate to the survey package was 40.9%. Of this total, 12 were removed because of missing data and 4 participants did not indicate their gender. The total number of participants in

the final analyses was thus reduced to 393 (268 women and 125 men). As this was an anonymous survey there was no information available pertaining to the number of men and women who received questionnaire packages, and thus no analysis could be done on the response rate of each gender. The age of female respondents ranged from 18 to 65 years (M = 43.48, SD = 10.75) and male respondents ranged from 22 to 78 years of age (M = 48.25, SD 10.36). The majority of respondents were married (68.4%), with 13.2% being single, 8.4% being divorced, 9.4% in long-term relationships, and 0.5% were widows or widowers. With regard to ethnicity, 89.3% described themselves as Caucasian, 4.3% Asian, 2.0% Aboriginal, 1.5% East Indian, 0.8% Middle Eastern, 0.8% Hispanic, and 1.3% indicated that none of the abovementioned categories represented their ethnicity. It is noteworthy that the ethnicity in this sample was quite representative of the demographic information reported by Statistics Canada for the city of Edmonton, Alberta (see Statistics Canada, 2001). The vocational fields consisted of administration (19%), nursing-related positions (18.8%), professors/teachers (15.9%), mental health professionals (9.5%), management (7.5%), clerical (5.1%), industrial trades (4.4%), computer technology (3.9%), doctors (3.6%), lawyers (1.5%), manual labor positions (1.5%), and 9% fell into a variety of other fields not previously mentioned. No personally indentifying information was requested on the survey, nor were surveys labeled by the researcher with any sort of code numbering system that could be used to identify specific participants.

Measures

Depression Anxiety Stress Scales 21 (DASS-21; Lovibond & Lovibond, 1995). The DASS-21 is a shortened version of the original 42-item *Depression Anxiety Stress Scales* (DASS; Lovibond & Lovibond, 1995) that contains 21 items relating to depression and dysphoric mood (depression subscale), symptoms of fear and autonomic arousal (anxiety subscale), and

symptoms of general nervousness and agitation (stress subscale). A Likert-type scale is used to rate items according to symptoms experienced in the past week, ranging from 0 (not at all) to 3 (most of the time). Factor analytic studies with both clinical and nonclinical samples have shown that the DASS-21 items can be reliably grouped into three scales with high internal consistency (e.g., Antony, Bieling, Cox, Enns, & Swinson, 1998; Henry & Crawford, 2005).

The measure has been found to differentiate between symptoms of anxiety and depression, as well as between symptoms of physical arousal and symptoms of general anxiety such as tension (Antony et al., 1998; Henry & Crawford, 2005). The Depression subscale is composed of 7 items that measure symptoms associated with depressed mood (e.g., sadness, worthlessness), whereas the 7 items of the Anxiety subscale are related to symptoms of physical arousal, panic attacks, and fear (e.g., trembling, faintness). The last 7 items that comprise the Stress subscale measure symptoms such as tension, irritability, and a tendency to overreact to stressful events. For the purposes of this study, only the Depression (α = .90) and Anxiety (α = .77) subscales were measured. The recommendations of Russell, Kahn, Spoth, and Altmaier (1998) were followed in order to create two observed indicators for the latent variables of depression and anxiety; however, instead of using factor analyses for these two small 7-item unidimensional subscales, the unique variance was determined for each item. The items were then rank ordered according to the magnitude of the contributing variance and successively assigned to pairs comprising the highest and lowest ranking items to equalize the average variance of each parcel. The two parcels for each subscale served as measured variables in the structural equation analysis.

Preliminary evidence suggests that the full-length DASS possesses adequate concurrent and discriminant validity in samples drawn from normal non-clinical samples (Crawford & Henry,

2003; Lovibond & Lovibond, 1995). In a sample of non clinical and clinical participants, Antony et al. (1998) demonstrated concurrent validity for the DASS-21 by correlating the subscales with established measures. The DASS-21 Depression subscale correlated highly (r = .79) with the *Beck Depression Inventory* (BDI; Beck, Rush, Shaw, & Emery, 1979), the DASS-21 Anxiety subscale correlated highly (r = .85) with the *Beck Anxiety Inventory* (BAI; Beck & Steers, 1990), and the DASS-21 Stress subscale correlated highly (r = .68) with another measure of stress, the *State-Trait Anxiety Inventory* (STAI-T; Spielberger, 1983). Lovibond and Lovibond (1995) maintain that doubling the DASS-21 scores is directly equivalent to the derived scores from the full version. More recently, however, Henry and Crawford (2005) provided normative data for the DASS-21 from a large non-clinical adult British sample (N = 1,794). Confirmatory factor analysis once again supported the three-factor structure (Depression, Anxiety, and Stress) of the full length DASS. Furthermore, the three-factor structure has effectively differentiated between depressed and anxious patients (Clara, Cox, & Enns, 2001). Overall, the DASS-21 has a number of advantages over the DASS including having fewer items, a cleaner factor structure, and small inter-factor correlations (Antony et al., 1998; Henry &Crawford, 2005).

Social Comparison Scale (SCS; Allan & Gilbert, 1995). The SCS is composed of 11 social comparison dimensions (Inferior-Superior, Incompetent-Competent, Unlikeable-Likeable, Leftout-Accepted, Different-Same, Untalented-More Talented, Weaker-Stronger, Unconfident-More Confident, Undesirable-More Desirable, Unattractive-More Attractive, Outsider-Insider) which an individual uses to rate themselves in relation to other people, using a 10-point Likert scale. Normative data were based on both undergraduate and clinical samples (Allan & Gilbert, 1995). The SCS was based on an earlier five-item version (Gilbert & Allan, 1994); however unlike the earlier scale, the current *Social Comparison Scale* contains three factors of social

comparison (i.e., social rank, attractiveness, and social group fit). The *Social Rank* factor consists of the Inferior-Superior, Incompetent-More Competent, Untalented-More Talented, Weaker-Stronger, and Unconfident-More Confident items, the *Attractiveness* factor contains Unlikeable-Likeable, Undesirable-More Desirable, and Unattractive-More Attractive, and the *Social Group Fit* factor contains the remaining three items.

The Cronbach alpha for the 11 item scale was .91 in a student population and .88 in a clinical population (Allan & Gilbert, 1995). The reliabilities among the subscales for the present study were as follows: *Rank* (α = .84), *Group Fit* (α = .86), and *Attractiveness* (α = .84). These three subscales served as measured variables of social comparison in the structural equation analysis. The discriminant validity for the *Social Comparison Scale* was established with the *Symptom Checklist-90-Revised* (SCL-90-R; Derogatis, 1983) on clinical and non-clinical samples (Allan & Gilbert, 1995; Gilbert, Price, & Allan 1995). Overall, the magnitude of the correlations increased between social comparison and psychopathology in the clinical groups compared to the student group. Interestingly, the social comparison of the *Social Group Fit* factor was not significant in the patient sample, although most of the SCL-90-R subscales were in the student group. Allan and Gilbert (1995) attribute this deviation to the group environment of a hospital setting where fitting in may not be desirable.

Submissive Behaviour Scale (SBS; Allan & Gilbert, 1997; Gilbert & Allan, 1994). The SBS is a 16-item unidimensional questionnaire in which respondents rate a series of statements on a 5-point scale (ranging from 0 to 4) where higher scores indicate more submissive behaviours. The scale was developed from the work of Buss and Craik (1986) and it seeks to differentiate between assertiveness and submissiveness in social interactions. The scale is designed to focus on social behaviours and also contains indicators of anxiety or depression (Allan & Gilbert,

1997). The scale has good internal and test-retest reliability. In a sample of undergraduate students, Gilbert et al. (1995) found a Cronbach's alpha of .89 and test-retest reliability over a four month period of .84. The Cronbach's alpha found in the present study (α = .87) was very similar to Gilbert et al.'s. Concurrent validity of the SBS was established by its satisfactory correlation (r = .73) with the nonassertive measure of the *Inventory of Interpersonal Problems* (Horowitz, Rosenberg, Baer, Ureno, & Vallasenor, 1988) in a group of female undergraduate students (Gilbert, Allan, & Goss, 1996). Using the rank order method, three parcels were created from the SBS to serve as measured variables in the structural equation analysis.

State Self-Esteem Scale (SSES; Heatherton & Polivy, 1991). The SSES was developed as a measure of *state* rather than trait self-esteem. Heatherton and Polivy (1991) created the scale because of the insensitivities and minimal variability in responses of more traditional assessments of self-esteem (e.g., *Rosenberg's Self-Esteem Scale*; Rosenberg, 1965) that tended to only measure stable self-esteem. The SSES consists of 20 items that tap momentary fluctuations in self-esteem. The scale has good internal consistency (α = .92) and it is responsive to temporary changes in self-evaluation (see Crocker, Cornwell, & Major, 1993).

According to Heatherton and Polivy (1991) three factors exist within the SSES and these include a six-item *Appearance* subscale (α = .77), a seven-item *Performance* subscale (α = .76), and a seven-item *Social* subscale (α = .81). In the present study, the Cronbach's alpha coefficient for the Total SSES scale was identical (α = .92) to the one found by Heatherton and Polivy (1991). In addition, all of the subscales were very similar ranging from .83 to .87: *Attractiveness* (α = .83), *Performance* (α = .83), and *Social* (α = .87).

Based on their five studies, Heatherton and Polivy (1991) concluded that the SSES is psychometrically sound and has a high degree of construct and discriminant validity. They

compared the SSES with other established measures of self-esteem, and found moderate to high correlations with each assessment tool [*Rosenberg Self-Esteem Scale*, $r = .72$ and *Janis-Field Feelings of Inadequacy Scale* (JFS; Janis & Field, 1959), $r = .76$]. Also, measures of depression, anxiety, hostility, and physical appearance were compared to the three subscales. This examination revealed that the *Performance* factor was most highly related to overall self-esteem, trait anxiety, and depression, but not social desirability, physical appearance, and hostility. The *Social* factor was most highly associated with trait social self-esteem (on the JFS) but less related to hostility and physical appearance. As expected, the *Appearance* factor was most highly related to physical appearance, depression, and overall self-esteem (on the *Rosenberg Self-Esteem Scale*), but was unrelated to social desirability. Discriminant validity of the SSES and its subscales was established by measuring changes in self-esteem between Day 1 and subsequent time periods. For example, Heatherton and Polivy (1991) found a drop in *Performance* state self-esteem on Day 2 when participants were told that they were going to take a difficult exam, whereas no statistically significant differences were observed on the *Social* and *Appearance* subscales. The Total SSES scale was used in the analysis of moderation in the current study. Moderation was assessed using the hierarchical regression analyses as outlined by Baron and Kenny (1986) in order to determine whether *social investment potential* was sensitive to fluctuations in the exogenous variables (i.e., defeat, social comparison, and secure attachment) leading to depression or anxiety.

Attachment Style Questionnaire (ASQ; Feeney, Noller, & Hanrahan, 1994). The ASQ is a 40-item, Likert-type, self-administered questionnaire designed to measure five dimensions central to Hazan and Shaver's (1987) and Bartholomew's (Bartholomew & Horowitz, 1991) conceptualizations of adult attachment. The *Confidence* scale contains eight items relating to

secure attachment behaviours, such as trust in others and belief in one's self-worth. There are two scales measuring preoccupied attachment behaviours: *Preoccupation with Relationships* (8 items) characterizes the anxious reaching out to others in order to fulfill dependency needs, and *Need for Approval* (7 items) reflects the individual's need for others' acceptance and confirmation. There are also two scales that measure dismissing attachment behaviours: *Relationships as Secondary* (7 items) contains items which describe the individual as protecting themselves against hurt and vulnerability by emphasizing achievement and independence. *Discomfort with Closeness* (10 items) relates to feeling uncomfortable with intimacy and closeness.

Respondents are asked to rate items on a 6-point scale ranging from *totally agree* to *totally disagree*. The scales have good internal and test-retest reliability (coefficient alpha of .74 over a 10-week period) with university and secondary school student samples, and the items also loaded appropriately on Hazan and Shaver's (1987) forced-choice attachment measure (Feeney et al., 1994). Feeney et al. (1994) gave the *Attachment Styles Questionnaire, the Intimacy, Conflict, and Parenting Style* (ICPS) *Family Functioning Scales* (Noller, Seth-Smith, Bouma, & Schweitzer, 1992), and/or the *Junior Eysenck Personality Questionnaire* (JEPQ) (Eysenck & Eysenck, 1975) to a sample of eighth graders. They found that perceptions of high family intimacy, democratic parenting, and low levels of family conflict on the ICPS were associated with high scores on *Confidence* and low scores on the scales measuring aspects of insecure attachment. On the JEPQ, *Neuroticism* was correlated with *Preoccupation with Relationships* and *Need for Approval*, while *Extroversion* was correlated with *Confidence* and with low levels of *Discomfort with Closeness* and lack of emphasis on *Relationships as Secondary*. Feeney et al. (1994) reported Cronbach alphas for the five scales as *Confidence* ($\alpha = .78$), *Discomfort with Closeness* ($\alpha = .86$), *Need for*

Approval (α = .77), *Preoccupation with Relationships* (α = .74), and *Relationships as Secondary* (α = .72). In the present study, only the *Confidence* subscale (α = .82) was collected to function as a measure of secure attachment. Using the rank order method of parceling, two parcels were created to function as measured variables in the structural equation analysis.

Interpersonal Sensitivity Measure (IPSM; Boyce & Parker, 1989). The IPSM consists of 36-items that were developed to measure both the over sensitivity to social interactions and cognitive distortions common in depression-prone individuals (Boyce & Mason, 1996; Boyce & Parker, 1989) and it has been termed the measure of "interpersonal rejection sensitivity" (see Harb, Heimberg, Fresco, Schneier, & Liebowitz, 2002). Each item is scored on a 4-point Likert scale (1 = very like me; 2 = moderately like me; 3 = moderately unlike me; and, 4 = very unlike me), allowing total scores on the instrument to range from 36 to 144. Although participants are usually asked to respond based on how they *generally* feel consistent with a more stable personality trait (Boyce et al., 1992), in the present study respondents were asked how they felt at the time they completed the questionnaire.

The scale measures five components of interpersonal sensitivity: 1) *Interpersonal Awareness*, referring to the way an individual appraises and attributes meaning to a situation; 2) *Need for Approval*, assessing the extent to which an individual needs to be approved of by others; 3) *Separation Anxiety*, assessing any undue anxiety about possible separation from a significant other; 4) *Timidity*, focusing on behavioural aspects of depression-prone characteristics, particularly the inability to behave assertively; and 5) *Fragile Inner Self*, which identifies difficulty with self-disclosure for fear of being rejected or ridiculed.

Boyce and Parker (1989) report that the IPSM has demonstrated satisfactory internal consistency in both a depressed (α = .86) and non-clinical sample (α = .85). The instrument was

found to be moderately stable over time in a non-clinical group (test-retest coefficient = .70). However, the IPSM does show sensitivity to current mood in depression and those recovering from depression (Boyce & Parker, 1989). In fact, elevated scores on the IPSM in a sample of non-depressed women over a six month period were predictive of increased risk of depression (Boyce, Parker, Barnett, Cooney, & Smith, 1991).

Boyce and Parker (1989) demonstrated concurrent validity by comparing the scores on the IPSM from nearly 500 participants (depressed patients and non-clinical students) with psychiatric interviews from clinicians (r = .72). Also, convergent validity was demonstrated by the moderately high correlation (r = .66) between the IPSM and the *Neuroticism* subscale of the *Eysenck Personality Inventory* (Eysenck & Eysenck, 1975). Shortened versions of the IPSM have been utilized in previous studies (e.g., Gillespie, Johnstone, Boyce, Heath, & Martin, 2001; Todd, Boyce, Heath, & Martin, 1994). In the present study, the *Separation Anxiety* subscale was excluded from the analysis due to the direct overlap with the questions of the DASS depression and anxiety variables. Fifteen items were selected (see Appendix I) from the other four subscales [*Interpersonal Awareness* (α = .79), *Need for Approval* (α = .61), *Timidity* (α = .75), and *Fragile Inner-Self* (α = .79)]. These items were selected based on face validity (i.e., interpersonal awareness and social risk taking) prior to conducting any analysis. Using Allen and Badcock's (2003) algorithmic model (see Figure 2, page 897 of their article), items that encapsulated attending to socially threatening information and interpreting social situations as threatening were selected. Three equal sized parcels were created using the rank order method which served as measured variables in the structural equation analysis.

Defeat Scale (DS; Gilbert & Allan, 1998). According to Gilbert and Allen (1998) the DS is the first and only self-report measure of subjective experiences of defeat. The *Defeat Scale* is

designed to measure a sense of personal failure and the loss of social rank. The measure consists of 16 items to which participants are asked to respond on a 5-point Likert scale indicating the extent to which each item describes their feelings (0 = never; 1 = rarely; 2 = sometimes; 3 = mostly; 4 = always/all the time). Using a large sample of non-clinical university students and a group of clinically depressed patients, the authors reported Cronbach's alpha as .94 for the student group and .93 for the depressed participants. High internal consistency was also observed between the sexes, the alpha for females being .94 and male .93 for both student and the depressed groups.

Factor analysis of the scale items revealed that all items possessed a loading of at least .45 or higher, indicated the unidimensionality of the construct. Concurrent validity for the *Defeat Scale* was established using the BDI and *Beck Hopelessness Scale* (BHS; Beck, Weissman, Lester, & Trexler, 1974). In each case high correlations were reported suggesting the DS is measuring a construct related to depression and hopelessness, but the scale is also deemed to be distinct from these two measures and other rank-oriented scales (Gilbert & Allan, 1998). The Cronbach's alpha coefficient for the entire *Defeat Scale* in the present study was .95. This scale was split into 3 parcels using the rank order method. These parcels were used as the measured variables in the structural equation analysis.

Procedures

A mail-out survey package was sent to the work addresses through the company mail system of all potential participants at each selected worksite over the winter of 2006/2007. Individual worksites were selected based on the heterogeneity of the vocational positions at each company. In other words, a conscientious effort was made to sample a wide range of professions. An information letter accompanied the survey that described depression and social interactions

as focal dimensions of interest and indicated that participation was strictly voluntary; however, a $5 donation would be made to a charity of their choice with each returned package. Furthermore it was communicated that all questionnaires would be stored safely in a locked file cabinet for a period of 7 years, after which time all data will be shredded. Potential participants were asked to ensure no identifying information (e.g., names) was recorded on the package; instead, they were informed that only researcher assigned numbers would be used to identify individual responses. Estimated completion time of the questionnaire package was between 20-30 minutes. Returning the questionnaire package constituted consent to participate in the study, and anonymity was assured by sending identical packages. Approval for the project was obtained from the University of Alberta's ethics review committee.

Results

Preliminary Analyses

Means, standard deviations, and correlations for the 21 measured variables used in the depression model (i.e., Study 1) and anxiety model (i.e., Study 2) for males and females are shown in Table 4 – 1 and Table 4 – 2, respectively as well as the correlations for the 8 latent variables found in Table 4 – 3 and Table 4 – 4 for males and females, respectively. The final structural models for the depression (i.e., Study 1) and anxiety (i.e., Study 2) models are shown in Figure 4 – 1 and Figure 4 – 2, respectively. In the depression model (i.e., Study 1) the fit to the data was acceptable at; χ^2 (95, N = 397, p < .001) = 234.58, χ^2 / df = 2.47, NFI = .944, CFI = .966, GFI = .930, RMSEA = .061 (90% CI: .051, .071). All paths were statistically significant (p < .05; see Figure 4 – 1). For this model, 23.1% of the variance in interpersonal sensitivity and 24.5% of the variance in submissive behaviour was explained by the combination of secure attachment, social comparison, defeat, and depression. In the anxiety model (i.e., Study 2) the fit

to the data was acceptable at; χ^2 (95, N = 397, p < .001) = 228.14, χ^2 / df = 2.40, NFI = .943, CFI = .966, GFI = .932, RMSEA = .059 (90% CI: .050, .069). All paths were statistically significant (p < .05; see Figure 4 – 2) suggesting that there was no need to alter this model any further. For this model, 23.3% of the variance in interpersonal sensitivity and 25.9% of the variance in submissive behaviour was explained by the combination of secure attachment, social comparison, defeat, and anxiety. These two models (see Figure 4 – 1 and Figure 4 – 2) served as baseline models for tests of invariance across gender in the present study.

Testing Gender Invariance in Study 1 – Depression Model

The sex of the participants as a potential moderator was evaluated through the multiple group analysis procedure in AMOS 16.0 (see Arbuckle, 2003; Byrne, 2004). This procedure involved the creation of separate female (N = 268) and male (N = 125) data sets and then comparing the measurement weights of the respective models (i.e., with no constraints imposed) so that the overall fit of the model can be compared by gender. Consistent with Anderson and Gerbing's (1988) two-step approach, the measurement weights were analyzed so that the relations of the observed variables to the underlying constructs could be permitted to intercorrelate freely. Measurement weight differences between the overall nested model comparisons were not statistically significant $\Delta\chi^2$ [10] = 13.743, p < .185 (*Note*. $\Delta\chi^2$ represents the minimum value discrepancy for multiple group comparisons of each structural weight followed by the degrees of freedom, in this case a change of 10). In the second step, the structural weights for the nested models comparing gender were evaluated. The results of this analysis indicated that there was not a statistically significant difference by sex, $\Delta\chi^2$ [5] = 7.945, p < .159. This finding implies that there are no overall differences among the standardized path coefficients or women and men in the depression model from Study 1. However, following the

recommendations of Steenkamp and Baumgartner (1998) tests of partial measurement invariance via individual constraints were analyzed given that this is an omnibus test (i.e., a chi-square difference test).

In order to determine whether the standardized path coefficients differ significantly between men and women, each pathway of the male data set was constrained (i.e., to the female value) thereby producing individual structural weights that could be contrasted with the original comparison (i.e., $\Delta\chi^2$ 7.945 with 5 degrees of freedom). Thus, with one pathway constrained for each individual comparison (i.e., defeat → depression; social comparison → depression; secure attachment → depression; depression → submissive behaviour; and, depression → interpersonal sensitivity) there are only 4 degrees of freedom associated with the resulting structural weight; therefore, the critical chi-square at 1 degree of freedom is equal to 3.84, $p < .05$. In other words, a statistically significant change will result if 7.945 – *structural weight* $\Delta\chi^2$ equals 3.84 or more. As shown in Table 4 – 5, there were no statistically significant differences between any of the pathways except for secure attachment → depression. In Figure 4 – 3 and Figure 4 – 4 it can be seen that the structural weights for the path between secure attachment to depression are both negative for males (i.e., -.59) and females (i.e., -.13) but the association is much stronger for males.

Testing Gender Invariance in Study 2 – Anxiety Model

For the anxiety model, the measurement weight differences between the overall nested model comparisons were not statistically significant $\Delta\chi^2$ [10] = 11.435, $p < .325$. However, the results of the structural weight differences indicated that there was a statistically significant difference by sex, $\Delta\chi^2$ [5] = 11.505, $p < .042$. This finding implies that there are differences among some or all of the standardized path coefficients for women and men in the anxiety model

from Study 2. In order to determine which standardized path coefficients differ significantly between men and women, each pathway of the male data set was constrained (i.e., to the female value) thereby producing individual structural weights that could be contrasted with the original comparison (i.e., $\Delta\chi^2$ 11.505 with 5 degrees of freedom). Thus, with one pathway constrained for each individual comparison (i.e., defeat → anxiety; social comparison → anxiety; secure attachment → anxiety; anxiety → submissive behavior; and, anxiety → interpersonal sensitivity) there are only 4 degrees of freedom associated with the resulting structural weight; therefore, the critical chi-square at 1 degree of freedom is equal to 3.84, $p < .05$. In other words, a statistically significant change will result if 11.505 – *structural weight* $\Delta\chi^2$ equals 3.84 or more. As shown in Table 4 – 6, there were no statistically significant differences between any of the pathways except for social comparison → anxiety. In Figure 4 – 5 and Figure 4 – 6 it can be seen that the structural weights for the path between social comparison to anxiety is positive for males (i.e., .10) but negative for females (i.e., -.32).

Testing the Moderating Effects of Self-esteem

A series of hierarchical regression analyses (see Baron & Kenny, 1986; Frazer, Tix, & Barron, 2004) were performed separately for males and females to determine whether self-esteem (i.e., social investment potential) functioned in the role of a moderator as suggested by Allen and Badcock's (2003) model over and above the variance predicted by the main effect variables. Before analyses of the data took place, all measured variables were standardized to make it easier to plot (and understand) significant moderator effects (see Frazer et al., 2004). Next, the values of the standardized measured variables were multiplied by the corresponding standardized weights from the final structural models (see Figures 4 – 3, 4 – 4, 4 – 5, and 4 – 6). In other words, the standardized factor scores of the indicator variables are used to create their

respective latent variables. The products from these simple equations become the latent variables for use in the moderation analyses. Separate sets of analyses were conducted to allow for submissive behaviour and interpersonal sensitivity to serve as separate dependent variables. In Step 1 of the analyses, defeat, social comparison, secure attachment, and depression *or* anxiety were all in a predictor block entered first in the regression equation which allowed for all of the main effects to be controlled for before testing interaction effects. Step 1 was completed separately for males and females for both depression and anxiety (see Tables 4 – 7, 4 – 8, 4 – 9, and 4 – 10) with submissive behaviours and interpersonal sensitivity as the final dependent variables. The analyses for defeat, social comparison, secure attachment, and depression (see Tables 4 – 7 and 4 – 9) combined to account for 26.2% of the variance in the submissive behavior scores for males, F (4, 120) = 10.65, $p < .001$; and, 25.0% of the variance in the female sample, F (4, 263) = 21.96, $p < .001$. These same variables combined to account for 16.7% of the variance in the interpersonal sensitivity scores for males, F (4, 120) = 6.02, $p < .001$; and, 31.1% of the variance for the female group, F (4, 263) = 29.65, $p < .001$ (see Tables 4 – 8 and 4 – 10). In Table 4 – 7, it can be seen that 26.6% of the variance in the submissive behaviours scores in the male sample is accounted for by defeat, social comparison, secure attachment, and anxiety, F (4, 120) = 10.89, $p < .001$; and, in Table 4 – 9 these four variables predict 26.4% of the variance in the female sample, F (4, 263) = 23.62, $p < .001$. These same variables combined to account for 15.8% of the variance in the interpersonal sensitivity scores for males, F (4, 120) = 5.63, $p < .001$; and, 31.0% of the variance for the female group, F (4, 263) = 29.52, $p < .001$ (see Tables 4 – 8 and 4 – 10).

Two-way interactions. In Step 2, the self-esteem variable was combined into three separate interaction terms with defeat, social comparison, and secure attachment, respectively, as

additional predictors of submissive behaviour (see Tables 4 – 7 and 4 – 9) and interpersonal sensitivity (see Tables 4 – 8 and 4 – 10) for males and females. These three two-way interactions were tested while controlling for the main effects of all the predictor variables in separate analyses for both dependent variables. Each interaction term was incrementally partitioned to determine the variance accounted for over and above the main effects for submissive behaviour and interpersonal sensitivity. Based on the recommendations of other researchers (e.g., Metalsky & Joiner, 1992), the effect of each interaction term was tested separately and then again while controlling for the effects of the other interaction terms. As such, the three interaction terms were combined into the second block to assess the unique contributions of each interaction term in predicting the dependent variable (i.e., interpersonal sensitivity and submissive behaviours) controlling for the other two interaction terms.

In Tables 4 – 7 and 4 – 9, each interaction term is separately analyzed for the final dependent variable, submissive behaviour for both males and females, respectively. There were no statistically significant interaction terms for self-esteem with any of the independent variables (i.e., defeat, social comparison, and secure attachment) in predicting depression. Similarly, when all three interaction terms were placed in Step 2, no statistically significant results were obtained. Also, represented in Tables 4 – 7 and 4 – 9 are the interaction terms for the abovementioned independent variables in predicting anxiety. Again, there were no significant interaction terms in the male and female samples when submissive behaviour served as the final dependent variable. In Tables 4 – 8 and 4 – 10, each interaction term is separately analyzed for the final dependent variable, interpersonal sensitivity for both males and females, respectively. There were no statistically significant interaction terms for self-esteem with any of the independent variables (i.e., defeat, social comparison, and secure attachment) in predicting depression for the males;

however, in the female sample there was a significant interaction for defeat. In other words, self-esteem moderates the relationship between defeat and depression, but only in the female sample, F (4, 263) = 4.05, $p < .05$, to predict 1% of unique variance in the interpersonal sensitivity score. Consistent with the recommendations of Jaccard, Turrisi, and Wan (1990), the slope of the significantly interacting terms were interpreted at each level of the independent variable. These simple slopes were defined as one standard deviation below the mean score and one standard deviation above the mean to provide for low and high levels, respectively. As shown in Figure 4 – 7, there was a statistically significant relation between defeat and depression for women with both low and high levels of self-esteem. These statistically significant findings were for females low in self-esteem (slope = 0.20, $t(264) = 7.46$, $p < .001$) and those with high levels of self-esteem (slope = -0.26, $t(264) = 5.40$, $p < .001$). Thus, when perceived defeat is high, low self-esteem will magnify (i.e., a positive slope) a woman's experience of depression. Whereas, a woman with high perceived defeat but high self-esteem will have her depressed mood assuaged (i.e., a negative slope).

As well, when all three interaction terms were put in the second block in the female sample (see Table 4 – 10), social comparison, F (4, 260) = 8.80, $p < .01$, interacted to predict 2% of the unique variance in the interpersonal sensitivity score. This suggested that when social comparison is together with defeat and secure attachment, there is some shared variance that is magnified when combined. When interpersonal sensitivity is the final outcome variable, this relationship functions to allow self-esteem to interact in predicting depression in the female sample.

The analyses testing for moderation for defeat, social comparison, and secure attachment in Step 2 for predicting anxiety with submissive behaviours as the final dependent variable, no

statistically significant relationships were found in either the male or female sample. A similar story was found for interpersonal sensitivity as the final dependent variable for both samples. (see Tables 4 – 7, 4 – 8, 4 – 9, and 4 – 10). Interestingly, when all three interaction terms were placed in Step 2 in the female sample, a statistically significant result was obtained. It was the defeat variable, F (4, 260) = 8.25, $p < .01$, that interacted to predict 2% of the unique variance in the interpersonal sensitivity score. This suggested that when defeat is together with social comparison and secure attachment, there is some shared variance that is magnified when combined. When interpersonal sensitivity is the final outcome variable, this relationship functions to allow self-esteem to interact in predicting anxiety in the female sample.

Discussion

Past research has found numerous socially relevant gender differences (see Bjorkland & Pellegrini, 2002) including explanations designed to explain the invariance between the sexes as a physiological byproduct (e.g., Klein, 1993; Papp et al., 1997; Perna et al., 1995; Sheik, Leskin, & Klein, 2002; Stroud et al., 2002). The present study undertook to test an adaptive model using SEM to help determine evolutionarily relevant relationships specific to males and females in anxiety and depression. A comparison of the male and female data from Study 1 and 2 were used to analyze gender invariance in the evolutionary model called the *social risk hypothesis* (see Allen & Badcock, 2003). The results indicate that many of the mechanisms of depression and anxiety both operate in a similar fashion across gender. Specifically, no sex differences were found between the effects of depression *or* anxiety mediating the relationship between defeat and the two final outcome variables, interpersonal sensitivity and submissive behaviours. It is noteworthy that this pathway is the only one that did not produce any invariance between males and females for both the anxiety and depression models.

Structural weights for the overall model were the same across gender in the depression model (i.e., Study 1); however, tests of partial measurement invariance revealed that men and women differed on the secure attachment-depression pathway. There was a stronger negative relationship between secure attachment and depression for men (-.59) compared to women (-.13). In the anxiety model (i.e., Study 2), the structural weights for the overall model indicated that there was at least one statistically significant difference between males and females. A closer look at the data revealed that none of the relationships in the model were significantly different except the association between social comparison and anxiety. In this path the structural weights for men was positive (.10) whereas the weight for women was negative (-.32). Lastly, the moderating effects of self-esteem were only present in the female sample, and only in the association between defeat and depression when predicting interpersonal sensitivity.

The stronger negative association between secure attachment and depression for males suggests that men who feel that their affiliative bonds are weak would be more prone to depression than women. Such a result initially seems contrary to much of the research used to explain sex differences in depression as an artifact of relationship difficulties (e.g., Corney, 1987; Cyanowski, Frank, Young, & Shear, 2000; Kobak & Sceery, 1988; Rounsaville, Weissman, Prusoff, & Herceg-Baron, 1979). However, it is important to recognize that this difference between the sexes may indicate that women (with whom relationships are more vital in our EEA; see Buss, 2008) use their secure relationships as an effective buffer to ward off depressive states. Men, on the other hand, could be viewed as less proficient at utilizing their affiliation in close relationships to protect themselves against the debilitating effects of depression. Indeed, men are often inclined toward demonstrations of personal prowess as is evinced by status striving activities in almost all cultures (Cummins, 2005). Along this line of

thought, men with high status would probably have many subordinates who are “attached” to them thereby creating a relationship of dependency. Such a prestigious male would be less likely to incur a bout of depression with his highly secure attachment to those conspecific minions within the group.

Given that social comparison was commensurate for men and women in the depression model it is possible that the level of competition produces two different types of attachment relationships. For instance men may have more subordinate-dominant relationships while women have a proclivity for “tend-and-befriend” bonds (Taylor et al., 2000). So the attachment is quite different between the sexes, more along the lines of quantity versus quality for men and women, respectively. The tenuousness of relationships for males may create a greater inclination toward depression because of the ephemeral nature of their attachment to others.

The other statistically significant difference in the tests of invariance between men and women revealed that social comparison varied in the anxiety model (see Figures 4 – 5 and 4 – 6). On the path between social comparison to anxiety there was a positive association for males (i.e., .10) but a negative one for females (i.e., -.32). Consistent with the proposed relationships in the *social risk hypothesis*, women with who perceived themselves as higher in status compared to others had fewer anxious symptoms. Conversely, women determining themselves as lower in the social order were more likely to activate the anxiety mechanism. However, the relationship found in the male sample is somewhat puzzling. The positive association between social comparison and anxiety suggests that a higher appraisal of a man’s status leads to anxiety.

One possible explanation relates to the fragile balance between being on top and staying on top of the social hierarchy. There seems to be more pressures associated with maintaining one’s status in relation to others. Strout et al. (2002) found that men placed in an achievement

condition (i.e., a mathematical and verbal challenge) released more of the stress hormone cortisol than their female counterparts. The release of cortisol has been linked to anxiety in men who are engaged in highly competitive contexts (e.g., Filaire, Alix, Rouveix, & Le Scanff, 2007; Robinson, Sunram-Lea, Leach, & Owen-Lynch, 2008; Taylor et al., 2008). Thus, it seems that there is a cost associated with being on top of the social ladder especially in shifting dominance hierarchies (Sapolsky, 2005). For example, the widely viewed HBO television series called The Sopranos featured a top-dog mobster, Tony Soprano, who being tough, feared, and respected by others still felt an ongoing need to be vigilant as someone was always jockeying for his position (which would translate into Tony being killed). Perhaps this is why some individuals are quite content with a lower rank (Gilbert, 2000b). The evolutionary underpinnings of this finding would suggest that alpha males were under threat of being replaced, and it would appear to be an adaptive mechanism that allowed them to be sensitive and vigilant to probable challenges.

A comparison of the variance in the two final outcome variables in the depression and anxiety models for males and females accounted for by secure attachment, defeat, social comparison, and depression *or* anxiety revealed some noteworthy differences. The variance in the submissive behaviours was very similar in the depression (26.2% vs. 25.0%) and anxiety models (26.6% vs. 26.4%) in the males and females, respectively. However, there was a marked discrepancy in the variance of the interpersonal sensitivity variable between the sexes. For females, the combination of secure attachment, defeat, social comparison, and depression *or* anxiety accounted for 31.1% and 31.0% variance in the depression and anxiety models, respectively. In the male sample only 16.7% and 15.8% variance in the depression and anxiety models, respectively, was accounted for by these three variables. This finding indicates that there is much more unexplained variance in the male sample when it comes to interpersonal

sensitivity. It would seem that the algorithmic model put forth by Allen and Badcock (2003) may be slightly less suited to men. Research has suggested that men tend to maintain more independence based on their unique qualities and ability to differentiate themselves from others (instrumental concerns), whereas women tend to maintain interdependence in which their self-definition is based predominately on relationships and "tend-and-befriend" behaviours (Cross & Madson, 1997; Taylor et al., 2000). Therefore, it could be that for males, the achievement strivings or inhibitions found in submissive behaviours are much more important than responsiveness to social rejection (Stroud et al., 2002).

Tests of the moderating effects of self-esteem also revealed some additional sex differences with the interpersonal sensitivity variable. In the male sample, self-esteem did not serve to moderate the relationships between depression *or* anxiety and any of the three latent variables (i.e., secure attachment, social comparison, and defeat); however, in the female sample the defeat-depression link was moderated by low and high self-esteem. *Social investment potential* (or self-esteem) has been a vital part of women's survival especially in relations to their limited reproductive years (Buss, 2008) and the necessity of finding and retaining a good mate to share parenting responsibilities (Trivers, 1972).

One possible interpretation of the difference in moderation might relate to social withdrawal and low levels of explorative behaviours inherent in experiences of defeat. It is conceivable that the depressive mechanism in women will be less likely to activate if they are at the tail end of their reproductive years (e.g., Sagud, Hotujac, Mihaljevic-Peles, & Jakovljevic, 2002). The mean age of women in this sample was 43.48 years and at this point in a woman's life, reproductive success is quite low. Perhaps women moving out of their reproductive years are only impacted by social isolation if they experience a drop in self-worth (it is important to note, however, that

serious depressive symptoms can be associated with menopause; see Cohen, Soares, Vitonis, Otto, Harlow, 2006). In western societies, women are increasingly career-oriented and derive satisfaction from their work accomplishments rather than solely relying on attracting others because of physical beauty or reproductive certainty.

Conclusion

In conclusion, the results of the present study revealed that the *social risk hypothesis* operates in a similar manner for men and women as an explanation for the retention of depression and anxiety mechanisms in human evolution. However, tests of invariance uncovered differences between the sexes in the depression and anxiety models for the variables of secure attachment and social comparison, respectively. In particular, there was a stronger negative association between secure attachment and depression in men. However, in the case of the relationship between social comparison and anxiety, a directional change was observed depending on one's gender. Specifically, there was a negative association between social comparison and anxiety in women as predicted, but in the male sample this association was positive. This finding may be a result of the need for excessive worrying/vigilance by high status males as other conspecifics are hankering to replace him through agonistic means.

Limitations and Directions for Future Research

This study revealed compelling evidence that differences between males and females may have an evolutionary basis according to the *social risk hypothesis*; however, the present analyses suggest several areas for future investigation. Firstly, a comparison of gender invariance is much more accurate when the sample sizes are the same. In the present study, men were underrepresented (i.e., 125 vs. 268) and this difference in sample size may have accounted for the differences in the moderating effects of self-esteem. As well, the overall depression and

anxiety models tested in this study were derived from the total sample, of which the majority were females. Therefore, some pathways (e.g., social comparison to depression/anxiety) may not have been statistically significant if there were an equal number of men and women. Second, results of the present study are based on an adult sample (albeit a diverse sample) but it is still unclear how the *social risk hypothesis* might operate within a sample of children or adolescents. For instance, according to DSM-IV-TR childhood depression can present as anger and volatility (American Psychiatric Association, 2000) rather than exhibiting submissive and risk-averse behaviours in the social domain. Similarly, research has increasingly held the view that sex differences in the prevalence of depression is less apparent in older adults (e.g., Bebbington et al., 1998), and so it would be instructive to test the *social risk hypothesis* model on the growing demographic of elderly persons who face different social struggles in later life. Thus, it would be very enlightening from a clinical and evolutionary standpoint to undertake an investigation with all age ranges.

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Figure 4 – 1

Study 1 – Depression Model: The mediated structural model of the relationship between the defeat, social comparison, and secure attachment in predicting interpersonal sensitivity and submissive behaviours.

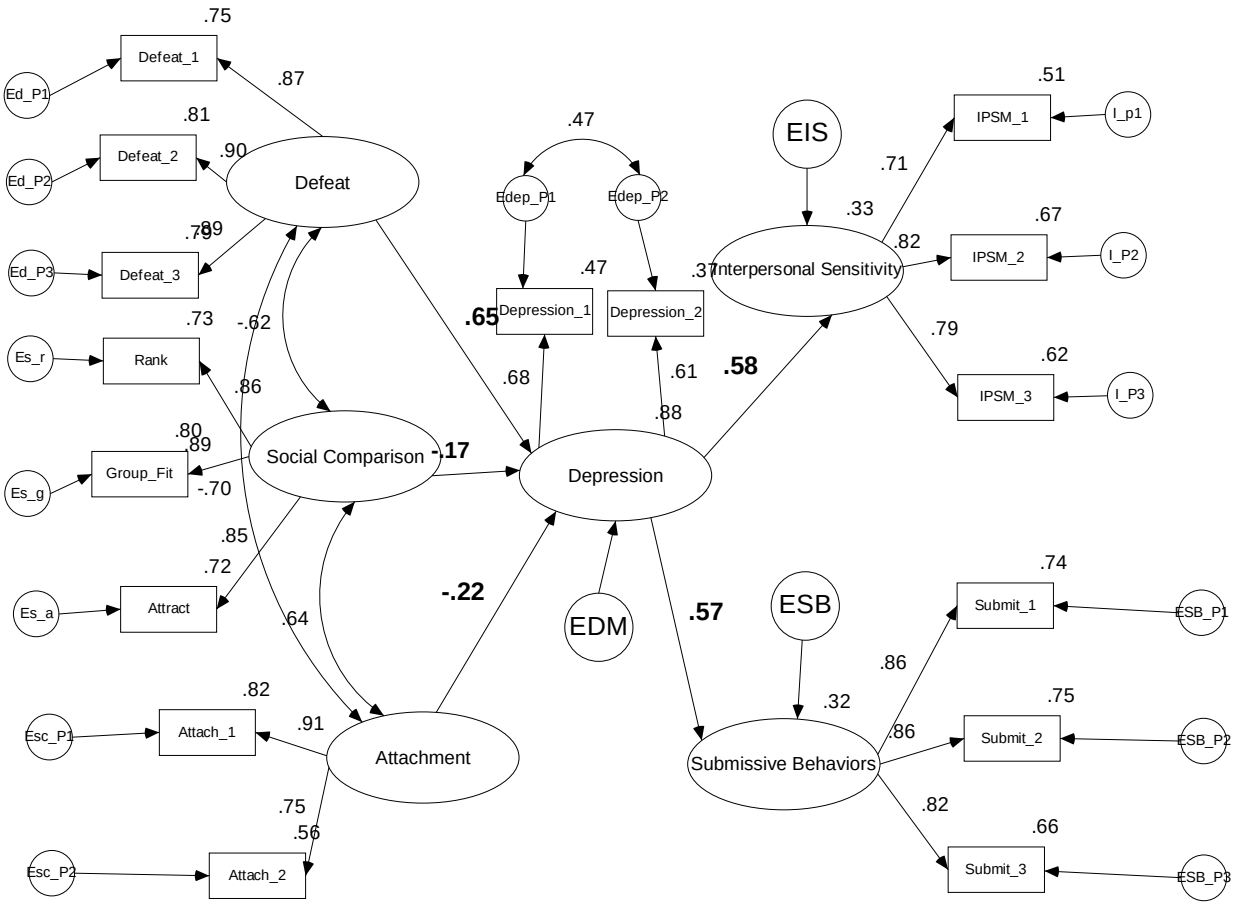

Figure 4 – 2

Study 2 – Anxiety Model: The mediated structural model of the relationship between the defeat, social comparison, and secure attachment in predicting interpersonal sensitivity and submissive behaviours.

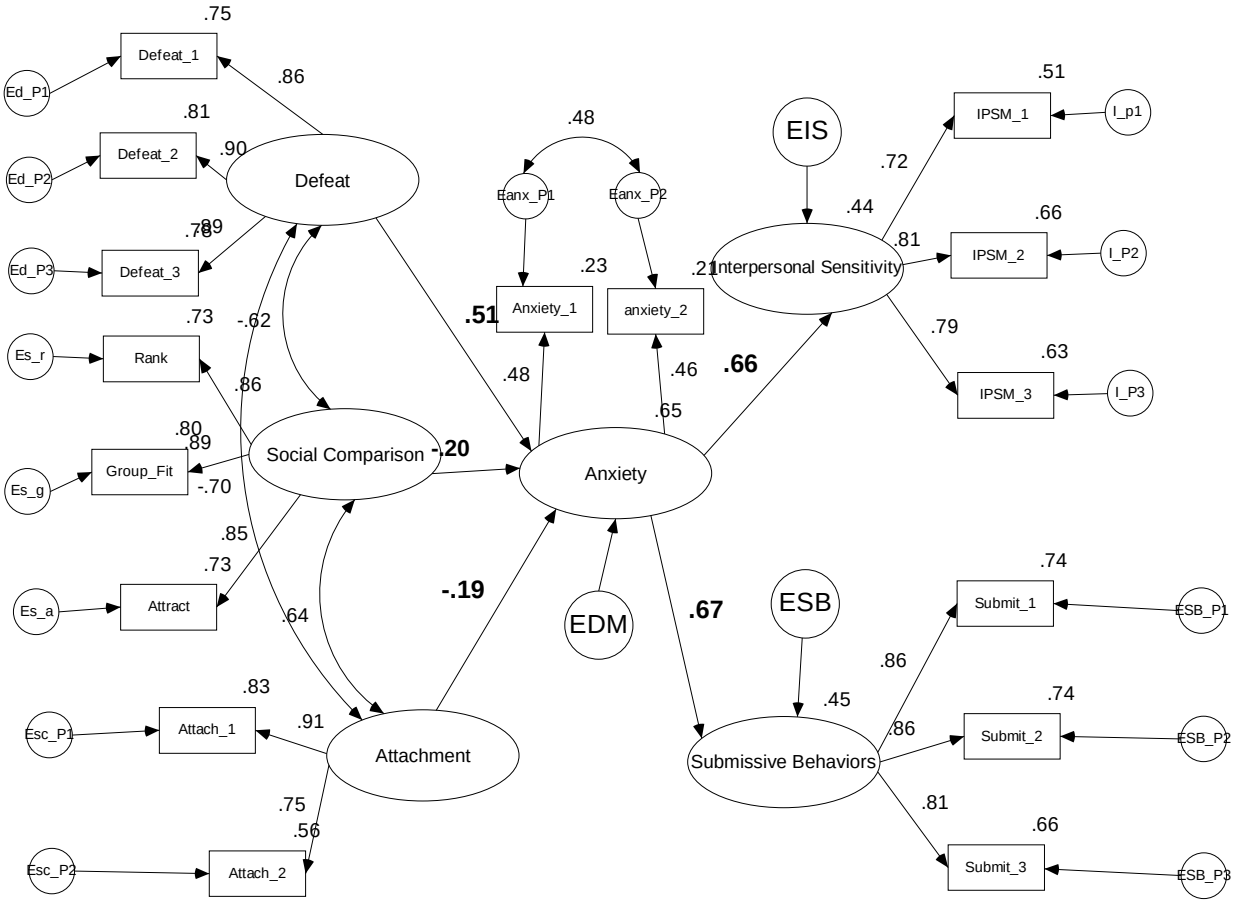

Figure 4 – 3

The Depression Model from Study 1 for Males (N = 125)

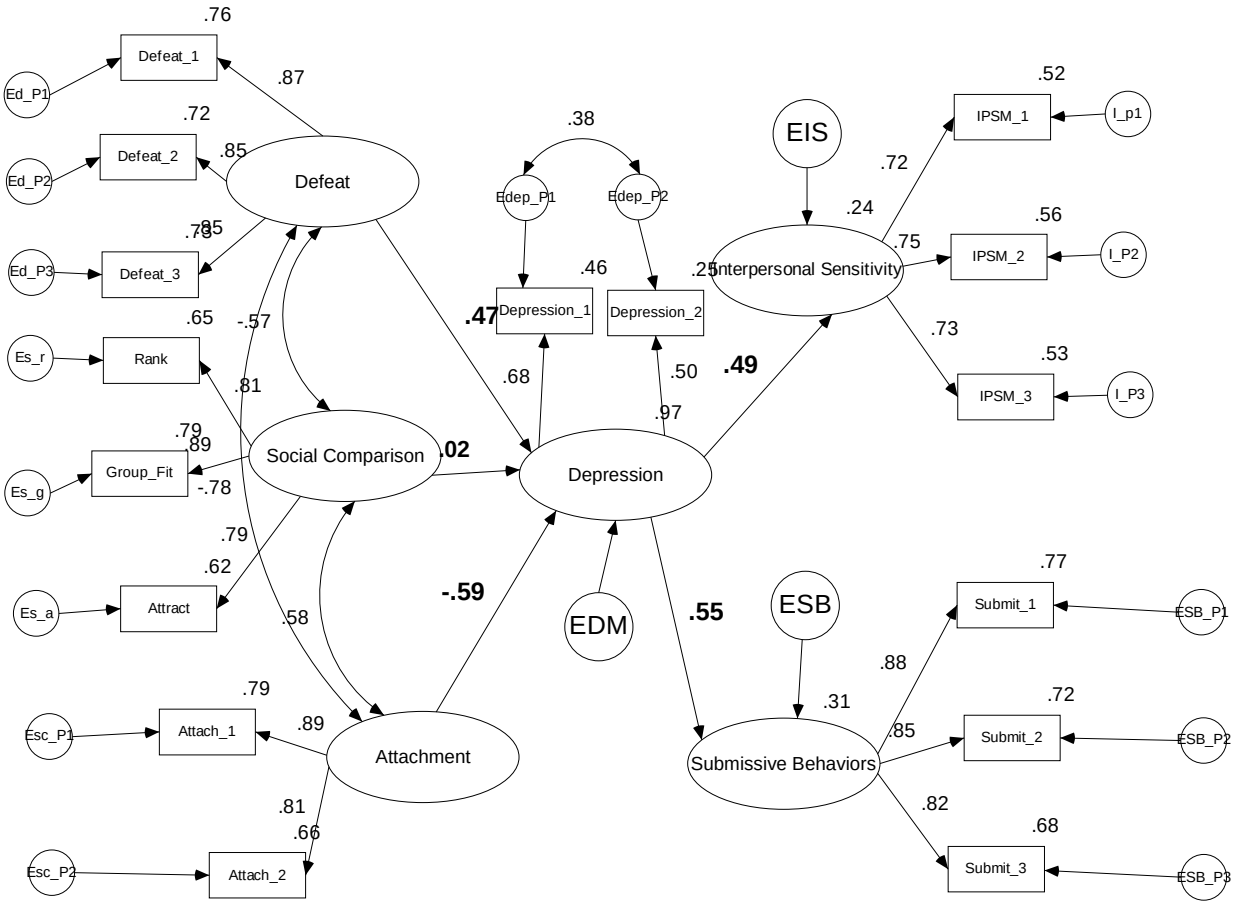

Figure 4 – 4

The Depression Model from Study 1 for Females (N = 268)

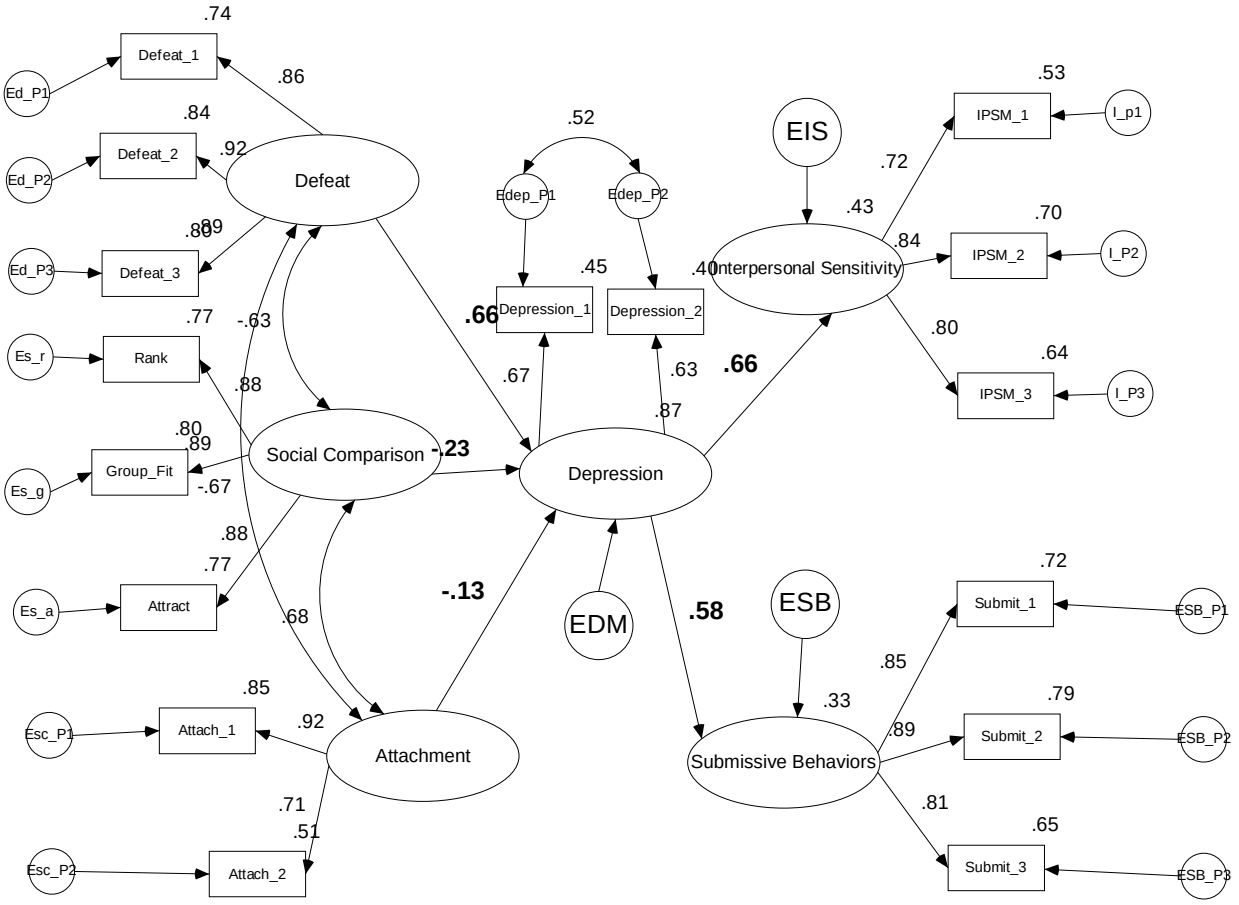

Figure 4 – 5

The Anxiety Model from Study 2 for Males (N = 125)

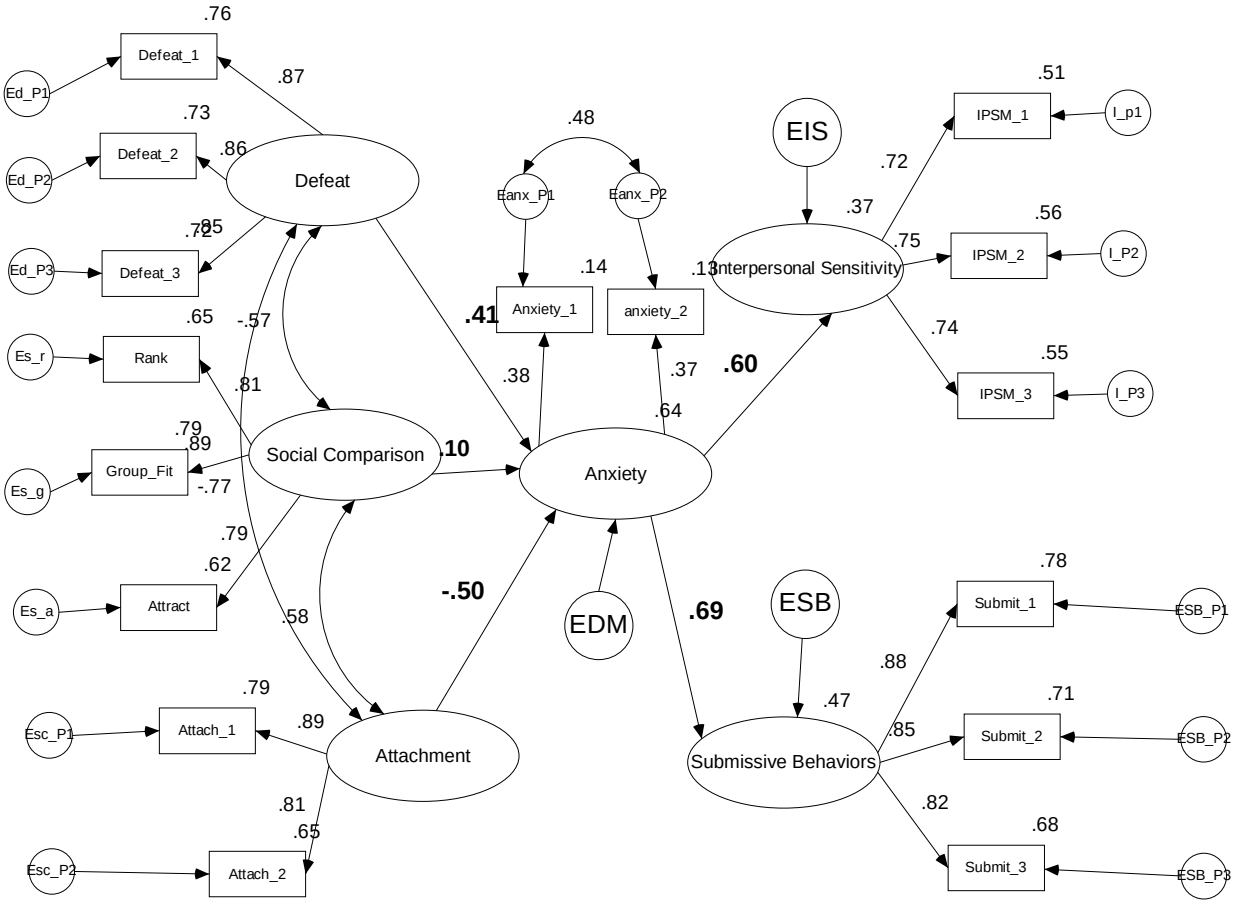

Figure 4 – 6

The Anxiety Model from Study 2 for Females (N = 268)

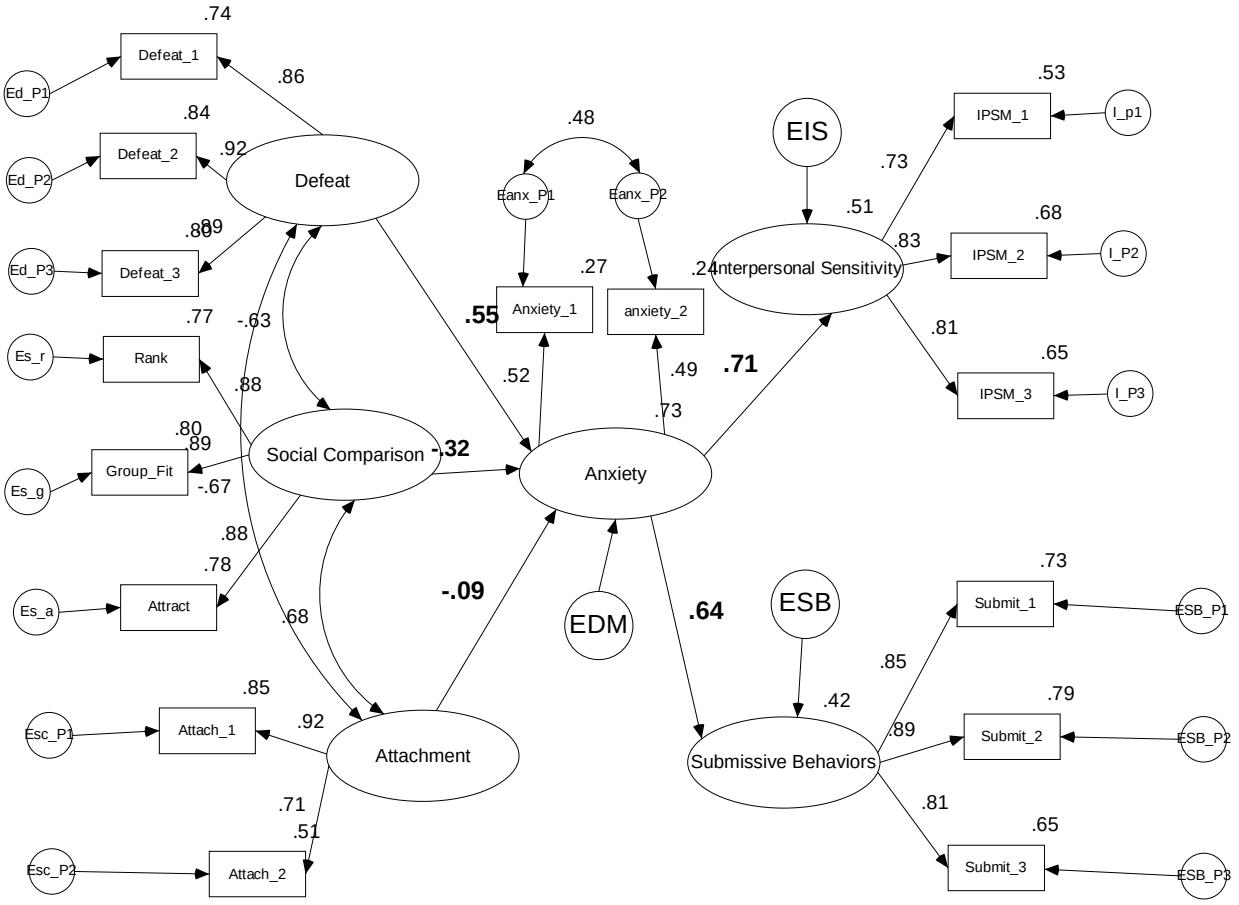

Figure 4 – 7

Two-way interaction between self-esteem and defeat predicting depression when interpersonal sensitivity is the end product in the female sample. Values of self-esteem and defeat are plotted using low (one standard deviation below the mean) and high (one standard deviation above the mean) values of self-esteem and defeat.

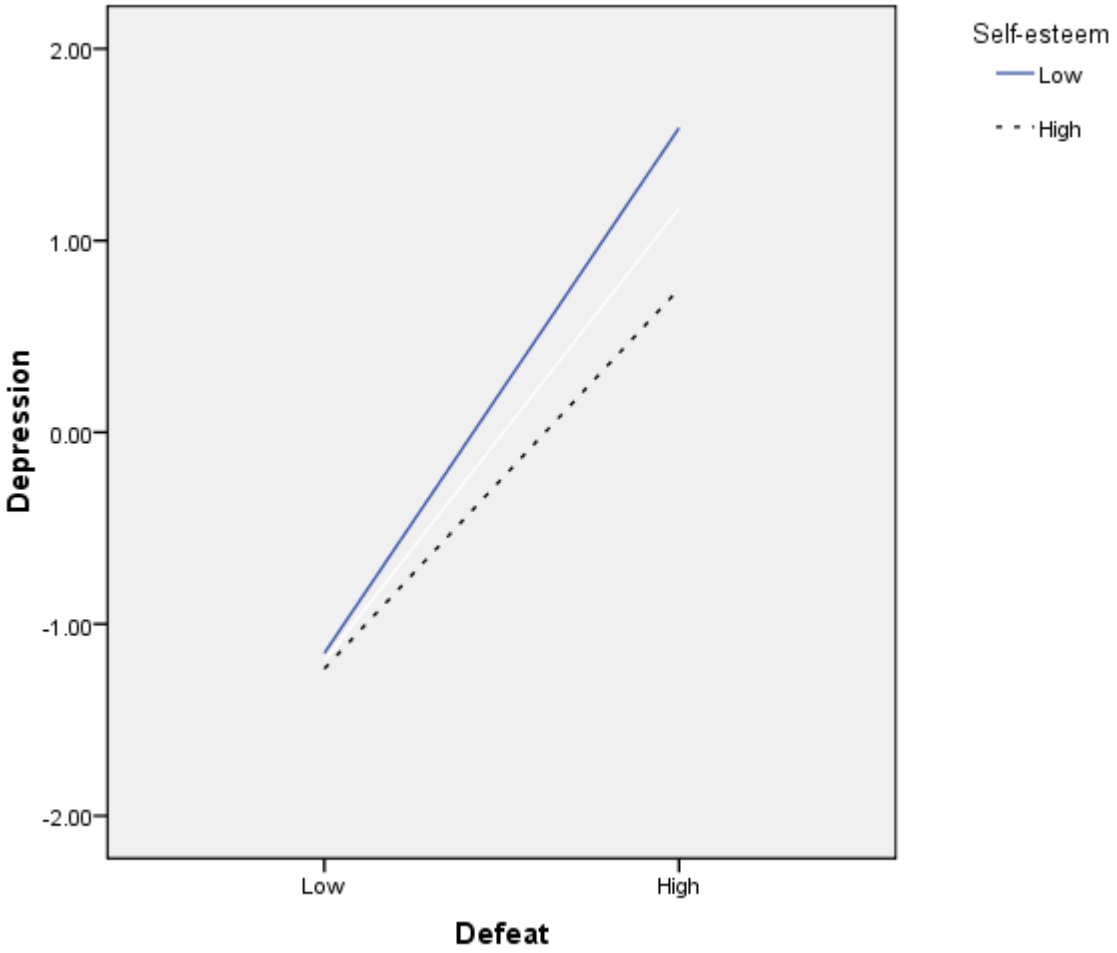

Table 4 – 1

Means, Standard Deviations, and Correlations for the Final Model Variables- Males only (N = 125)

Variables	*M (SD)*	1	2	3	4
1. DASS 21: Depression – P1[a]	0.72 (0.74)	–			
2. DASS 21: Depression – P2 [a]	0.87 (0.81)	.59**	–		
3. DASS 21: Anxiety – P1[a]	0.51 (0.65)	.20*	.24**	–	
4. DASS 21: Anxiety – P2 [a]	0.56 (0.71)	.21*	.22**	.55**	–
5. IPSM – P1[b]	12.48 (2.53)	.32**	.27**	.18*	.16*
6. IPSM – P2[b]	13.60 (2.64)	.32**	.13	.13	.21*
7. IPSM – P3[b]	13.66 (2.55)	.28**	.14	.08	.18*
8. ASQ: Secure Attachment – P1[c]	17.05 (3.11)	-.55**	-.38**	-.20*	-.21*
9. ASQ: Secure Attachment – P2[c]	16.40 (3.13)	-.53**	-.43**	-.25**	-.19*
10. RBS: Social Risk – P1[d]	12.71 (2.74)	-.13	-.09	-.13	-.09
11. RBS: Social Risk – P2[d]	11.38 (2.79)	-.10	.04	-.14	-.02
12. SCS – Rank[e]	24.58 (6.65)	-.35**	-.35**	-.05	-.13
13. SCS – Group Fit[e]	19.50 (4.36)	-.29**	-.34**	.00	-.10
14. SCS – Attractiveness[e]	26.98 (4.97)	-.36**	-.32**	-.08	-.18*
15. Defeat Scale – P1	1.42 (1.06)	.56**	.38**	.29**	.30**
16. Defeat Scale – P2	1.87 (0.71)	.49**	.40**	.28**	.30**
17. Defeat Scale – P3	1.98 (0.83)	.60**	.43**	.30**	.28**
18. Submissive Behaviour – P1 [f]	7.09 (3.17)	.19*	.15	.26**	.19*
19. Submissive Behaviour – P2 [f]	7.33 (3.06)	.25**	.25**	.23**	.18*
20. Submissive Behaviour – P3 [f]	6.03 (3.40)	.26**	.17	.17	.14

21. SSES: Self-Esteem Total [g]	77.05 (11.33)	-.56**	-.46**	-.24**	-.29**

Variables	5	6	7	8	9	10
5. IPSM – P1 [b]	–					
6. IPSM – P2 [b]	.52**	–				
7. IPSM – P3 [b]	.50**	.59**	–			
8. Secure Attachment – P1[c]	-.49**	-.25**	-.29**	–		
9. Secure Attachment – P2[c]	-.31**	-.09	-.12	.72**	–	
10. RBS: Social Risk – P1[d]	-.16	-.03	.01	.05	.14	–
11. RBS: Social Risk – P2[d]	-.28**	-.25**	-.05	.24**	.25**	.52**
12. SCS – Rank[e]	-.26**	-.05	-.08	.45**	.36**	-.04
13. SCS – Group Fit[e]	-.14	-.02	-.10	.43**	.41**	-.05
14. SCS – Attractiveness[e]	-.24**	-.10	-.21*	.41**	.43**	.00
15. Defeat Scale – P1	.41**	.34**	.33**	-.59**	-.51**	-.08
16. Defeat Scale – P2	.32**	.27**	.20*	-.54**	-.59**	-.09
17. Defeat Scale – P3	.26**	.17	.14	-.61**	-.60**	-.06
18. Submissive Behaviour – P1 [f]	.24**	.23**	.34**	-.37**	-.28**	-.02
19. Submissive Behaviour – P2 [f]	.34**	.21*	.28**	-.53**	-.45**	.02
20. Submissive Behaviour – P3 [f]	.29**	.27**	.33**	-.43**	-.33**	.03
21. SSES: Self-Esteem Total [g]	-.43**	-.49**	-.41**	.63**	.62**	.11

Variables	11	12	13	14	15	16	17
11. RBS: Social Risk – P2[d]	–						
12. SCS – Rank[e]	-.02	–					
13. SCS – Group Fit[e]	.02	.73**	–				
14. SCS – Attractiveness[e]	.19*	.60**	.71**	–			
15. Defeat Scale – P1	-.14	-.47**	-.39**	-.48**	–		
16. Defeat Scale – P2	-.20*	-.40**	-.33**	-.43**	.76**	–	
17. Defeat Scale – P3	-.17	-.44**	-.41**	-.48**	.72**	.73**	–
18. Submissive Behaviour – P1[f]	-.16	-.09	-.23*	-.30**	.38**	.28**	.33**
19. Submissive Behaviour – P2[f]	-.20*	-.23**	-.35**	-.38**	.36**	.26**	.40**
20. Submissive Behaviour – P3[f]	-.05	-.26**	-.28**	-.34**	.43**	.38**	.38**
21. SSES: Self-Esteem Total[g]	.21*	.39**	.46**	.53**	-.60**	-.63**	-.62**

Variables	18	19	20	21
18. Submissive Behaviour – P1 [f]	–			
19. Submissive Behaviour – P2 [f]	.75**	–		
20. Submissive Behaviour – P3 [f]	.73**	.67**	–	
21. SSES: Self-Esteem Total [g]	-.39**	-.54**	-.51**	–

*$p < .05$

**$p < .01$

Note.

P1 = parcel 1

P2 = parcel 2

P3 = parcel 3

[a] Depression Anxiety Stress Scales 21

[b] Interpersonal Sensitivity Measure

[c] Attachment Style Questionnaire

[d] Risk Behavior Scale

[e] Social Comparison Scale

[f] Submissive Behaviour Scale

[g] State Self-Esteem Scale

Table 4 – 2

Means, Standard Deviations, and Correlations for the Final Model Variables- Females only (N = 268)

Variables	*M (SD)*	1	2	3	4
1. DASS 21: Depression – P1[a]	0.88 (0.77)	–			
2. DASS 21: Depression – P2 [a]	0.95 (0.85)	.72**	–		
3. DASS 21: Anxiety – P1[a]	0.52 (0.69)	.49**	.54**	–	
4. DASS 21: Anxiety – P2 [a]	0.67 (0.79)	.46**	.48**	.61**	–
5. IPSM – P1[b]	12.84 (2.51)	.27**	.28**	.18**	.20**
6. IPSM – P2[b]	14.79 (2.94)	.35**	.37**	.23**	.19**
7. IPSM – P3[b]	14.29 (2.64)	.27**	.26**	.25**	.31**
8. ASQ: Secure Attachment – P1[c]	17.48 (3.06)	-.44**	-.41**	-.29**	-.27**
9. ASQ: Secure Attachment – P2[c]	17.14 (3.13)	-.35**	-.31**	-.23**	-.17**
10. RBS: Social Risk – P1[d]	13.21 (2.91)	.00	.10	-.02	.05
11. RBS: Social Risk – P2[d]	11.64 (3.07)	.05	.11	.02	.06
12. SCS – Rank[e]	24.55 (6.82)	-.43**	-.43**	-.32**	-.36**
13. SCS – Group Fit[e]	18.95 (4.84)	-.39**	-.38**	-.27**	-.32**
14. SCS – Attractiveness[e]	25.51 (5.55)	-.37**	-.35**	-.30**	-.31**
15. Defeat Scale – P1	1.62 (1.05)	.57**	.55**	.44**	.42**
16. Defeat Scale – P2	1.90 (0.81)	.59**	.53**	.44**	.40**
17. Defeat Scale – P3	2.09 (0.92)	.58**	.55**	.44**	.40**
18. Submissive Behaviour – P1 [f]	7.52 (3.14)	.32**	.28**	.32**	.24**
19. Submissive Behaviour – P2 [f]	6.80 (3.23)	.31**	.29**	.33**	.23**

20. Submissive Behaviour – P3 [f]	6.27 (3.54)	.26**	.24**	.30**	.21**
21. SSES: Self-Esteem Total [g]	73.82 (12.38)	-.56**	-.52**	-.46**	-.43**

Variables	5	6	7	8	9	10
5. IPSM – P1 [b]	–					
6. IPSM – P2 [b]	.59**	–				
7. IPSM – P3 [b]	.58**	.68**	–			
8. Secure Attachment – P1[c]	-.37**	-.31**	-.32**	–		
9. Secure Attachment – P2[c]	-.38**	-.30**	-.21**	.66**	–	
10. RBS: Social Risk – P1[d]	-.20**	-.04	-.11	.08	.13*	–
11. RBS: Social Risk – P2[d]	-.22**	-.04	-.16*	.08	.16*	.60**
12. SCS – Rank[e]	-.40**	-.42**	-.38**	.64**	.48**	.08
13. SCS – Group Fit[e]	-.38**	-.38**	-.37**	.52**	.36**	.12
14. SCS – Attractiveness[e]	-.39**	-.39**	-.42**	.54**	.37**	.16*
15. Defeat Scale – P1	.40**	.41**	.38**	-.51**	-.42**	-.07
16. Defeat Scale – P2	.46**	.43**	.40**	-.55**	-.47**	-.13*
17. Defeat Scale – P3	.36**	.40**	.34**	-.58**	-.46**	-.08
18. Submissive Behaviour – P1 [f]	.38**	.40**	.37**	-.33**	-.28**	-.20**
19. Submissive Behaviour – P2 [f]	.45**	.39**	.36**	-.43**	-.37**	-.12
20. Submissive Behaviour – P3 [f]	.30**	.27**	.30**	-.41**	-.33**	-17**
21. SSES: Self-Esteem Total [g]	-.44**	-.55**	-.52**	.55**	.48**	.14*

Variables	11	12	13	14	15	16	17
11. RBS: Social Risk – P2[d]	–						
12. SCS – Rank[e]	.05	–					
13. SCS – Group Fit[e]	.16**	.79**	–				
14. SCS – Attractiveness[e]	.18**	.75**	.81**	–			
15. Defeat Scale – P1	-.09	-.49**	-.44**	-.49**	–		
16. Defeat Scale – P2	-.12	-.53**	-.49**	-.54**	.79**	–	
17. Defeat Scale – P3	-.06	-.51**	-.47**	-.54**	.77**	.82**	–
18. Submissive Behaviour – P1[f]	-.20**	-.37**	-.34**	-.38**	.29**	.39**	.37**
19. Submissive Behaviour – P2[f]	-.16**	-.37**	-.29**	-.30**	.36**	.39**	.40**
20. Submissive Behaviour – P3[f]	-.16**	-.31**	-.30**	-.35**	.33**	.34**	.32**
21. SSES: Self-Esteem Total[g]	.17**	.56**	.59**	.65**	-.66**	-.68**	-.68**

Variables	18	19	20	21
18. Submissive Behaviour – P1 [f]	–			
19. Submissive Behaviour – P2 [f]	.75**	–		
20. Submissive Behaviour – P3 [f]	.69**	.72**	–	
21. SSES: Self-Esteem Total [g]	-.47**	-.45**	-.43**	–

*$p < .05$

**$p < .01$

Note.

P1 = parcel 1

P2 = parcel 2

P3 = parcel 3

[a] Depression Anxiety Stress Scales 21

[b] Interpersonal Sensitivity Measure

[c] Attachment Style Questionnaire

[d] Risk Behavior Scale

[e] Social Comparison Scale

[f] Submissive Behaviour Scale

[g] State Self-Esteem Scale

Table 4 – 3

Correlation Among Latent Variables for the Measurement Model and Moderation – Males only

Variables	1	2	3	4	5	6	7	8
1. Defeat	---							
2. Social Comparison	-.54**	---						
3. Secure Attachment	-.68**	.50**	---					
4. Self-Esteem	-.67**	.52**	.67**	---				
5. Depression	.59**	-.43**	-.57**	-.57**	---			
6. Anxiety	.37**	-.12	-.26**	-.30**	.28**	---		
7. IPSM[a] Total	.37**	-.18*	-.34**	-.53**	.32**	.22*	---	
8. SBS[b] Total	.44**	-.34**	-.48**	-.53**	.26**	.24**	.38**	---

Note. $N = 125$.

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

[a]Interpersonal Sensitivity Measure

[b]Submissive Behaviour Scale

Table 4 – 4

Correlation Among Latent Variables for the Measurement Model and Moderation – Females only

Variables	1	2	3	4	5	6	7	8
1. Defeat	---							
2. Social Comparison	-.58**	---						
3. Secure Attachment	-.59**	.58**	---					
4. Self-Esteem	-.72**	.65**	.57**	---				
5. Depression	.65**	-.46**	-.44**	-.58**	---			
6. Anxiety	.51**	-.38**	-.29**	-.49**	.59**	---		
7. IPSM[a] Total	.50**	-.49**	-.40**	-.58**	.38**	.29**	---	
8. SBS[b] Total	.42**	-.41**	-.44**	-.49**	.34**	.33**	.46**	---

Note. $N = 268$.

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

[a]Interpersonal Sensitivity Measure

[b]Submissive Behaviour Scale

Table 4 – 5

Gender Invariance for the Depression Model: Individual Standardized Path Coefficient Compared for Males (N = 125) and Females (N = 268)

Latent Variable Pathways	Structural Weight $\Delta\chi^2$ with 1 *df*	*p*-value
Defeat → Depression	7.945 – 6.846 = 1.099	.29
Social Comparison → Depression	7.945 – 5.880 = 2.065	.15
Secure Attachment → Depression	7.945 – 3.498 = 4.447	.04*
Depression → Submissive Behavior	7.945 – 7.892 = 0.466	.47
Depression → Interpersonal Sensitivity	7.945 – 5.888 = 2.057	.15

Note. Defeat = Defeat Scale; Social Comparison = Social Comparison Scale; Secure Attachment = the Confidence subscale from the Attachment Style Questionnaire; Depression = Depression subscale from the Depression Anxiety Stress Scales 21; Interpersonal Sensitivity = Interpersonal Sensitivity Measure; and, Submissive Behaviour = Submissive Behaviour Scale.

* $p < .05$

Table 4 – 6

Gender Invariance for the Anxiety Model: Individual Standardized Path Coefficient Compared for Males (N = 125) and Females (N = 268)

Latent Variable Pathways	Structural Weight $\Delta\chi^2$ with 1 *df*	*p*-value
Defeat → Anxiety	11.505 – 10.078 = 1.427	.23
Social Comparison → Anxiety	11.505 – 5.177 = 6.328	.01*
Secure Attachment → Anxiety	11.505 – 9.401 = 2.104	.15
Anxiety → Submissive Behavior	11.505 – 9.290 = 2.215	.14
Anxiety → Interpersonal Sensitivity	11.505 – 11.446 = .059	.81

Note. Defeat = Defeat Scale; Social Comparison = Social Comparison Scale; Secure Attachment = the Confidence subscale from the Attachment Style Questionnaire; Anxiety = Anxiety subscale from the Depression Anxiety Stress Scales 21; Interpersonal Sensitivity = Interpersonal Sensitivity Measure; and, Submissive Behaviour = Submissive Behaviour Scale.

* $p < .05$

Table 4 – 7

Hierarchical Regression Analyses with Defeat, Social Comparison, Secure Attachment, Depression/Anxiety, and the Interaction Effects of Self-Esteem as Predictors of Submissive Behaviour for Males

Variable	β	F	ΔR^2
Step 1			.26*** (.26***)
Defeat	.21(.13)	3.11(1.17)	
Social Comparison	-.10(-.11)	1.08(1.23)	
Secure Attachment	-.35(-.31)	9.34** (7.99**)	
Depression	-.11(.11)	1.04(1.75)	
Step 2			.02(.02)
Defeat x Self-Esteem	.13(.13)	2.54(2.58)	
Step 2			.00(.00)
Social Comparison x Self-Esteem	.03(.04)	.13(.21)	
Step 2			.02(.02)
Secure Attachment x Self-Esteem	-.14(-.14)	2.47(2.59)	

Variable	β	F	ΔR^2
Step 2			.03(.03)
Defeat x Self-Esteem	.11(.11)	.62(.61)	
Social Comparison x Self-Esteem	.13(15)	1.84(2.20)	
Secure Attachment x Self-Esteem	-.11(-.12)	.51(.62)	

Note. Numbers in brackets are for the Anxiety model, while Depression numbers do not have brackets.

* $p < .05$. ** $p < .01$. *** $p < .001$.

Table 4 – 8

Hierarchical Regression Analyses with Defeat, Social Comparison, Secure Attachment, Depression/Anxiety, and the Interaction Effects of Self-Esteem as Predictors of Interpersonal Sensitivity for Males

Variable	β	F	ΔR^2
Step 1			$.17^{***}(.16^{***})$
Defeat	.21(.23)	2.69(3.41)	
Social Comparison	.07(.05)	.46(.19)	
Secure Attachment	-.15(-.19)	1.48(2.63)	
Depression	.16(.09)	2.12(.76)	
Step 2			.02(.02)
Defeat x Self-Esteem	.16(.15)	3.34(2.94)	
Step 2			.01(.01)
Social Comparison x Self-Esteem	-.10(-.09)	1.16(.91)	
Step 2			.02(.02)
Secure Attachment x Self-Esteem	-.16(-.14)	2.86(2.27)	

Variable	β	F	ΔR^2
Step 2			.02(.02)
Defeat x Self-Esteem	.11(.12)	.53(.63)	
Social Comparison x Self-Esteem	-.02(-.02)	.11(.02)	
Secure Attachment x Self-Esteem	-.05(-.03)	.04(.04)	

Note. Numbers in brackets are for the Anxiety model, while Depression numbers do not have brackets.

* $p < .05$. ** $p < .01$. *** $p < .001$.

Table 4 – 9

Hierarchical Regression Analyses with Defeat, Social Comparison, Secure Attachment, Depression/Anxiety, and the Interaction Effects of Self-Esteem as Predictors of Submissive Behaviour for Females

Variable	β	F	ΔR^2
Step 1			.25***(.26***)
Defeat	.16(.13)	3.71(2.77)	
Social Comparison	-.15(-.13)	4.23*(3.42)	
Secure Attachment	-.23(-.25)	10.41**(12.24**)	
Depression	.07(.15)	.91(5.72*)	
Step 2			.00(.00)
Defeat x Self-Esteem	.06(.07)	1.09(1.38)	
Step 2			.00(.00)
Social Comparison x Self-Esteem	-.05(-.05)	.72(.73)	
Step 2			.00(.00)
Secure Attachment x Self-Esteem	-.01(-.00)	.02(.00)	

Variable	β	F	ΔR^2
Step 2			.01(.01)
Defeat x Self-Esteem	.09(.12)	.78(1.30)	
Social Comparison x Self-Esteem	-.03(-.02)	.11(.06)	
Secure Attachment x Self-Esteem	.08(.09)	.81(1.25)	

Note. Numbers in brackets are for the Anxiety model, while Depression numbers do not have brackets.

* $p < .05$. ** $p < .01$. *** $p < .001$.

Table 4 – 10

Hierarchical Regression Analyses with Defeat, Social Comparison, Secure Attachment, Depression/Anxiety, and the Interaction Effects of Self-Esteem as Predictors of Interpersonal Sensitivity for Females

Variable	β	F	ΔR^2
Step 1			$.31^{***}(.31^{***})$
Defeat	.27(.28)	$11.72^{**}(14.80^{***})$	
Social Comparison	-.28(-.28)	$17.29^{***}(17.33^{***})$	
Secure Attachment	-.05(-.06)	.59(.68)	
Depression	.05(.02)	.51(.16)	
Step 2			$.01^{*}(.01)$
Defeat x Self-Esteem	.11(.11)	$4.05^{*}(3.74)$	
Step 2			.00(.00)
Social Comparison x Self-Esteem	-.03(-.03)	.33(.28)	
Step 2			.00(.00)
Secure Attachment x Self-Esteem	.00(.00)	.00(.00)	

Variable	β	F	ΔR^2
Step 2			.02*(.02*)
Defeat x Self-Esteem	.29(.28)	1.12(8.25**)	
Social Comparison x Self-Esteem	.10(.10)	8.80**(1.18)	
Secure Attachment x Self-Esteem	.13(12)	2.60(2.27)	

Note. Numbers in brackets are for the Anxiety model, while Depression numbers do not have brackets.

* $p < .05$. ** $p < .01$. *** $p < .001$.

Chapter 5

CONCLUSION

The overarching intent of this research project was to foster a better understanding of the evolved mechanisms that operate in depressed mood and anxiety for both men and women. The *social risk hypothesis* suggests that mild to moderate depression is an adaptive mechanism that performs several vital tasks for individuals in this mood state (Allen & Badcock, 2003). First, a depressed person has a heightened sensitivity to social risks or threats of rejection. Second, depressed mood in an individual signals to others that he or she is not a social threat. As well, there is a drive toward eliciting more social support from significant others during a period of low mood. Lastly, the *social risk hypothesis* contends that depression will reduce an individual's propensity to engage in socially risky, appetitive behaviours.

This study examined several hundred adult workers (N = 397) from Edmonton and surrounding areas on measures of secure attachment, social comparison, defeat, depression, anxiety, self-esteem, interpersonal sensitivity, and submissive behaviours. Structural equation modeling (SEM) was then used to examine the relationships between these variables as specified in Allen and Badcock's (2003) *social risk hypothesis* model across three separate studies. As well, each study tested for the moderating effects of *social investment potential* (i.e., self-esteem) in the individual models.

Study 1

Allen and Badcock's (2003) speculation that threatening social experiences that involve agency and affiliation will force individuals to be very cognizant of further losses to their social standing proved to be supported in Study 1. These results gave convincing support of an adaptive evolutionary mechanism operating within depressed mood. All of the purported relationships in

the *social risk hypothesis* fit well with the data according to the SEM analyses. As well, all pathways to interpersonal sensitivity and submissive behaviours were fully mediated by depression.

The activation of the depressive mechanism initiates a reappraisal of one's role pursuits such that both communicative (signaling to reduce threats and to elicit safe forms of support) and resource acquisition behaviours (taking a risk-averse approach to interpersonal conflict and competition) are recalibrated. In modern day this translates into a need to attend to (and be aware of) how our speech, posture, eye contact, and other verbal and nonverbal cues impact the quality of our social relationships. These aspects of social interaction are vitally important when a person perceives a drop in self-worth compared to others in one's community sphere. When depressed mood ensues, there is a cautiousness that develops when dealing with friends, family, and work associates. A depressed individual does not want to communicate animosity nor would one want to challenge others, rather there is a drive to acquire more support.

The need for social support in times of depression has long been recognized (e.g., Brown & Harris, 1978); however, it is the careful acquisition of this resource that is so important in the *social risk hypothesis*. In many respects the empirical support of this evolutionary model of depression is strikingly similar to Coyne's (1976a) *interactional* model which combines the behavioural operations of individuals with the reactions of socially significant others in their everyday context. Given that it is the negative responses by others that play a key role in the maintenance of depression (Coyne, 1976a, 1999), a depressed person would need to be very mindful of how they are perceived by socially important individuals. According to the *social risk hypothesis*, a depressed person would want to gradually bolster their *social investment potential* (SIP) through submission and increased interpersonal sensitivity as opposed to eliciting

impatience, hostility, and rejection by becoming overly needy (Coyne, 1976b). Being too demanding (e.g., excessive amount of phone calls) may push a depressed person's social supports away, whereas a discrete "cry for help" will provide slow and steady gains in one's perceived value on both an intrapersonal and interpersonal level.

Study 2

The results of Study 2 challenged Allen and Badcock's (2003) assertion that their *social risk hypothesis* model was exclusive to depression. The SEM analyses provided a good fit to the data when anxiety served as the mediator (in place of depression); however, not all of the paths were statistically significant. In particular, the relationship between secure attachment and the two outcome measures (i.e., interpersonal sensitivity and submissive behaviours) were not mediated by anxiety.

The lack of statistically significant mediation between secure attachment and both interpersonal sensitivity and submissive behaviours suggests that anxiety is more linked to markers of social rank (i.e., social comparison and experiences of defeat) as opposed to having a need to elicit support from a secure base. This finding may speak to the differences in relationship development experienced by adults compared to children who are very reliant on attachment figures doing the work to build and maintain a caring relationship (i.e., parent-child dyad). The participants in the present study were all adults and perhaps this factor accounted for the lack of mediation by anxiety in the *social risk hypothesis*. Although waning social relations are related to some forms of distress (especially depression) it seems that adults are less prone to experiences of anxiety when this occurs. The obvious treatment implication is the need to create instances where social feats can be accomplished by an anxious individual. This slow acquisition

of successful social ventures will serve to alleviate the symptoms according to the cyclical nature of the *social risk hypothesis*.

The overall operation of anxiety as a mediator in the *social risk hypothesis* is commensurate with other evolutionary theorists who have acknowledged the many overlapping features of these two psychological disorders (e.g., Price, Gardner, Jr., & Erickson, 2004; Sloman, 2008; Sloman, Farvolden, Gilbert, & Price, 2006). The evolutionary significance of anxiety as a priming system that raises awareness of threat seems highly adaptive within a social context, especially in our *environment of evolutionary adaptation* (EEA; Tooby & Cosmides, 1992). This study has illuminated the social variables that need to be addressed from a treatment standpoint.

Study 3

A third study was conducted to provide clarification on the influence that sex differences may have within the *social risk hypothesis*. It is well-established that depression and anxiety occur in women at a rate of 2 to 3 times more than their male counterparts (Kessler et al., 1994; Murphy et al., 2004; Pajer, 1995; Weissman & Klerman, 1977; Zerbe, 1995). As well, many sex differences exist especially in evolutionarily important areas (see Bjorklund & Pellegrini, 2002). These two factors prompted the need for an investigation into possible differences between males and females in the mechanisms of the *social risk hypothesis*.

Some of the results in Study 3 were surprising. Specifically, men had a stronger negative association in the relationship between secure attachment and depression. This finding would suggest that when men feel that their close relationships are tenuous, the depressive mechanism is more likely to be activated. This sex difference is important, as most researchers commonly attribute social closeness to be more vital for women (e.g., Taylor et al., 2000), but men prone to depressed mood seem to need this safe support as much (if not more) than women. Also,

contrary to the commonly found negative association between social comparison and anxiety, men actually experienced more anxiety when they perceived themselves more highly ranked in the social context. Thus, it would be prudent for mental health therapists to be aware of this relationship and provide their male clients with this information, as involvement in non-competitive social activities would likely alleviate some of this evolutionarily adaptive anxiety.

General Conclusion

Overall, these three studies offered a comprehensive test of Allen and Badcock's (2003) algorithmic model of adaptive depression. The findings of these investigations support the operation of an evolutionary mechanism that has survived in modern day humans due to its ability to stave off ostracism and promote productive group living in our EEA. The *social risk hypothesis* model seems to operate in a similar manner for both depression and anxiety. As a result, clinicians and researchers have many more avenues to explore in order to better understand these two psychological disorders.

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Appendix A

Cover Letter

Dear Sir or Madam,

My name is Joshua Dunn, I am a Ph.D. student in the Counselling Psychology program at the University of Alberta. The present study will be used to fulfill the dissertation requirements for my Doctorate of Philosophy (Ph.D.).

The enclosed package contains a combination of measures to assess the relationship between risk taking behaviours and depressed mood in working adults. Unfortunately, this is a topic and population (i.e., working adults) that has been largely ignored in the research literature. I am asking you to complete this anonymous questionnaire package to help me better understand the impact that social factors and depressive symptoms have on your life. I have completed the questionnaire package myself and it took between 20 and 30 minutes to finish. I know your time is valuable and I would greatly appreciate your participation in this large anonymous study.

Sincerely yours,

P.S. For a more detailed account of this study please refer to the enclosed “Information Sheet.”

Information Sheet about the Risk Taking and Depression Project

Principal Researcher: Joshua C. Dunn
#202 7120 77th Avenue
Edmonton, AB T6B OB6
Phone: (780) 886-6540

In this society adults have many responsibilities and demands such as family, finances, social stressors, and work. These numerous pressures can be particularly harmful to those who have poor relations with significant others and/or are in constant social comparison with others. Such pressures can lead to depressed mood which can alter our interactions with others, especially with regard to the risks we take in social domains.

The main objective of this study is to better understand the cause of depressed mood and its relationship to risk taking behaviours in working adults. You and your company are among the broad range of working adults that have been selected to participate in this study. Your participation involves filling out a questionnaire package that will take approximately 30-40 minutes to complete as well as mailing the package in the enclosed self-addressed, stamped envelope (*Note*: Please attempt to complete the entire questionnaire package all at one time (i.e., in the evening), rather than at multiple sittings).Returning the questionnaire package will indicate that you are consenting to participate in this study, and to not return the questionnaire package indicates that you do not consent to participate in this research. Your name will not be included in any manner in the data collection, instead each participant will be differentiated by an ID number to ensure complete anonymity. Only the principal researcher, Joshua C. Dunn, will view the questionnaire responses. All questionnaire packages will be strictly confidential, and these responses will remain locked in the University of Alberta Education Clinic at all times.

This is a voluntary project, and while the findings of this research may be published, your identity will be unknown, and therefore confidentiality of your responses will be ensured at all times. A summary of the main research findings can be obtained at the office of the supervising professor (Dr. William Whelton at 6-123G Education North, University of Alberta) of the principal research after the study has been completed. The study has been reviewed and approved by the Research Ethics Board of the Faculties of Education and Extension at the University of Alberta. For questions regarding participants rights and ethical conduct of research, contact the Chair of the Research Ethics Board at (780) 492-3751.

There is a very small possibility that you may become newly aware of feelings of emotional distress as you are completing the questionnaires. If such feelings were to be acute or to persist, you are encouraged to seek consultation from a trained mental health professional or visit the nearest hospital emergency department. The possible benefits this study may offer include increased self-knowledge, and an expansion of your awareness of thoughts and feelings and how you have been coping with them.

Appendix B

Demographic Sheet

The following demographic questions are voluntary, but the information would be greatly appreciated for research purposes.

1. Please write your age in the space provided.

AGE:_____

2. Please indicate your gender by checking either male or female.

MALE

FEMALE

3. Please indicate your current status from the following list of options by checking the one(s) that applies to you:

SINGLE

DIVORCED

MARRIED

COMMON-LAW or OTHER LONG-TERM RELATIONSHIP

4. Please indicate your ethnicity by checking one of the following options that describes you:

CAUCASION

ABORIGINAL

BLACK/AFRICAN-CANADIAN

MIDDLE EASTERN

ASIAN

HISPANIC

EAST INDIAN

OTHER (please specify)_____

5. Please specify your job-type (e.g., welder, lawyer, nurse, construction, psychologist) in this space_____.

Appendix C

Depression Anxiety Stress Scale-Brief Version (DASS-21)

For each of the statements below, please circle the number which best 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 one statement.
0 = Did not apply to me at all
1 = Applied to me to some degree
2 = Applied to me a considerable degree, or a good part of the time
3 = Applied to me very much, or most of the time

___ 1. I felt downhearted and blue.

___ 2. I felt that I had nothing to look forward to.

___ 3. I felt that life was meaningless.

___ 4. I felt I wasn't worth much as a person.

___ 5. I was unable to become enthusiastic about anything.

___ 6. I couldn't seem to experience any positive feeling at all.

___ 7. I found it difficult to work up the initiative to do things.

___ 8. I was aware of the action of my heart in the absence of physical exertion (e.g., sense of heart rate increase, heart missing a beat).

___ 9. I was aware of dryness of my mouth.

___ 10.I experienced breathing difficulty (e.g., excessively rapid breathing, breathlessness in the absence of physical exertion).

___ 11. I experienced trembling (e.g., in the hands).

___ 12. I was worried about situations in which I might panic and make a fool of myself.

___ 13. I felt I was close to panic.

___ 14. I felt scared without any good reason.

___ 15. I found it hard to wind down.

___ 16. I found it difficult to relax.

___ 17. I felt that I was using a lot of nervous energy.

___ 18. I found myself getting agitated.

___ 19. I tended to over-react to situations.

___ 20. I felt that I was rather touchy.

___ 21. I was intolerant of anything that kept me from getting on with what I was doing.

Appendix D

Risk Behavior Scale

For each of the following statements, please indicate your **likelihood** of engaging in each activity or behavior. Provide a rating from **1 to 5**, using the following scale:

1	2	3	4	5
Very unlikely		Unlikely	Not sure	Likely	Very likely

1. Admitting that your tastes are different from those of your friends. _____
2. Going camping in the wilderness, beyond the civilization of a campground. _____
3. Betting a day's income at the horse races. _____
4. Buying an illegal drug for your own use. _____
5. Cheating on an exam. _____
6. Chasing a tornado or hurricane by car to take dramatic photos. _____
7. Investing 10% of your annual income in a moderate growth mutual fund. _____
8. Consuming five or more servings of alcohol in a single evening. _____
9. Cheating by a significant amount on your income tax return. _____
10. Disagreeing with your father on a major issue. _____
11. Betting a day's income at a high stake poker game. _____
12. Having an affair with a married man or woman. _____
13. Forging somebody's signature. _____
14. Passing off somebody else's work as your own. _____
15. Going on a vacation in a third-world country without prearranged travel and hotel accommodations. _____
16. Arguing with a friend about an issue in which he or she has a very different opinion. _____
17. Going down a ski run that is beyond your ability or closed. _____
18. Investing 5 % of your annual income in a very speculative stock. _____
19. Approaching your boss to ask for a raise. _____
20. Illegally copying a piece of software. _____
21. Going whitewater rafting during rapid water flows in the spring. _____
22. Betting a day's income on the outcome of a sporting event (e.g., baseball, soccer, or football). _____

1	2	3	4	5
Very unlikely	Unlikely	Not sure	Likely	Very likely

23. Telling a friend if his or her significant other has made a pass at you. _____
24. Investing 5% of your annual income in a conservative stock. _____
25. Shoplifting a small item (e.g., a lipstick or a pen). _____
26. Wearing provocative or unconventional clothes on occasion. _____
27. Engaging in unprotected sex. _____
28. Stealing an additional TV cable connection off the one you pay for. _____
29. Not wearing a seatbelt when being a passenger in the front seat. _____
30. Investing 10% of your annual income in government bonds (treasury bills). _____
31. Periodically engaging in a dangerous sport (e.g., mountain climbing or sky diving). _____
32. Not wearing a helmet when riding a motorcycle. _____
33. Gambling a week's income at a casino. _____
34. Taking a job that you enjoy over one that is prestigious but less enjoyable _____
35. Defending an unpopular issue that you believe in at a social occasion. _____
36. Exposing yourself to the sun without using sunscreen. _____
37. Trying out bungee jumping at least once. _____
38. Piloting your own small plane, if you could. _____
39. Walking home alone at night in a somewhat unsafe area of town. _____
40. Regularly eating high cholesterol foods. _____

Appendix E

Social Comparison Scale

Please place a mark on each line at a point which best describes the way in which you see yourself in comparison to others.

Example:

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

If you put a mark on 3 this means you see yourself as shorter than others; if you put a mark at 5-6 about average; and a mark at 7 somewhat taller.

***In relationship to others I generally feel…**

1	2	3	4	5	6	7	8	9	10
Inferior									Superior
1	2	3	4	5	6	7	8	9	10
Incompetent									Competent
1	2	3	4	5	6	7	8	9	10
Unlikeable									Likeable
1	2	3	4	5	6	7	8	9	10
Left Out									Accepted
1	2	3	4	5	6	7	8	9	10
Different									Same
1	2	3	4	5	6	7	8	9	10
Untalented									More talented
1	2	3	4	5	6	7	8	9	10
Weaker									Stronger
1	2	3	4	5	6	7	8	9	10
Unconfident									More Confident
1	2	3	4	5	6	7	8	9	10
Undesirable									More desirable
1	2	3	4	5	6	7	8	9	10
Unattractive									More attractive
1	2	3	4	5	6	7	8	9	10
Outsider									Insider

Appendix F

Submissive Behaviour Scale

Please indicate the frequency that you engage in the following behaviours:

1 = Never
2 = Almost Never
3 = Sometimes
4 = Very Often
5 = Always

1.	I agree that I am wrong, even though I know I'm not.	1	2	3	4	5
2.	I do things because other people are doing them, rather than because I want to.	1	2	3	4	5
3.	I would walk out of a shop without questioning, knowing I had been short changed.	1	2	3	4	5
4.	I let others criticize me or put me down without defending myself.	1	2	3	4	5
5.	I do what is expected of me even when I don't want to.	1	2	3	4	5
6.	If I try to speak and others continue, I shut up.	1	2	3	4	5
7.	I continue to apologize for minor mistakes.	1	2	3	4	5
8.	I listen quietly if people in authority say unpleasant things about me.	1	2	3	4	5
9.	I am not able to tell my friends when I am angry with them.	1	2	3	4	5
10.	At meetings and gathering, I let others monopolize the conversation.	1	2	3	4	5
11.	I don't like people to look straight at me when they are talking.	1	2	3	4	5
12.	I say 'thank you' enthusiastically and repeatedly when someone does a small favour for me.	1	2	3	4	5
13.	I avoid direct eye contact.	1	2	3	4	5
14.	I avoid starting conversations at social gatherings.	1	2	3	4	5
15.	I blush when people stare at me.	1	2	3	4	5
16.	I pretend I am ill when declining an invitation.	1	2	3	4	5

Appendix G

State Self-Esteem Scale (SSES)

This is a questionnaire designed to measure what you are thinking at this moment. There is no right answer for any statement. The best answer is what you feel is true of yourself at this moment. Be sure to answer all of the items, even if you are not certain of the best answer. Again, answer these questions as they are true for you **RIGHT NOW**.

1. I feel confident about my abilities.

1	2	3	4	5
not at all	a little bit	somewhat	very much	extremely

2. I am worried about whether I am regarded as a success or failure.

1	2	3	4	5
not at all	a little bit	somewhat	very much	extremely

3. I feel satisfied with the way my body looks right now.

1	2	3	4	5
not at all	a little bit	somewhat	very much	extremely

4. I feel frustrated or rattled about my performance.

1	2	3	4	5
not at all	a little bit	somewhat	very much	extremely

5. I am dissatisfied with my weight.

1	2	3	4	5
not at all	a little bit	somewhat	very much	extremely

6. I feel self-conscious.

1	2	3	4	5
not at all	a little bit	somewhat	very much	extremely

7. I feel as smart as others.

1	2	3	4	5
not at all	a little bit	somewhat	very much	extremely

8. I am pleased with my appearance right now.

1	2	3	4	5
not at all	a little bit	somewhat	very much	extremely

9. I am worried about what other people think of me.

1	2	3	4	5
not at all	a little bit	somewhat	very much	extremely

10. I feel confident that I understand things.

1	2	3	4	5
not at all	a little bit	somewhat	very much	extremely

11. I feel that I am having trouble understanding things that I read.

1	2	3	4	5
not at all	a little bit	somewhat	very much	extremely

12. I feel that others respect and admire me.

1	2	3	4	5
not at all	a little bit	somewhat	very much	extremely

13. I feel displeased with myself.

1	2	3	4	5
not at all	a little bit	somewhat	very much	extremely

14. I feel good about myself.

1	2	3	4	5
not at all	a little bit	somewhat	very much	extremely

15. I feel inferior to others at this moment.

1	2	3	4	5
not at all	a little bit	somewhat	very much	extremely

16. I feel unattractive.

1	2	3	4	5
not at all	a little bit	somewhat	very much	extremely

17. I feel concerned about the impression I am making.

1	2	3	4	5
not at all	a little bit	somewhat	very much	extremely

18. I feel that I have less scholasitic ability right now than others.

1	2	3	4	5
not at all	a little bit	somewhat	very much	extremely

19. I feel like I'm not doing well.

1	2	3	4	5
not at all	a little bit	somewhat	very much	extremely

20. I am worried about looking foolish.

1	2	3	4	5
not at all	a little bit	somewhat	very much	extremely

Appendix H

Attachment Style Questionnaire

Show how much you agree with each of the following items by rating them on this scale: 1 = totally disagree; 2 = strongly disagree; 3 = slightly disagree; 4 = slightly agree; 5 = strongly agree; or 6 = totally agree.

		Totally Disagree	Strongly Disagree	Slightly Disagree	Slightly Agree	Strongly Agree	Totally Agree
1.	Overall I am a worthwhile person.	1	2	3	4	5	6
2.	I am easier to get to know than most people	1	2	3	4	5	6
3.	I feel confident that other people will be there for me when I need them.	1	2	3	4	5	6
4.	I prefer to depend on myself rather than other people.	1	2	3	4	5	6
5.	I prefer to keep to myself.	1	2	3	4	5	6
6.	To ask for help is to admit that you're a failure.	1	2	3	4	5	6
7.	People's worth should be judged by what they achieve.	1	2	3	4	5	6
8.	Achieving things is more important than building relationships.	1	2	3	4	5	6
9.	Doing your best is more important than getting along with others.	1	2	3	4	5	6
10.	If you've got a job to do, you should do it no matter who gets hurt.	1	2	3	4	5	6
11.	It's important to me that others like me.	1	2	3	4	5	6
12.	It's important to me to avoid doing things that others won't like.	1	2	3	4	5	6
13.	I find it hard to make a decision unless I know what other people think.	1	2	3	4	5	6
14.	My relationships with others are generally superficial.	1	2	3	4	5	6
15.	Sometimes I think that I am not good at all.	1	2	3	4	5	6
16.	I find it hard to trust other people.	1	2	3	4	5	6
17.	I find it difficult to depend on others.	1	2	3	4	5	6

18.	I find that others are reluctant to get as close as I would like.	1	2	3	4	5	6
		Totally Disagree	Strongly Disagree	Slightly Disagree	Slightly Agree	Strongly Agree	Totally Agree
19.	I find it relatively easy to get close to other people.	1	2	3	4	5	6
20.	I find it easy to trust others.	1	2	3	4	5	6
21.	I feel comfortable depending on others.	1	2	3	4	5	6
22.	I worry that others won't care about me as much as I care about them.	1	2	3	4	5	6
23.	I worry about people getting too close.	1	2	3	4	5	6
24.	I worry that I won't measure up to other people.	1	2	3	4	5	6
25.	I have mixed feelings about being close to others.	1	2	3	4	5	6
26.	While I want to get close to others, I feel uneasy about it.	1	2	3	4	5	6
27.	I wonder why people would want to be involved with me.	1	2	3	4	5	6
28.	It's very important to me to have a close relationship.	1	2	3	4	5	6
29.	I worry a lot about my relationships.	1	2	3	4	5	6
30.	I wonder how I would cope without someone to love me.	1	2	3	4	5	6
31.	I feel confident about relating to others.	1	2	3	4	5	6
32.	I often feel left out or alone.	1	2	3	4	5	6
33.	I often worry that I do not really fit in with other people.	1	2	3	4	5	6
34.	Other people have their own problems, so I don't bother them with mine.	1	2	3	4	5	6
35.	When I talk over my problems with others, I generally feel ashamed or foolish.	1	2	3	4	5	6
36.	I am too busy with other activities to put	1	2	3	4	5	6

	much time into relationships.						
37.	If something is bothering me, others are generally aware and concerned.	1	2	3	4	5	6
38.	I am confident that other people will like and respect me.	1	2	3	4	5	6
		Totally Disagree	Strongly Disagree	Slightly Disagree	Slightly Agree	Strongly Agree	Totally Agree
39.	I get frustrated when others are not available when I need them.	1	2	3	4	5	6
40.	Other people often disappoint me.	1	2	3	4	5	6

Appendix I

Interpersonal Sensitivity Measure (IPSM)

Instructions: A number of statements are listed below which relate to how you might feel about yourself or other people in your life. Please circle the number that applies best to you. Respond to each statement in terms of how you feel RIGHT NOW, rather than just in general. There are no right or wrong answers.

1 = Very like you
2 = Moderately like you
3 = Moderately unlike you
4 = Very unlike you

1.	I feel insecure when I say goodbye to people.	1	2	3	4
2. *	I worry about the effect I have on other people.	1	2	3	4
3. *	I avoid saying what I think for fear of being rejected.	1	2	3	4
4. *	I feel uneasy meeting new people.	1	2	3	4
5.	If others knew the real me, they would not like me.	1	2	3	4
6.	I feel secure when I'm in a close relationship.	1	2	3	4
7.*	I don't get angry with people for fear that I may hurt them.	1	2	3	4
8.*	After a fight with a friend, I feel uncomfortable until I have made peace.	1	2	3	4
9. *	I am always aware of how other people feel.	1	2	3	4
10.*	I worry about being criticized for things I have said or done.	1	2	3	4
11.*	I always notice if someone doesn't respond to me.	1	2	3	4
12.	I worry about losing someone close to me.	1	2	3	4
13.	I feel that people generally like me.	1	2	3	4
14.	I will do something I don't want to do rather than offend or upset someone.	1	2	3	4
15.	I can only believe that something I have done is good when someone tells me it is.	1	2	3	4
16.*	I will go out of my way to please someone I am close to.	1	2	3	4
17.	I feel anxious when I say goodbye to people.	1	2	3	4
18.	I feel happy when someone compliments me.	1	2	3	4
19.	I fear that my feelings will overwhelm people.	1	2	3	4
20.	I can make other people feel happy.	1	2	3	4
21.	I find it hard to angry with people.	1	2	3	4
22.*	I worry about criticizing other people.	1	2	3	4
23.*	If someone is critical of something I do, I feel bad.	1	2	3	4
24.	If other people knew what I am really like, they would think less of me.	1	2	3	4
25.	I always expect criticism.	1	2	3	4
26.	I can never really be sure if someone is pleased with me.	1	2	3	4
27.	I don't like people to really know me.	1	2	3	4
28.	If someone upsets me, I am not about to put it easily out of my mind.	1	2	3	4
29.	I feel others do not understand me.	1	2	3	4
30.*	I worry about what others think of me.	1	2	3	4
31.	I don't feel happy unless people I know admire me.	1	2	3	4
32.*	I am never rude to anyone.	1	2	3	4

33.*	I worry about hurting the feelings of other people.	1	2	3	4
34.	I feel hurt when someone is angry with me.	1	2	3	4
35.	My value as a person depends enormously on what others think of me.	1	2	3	4
36.*	I care about what people feel about me.	1	2	3	4

Note. * = Item selected.

Appendix J

Defeat Scale

Please indicate (by circling) the extent to which the items below represent your thoughts and feelings RIGHT NOW using the scale below from 0 to 4. There are no right or wrong answers.

0 = *Never*
1 = *Rarely*
2 = *Sometimes*
3 = *Mostly*
4 = *Always/All of the time*

1.	I feel that I have not made it in life.	0	1	2	3	4
2.	I feel that I am a successful person.	0	1	2	3	4
3.	I feel defeated by life.	0	1	2	3	4
4.	I feel that I am basically a winner.	0	1	2	3	4
5.	I feel that I have lost my standing in the world.	0	1	2	3	4
6.	I feel that life has treated me like a punching bag.	0	1	2	3	4
7.	I feel powerless.	0	1	2	3	4
8.	I feel that my confidence has been knocked out of me.	0	1	2	3	4
9.	I feel able to deal with whatever life throws at me.	0	1	2	3	4
10.	I feel that I have sunk to the bottom of the ladder.	0	1	2	3	4
11.	I feel completely knocked out of action.	0	1	2	3	4
12.	I feel that I am one of life's losers.	0	1	2	3	4
13.	I feel that I have given up.	0	1	2	3	4
14.	I feel down and out.	0	1	2	3	4
15.	I feel that I have lost important battles in life.	0	1	2	3	4
16.	I feel that there is no fight left in me.	0	1	2	3	4