

Investigating Major Depressive Disorder from an Evolutionary Adaptationist Perspective:
Fitness Hindrances and The Social Navigation Hypothesis

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Abstract

During decades of intense research, diverse theoretical and treatment perspectives on Major Depressive Disorder (MDD) have emerged. Only recently, though, have evolutionary adaptationist approaches to depression been proposed. Adaptationist approaches to the analysis of mental phenomena entail consideration of the long history of selection pressures that designed present day minds to respond as they do to past and present environmental contingencies. Virtually all theory and practice concerning clinical MDD, whether influenced by evolutionary thinking or not, assumes that depression is either a true disorder or a maladaptive byproduct of functional adaptations interacting in inauspicious ways. The former classically “medical” view portrays clinical MDD as the product of physically damaged or malformed adaptations. The latter plausibly occurs, for example, when the individual lives in an evolutionarily novel environment. Until the recent work of Hagen (1999, 2002) and Watson and Andrews (2002), there has been a lack of modern evolutionary adaptationist analyses of MDD’s key symptoms that aim at developing testable hypotheses about their potential efficacy for providing net benefits to the afflicted individual. Even if MDD is a true disorder, this cannot be verified without thoroughly testing alternative models that propose specific ways MDD could effectively and efficiently solving reproductive problems.

The above-mentioned adaptive models of MDD arose via the widely used process of reverse engineering analysis. Both Hagan and Watson and Andrews drew upon (1) the rich literature describing MDD’s core symptomatology and the life circumstances that are risk factors for MDD and (2) evolutionary social and communication theory pertinent to

humans. This resulted in the “Social Navigation Hypothesis” (SNH) of Watson & Andrews (2002) and Hagen’s related “Bargaining Hypothesis.”

The SNH postulates that depression functions to solve cognitively complex social problems that stubbornly resist solution via conventional social negotiation. Under the SNH, a prime function for depression is to accrue support for major shifts in an individual’s life, called “social niche change,” that initially are socially constrained. Depression is proposed to occur in situations where there is a severe and prolonged mismatch between the individual’s intrinsic capacities versus their existing opportunities for fitness enhancing activities that are explicitly or implicitly enforced by social partners.

This chapter describes the reasoning behind the SNH and preliminarily investigates the relevance of socially based Fitness Hindrances (FH) to depression. FH are events that either directly decrease individuals’ fitness (e.g., job loss) or inhibit people from increasing their fitness (e.g., prevented from going to college), but which also have socially based solutions. Adaptationist hypotheses of MDD, like the SNH, rest on the assumption that MDD addresses FH laden circumstances. Empirical tests relating FH and MDD and examining important postulates of the SNH are presented.

Introduction

Victims of Major Depressive Disorder are afflicted by feelings of low mood, loss of pleasure (anhedonia), and fatigue powerful enough to profoundly alter or disrupt all

aspects of an individual's life including emotions, thought processes, behavior, and physical health (NIMH, 2001). Depression is the second most common cause of disability worldwide (Murray & Lopez, 1997). Major Depressive Disorder (MDD) remains a widely under-appreciated affliction. In the United States, it is estimated that 10% of American adults (ca. 19 million) experience clinical depression each year (NIMH, 2001). In addition to its great personal costs, depression negatively impacts those with close relationships to the depressive. MDD rains down emotional distress and financial strain upon families, and it can even have legal ramifications (NIMH, 2001). At a societal level, the costs of MDD in the United States are estimated at 40 billion dollars per year (Greenberg et al., 1993). Although the socioeconomic expense and disruption of MDD is high, one of the greatest costs of depression undoubtedly is suicide (NIMH, 2001). A large number of individuals do not seek treatment for depression, and among those who have severe and untreated symptoms of depression, one in six commit suicide (NIMH, 2001). As stated in the National Institute of Mental Health's strategic plan for mood disorders, "Clearly, improved understanding, recognition, treatment, and prevention of mood disorders are critical scientific and public health priorities." (NIMH, 2001, p. 15).

Approaches to understanding, predicting, and treating MDD are numerous, ranging from social problem solving therapy to cognitive behavioral approaches, and pharmacological interventions. The vast amounts of valuable research generated over the decades by these viewpoints have furthered the treatment of MDD. Although these diverse perspectives vary in their approach to depression, all are unified by the assumption that MDD is a disorder. Describing MDD as a disorder infers that it is a cognitive and emotional state

whose obvious costs are, on average, not associated with compensatory benefits, and therefore should be eradicated using any medically valid tools available. Thus much of the research and literature on depression is based on the standpoint that malfunctioning cognition or physiology are primarily responsible for the occurrence of MDD. Even when MDD is clearly recognized as a response to stressful life events it is often assumed to be psychopathological (Caspi et al., 2003).

MDD as a Psychological Adaptation

Numerous non-adaptationist psychological, physiological and genetic theories of MDD exist. Since the 1970's, evolutionarily-minded psychiatrists have promoted the social-yielding theory of depression, where depression serves as an unconsciously generated shutting down of competitive abilities that rescues a person from himself when he harbors a conscious desire to continue fighting a costly losing battle (Sloman et al., 1994; Price, 1991; Price et al., 1987; Gardner, 1982). Social-yielding theorists generally see clinical MDD as a maladaptive, over expression of this fail-safe damage control mechanism (Sloman et al., 1994; Price, 1991; Price et al., 1987; Gardner, 1984).

Evolutionarily minded psychiatrists also have tried to elucidate MDD as a maladaptive expression of other adaptive emotional traits, such as a response to severe trauma or abuse by a person harboring the adaptive human capacity to empathize profoundly with the suffering of others (Nesse, 2000; Akiskal 2001).

Recently, evolutionary biologists specializing in animal and human behavior have formulated adaptationist theories of depression, including severe MDD (Watson &

Andrews, 2002; Hagen, 1999, 2002). These models are based on modern Darwinian conceptual frameworks widely employed to analyze the adaptive significance of psychological pain (Thornhill & Thornhill, 1989), communicative signaling strategies (Vehrencamp & Bradbury, 1998), and human socioeconomic and political decision-making (Alexander 1987, 1989). They differ from all other perspectives of MDD in that they do not begin with the assumption - often bordering on ideology - that depression is a disorder. Instead, some evolutionary theorists strive to illuminate the possibility that even full-blown depression is a pan-human capacity designed by natural selection in the hominid environment of evolutionary adaptation (EEA, Tooby & Cosmides, 1990), and potentially still has significant functional value in modern human social life. Thus, these models explain how MDD could be a *psychological adaptation*; the product of evolved nervous system components designed to process complex information and lead to emotional states and behaviors that have, on average and over evolutionary time, helped to solve important reproductive problems. In doing so, psychological adaptations increase individual *inclusive fitness* – the individual’s ability to propel genetic relatives - not necessarily just its own offspring - and thus exact replicates of its genes into succeeding generations (Hamilton, 1964).

Adaptations exist to solve *specific* fitness issues. Thus, they are shaped and designed according to their functions and the selective pressures that acted on them (Thornhill, 1990; Symons, 1992; Thornhill, 1997). One example of a psychological adaptation that has received much attention is sexual jealousy. Buss and his colleagues’ (Buss, 2000; Buss et al., 1992) research indicates that when individuals perceive a risk in their

relationship they become sexually jealous. In this case, the risk is possible sexual or emotional infidelity, which could be costly to individual fitness. For men, the cost of sexual infidelity could be cuckoldry (Daly & Wilson, 1982). As for women, infidelity could lead to hindered offspring development and quality if her mate spreads wealth and resources to relationships other than the ones with her and their descendants (Buss, 2000). To prevent or stop this detrimental and costly event, individuals experience the unpleasant emotion of sexual jealousy in response to specific infidelity risk cues.

Jealousy, then, functions to focus cognitions and behaviors on the relationship at risk, and develop solutions (such as mate guarding) that resolve the fitness costly problem of infidelity (Buss, 2000).

Social Navigation Hypothesis

One evolutionary approach to depression is the Social Navigation Hypothesis (SNH) of Watson & Andrews (2002). This adaptive model proposes that depression is seldom caused by pathologically imbalanced neurochemistry or truly flawed cognition (i.e., cognitive patterns that are demonstrably inappropriate for addressing the fitness-limiting problems at hand for the individual). Instead, MDD represents a facultative, unconsciously calculated mental strategy founded on a panhuman, conditional (i.e., environmentally responsive) genetic program that was designed by natural selection to help the depressive overcome serious fitness hindrances resolutely imposed by the social network. Under the SNH model, MDD has two main functions. The first is to *divert cognitive processing power* towards ruthlessly sober, and sometimes seemingly pessimistic, social problem-solving ruminations. The second is to *motivate social*

partners to help solve the depressive's problems. Among the testable predictions of the SNH, the most pertinent is that the lives of depressives should routinely feature appropriate fitness hindrances with social origins that stubbornly resist solution via conventional tactics of social negotiation.

In this way, the SNH postulates that depression helps accomplish a change in social niche in two complementary ways. First, mild to moderate and, perhaps, even severe depression configure the mind for focused, sober analysis of the costs and benefits of the current and possible future social niches via incisive social problem-solving rumination. Second, and more counter-intuitively, MDD's costly symptoms of psychomotor perturbation, fatigue, and anhedonia, function to persuade members of the social network to help the depressive attain niche change. It is the costliness of these symptoms to both the depressive and his dependent social partners (social exchange partners, including family, friends and, broadly defined, "business partners") that give MDD this "social motivation function."

The gradual erosion of the depressive's ability to care for self and others is powerfully enforced by MDD's core symptoms. The whole movement into major depression is essentially parasuicidal. Explicit suicidal ideation and behavior are nested within the parasuicidal tendency toward being unable to engage in standard fitness-enhancing activities. MDD's symptoms thus cause the depressive to involuntarily broadcast (1) an honest signal of need and (2) extortionary pressures to members of his social network who are initially reluctant to provide help in implementing niche change. The depressive's extortionary leverage comes from the escalating costs that dependent social

partners face when forced to live without the social exchange benefits once supplied by the pre-depressive (the symptoms associated with severe depression prevent the depressive from effectively supplying these goods).

Adaptiveness of Psychological Pain

The Social Navigation Hypothesis (SNH) is rooted in the modern evolutionary theory of psychological pain (Thornhill and Thornhill, 1989). Psychological pain is somewhat analogous to physical pain. In physical pain, if an individual stepped barefoot on hot coals, he would feel physical pain – an adaptive response. This pain has two main adaptive functions: (1) to focus awareness on the physically threatening or damaging features in the environment (i.e. by causing a highly localized painful sensation), and (2) to motivate the individual to do something that lessens the pain, thereby resolving the harmful problem – in this case, removing feet from hot, tissue damaging coals. Physical pain involves the sensation of sore body parts, while psychological pain involves more of an emotional hurt, or uncomfortable experience, which provokes reaction to ameliorate. Although these two sensations may “feel” different, their functions are similar. Like physiological pain, psychological pain works by directing attention and cognitive resources toward potentially harmful fitness circumstances in the environment and helps resolve the problem by motivating specifically designed behavioral solutions. The emotional response of sexual jealousy is one form of psychological pain: The unpleasant emotional response triggered by seeing a loved one interacting with a potential competitor concentrates our attention on the potential threat and motivates us to engage

in a behavior that helps reduce the dilemma (e.g. going over and joining the conversation, being more attentive to the partner, or even insulting the competition).

Experiences of pleasure and pain are important beneficial responses, and are motivators for behavior. Modern *Homo sapiens* have inherited an ancestral system of intrapsychic carrots and sticks that compel us, whether we are aware of it or not, to pursue fitness-promoting activities (Buss 1999). The cocktail of positive and negative emotions that we experience vis a vis a present or imagined situation configures us mentally and physically to deal with its inherent fitness-enhancing or fitness-threatening factors in an effective and efficient manner, and with appropriate levels of cost-benefit information-processing and priority. No doubt this system has been updated for the past 3-4 million years during the evolution of other adaptive psychological changes and capacities related to the increasingly complex social life of hominids. So, situations or behaviors that consistently enhanced fitness in the ancestral hominid and pre-agricultural human environment of evolutionary adaptation, or EEA (Tooby & Cosmides, 1990), reliably result in pleasurable emotions amongst the people of today. Meanwhile situations and behaviors that historically reduced fitness result in appropriate, purpose-designed, psychological pain. For instance, eating high calorie fatty and sweet foods, which were limited in availability in the EEA, tends to bring satisfaction, while their lack causes cravings, a type of psychological pain.

Anhedonia – The Fundamental Psychological Pain of MDD

Although most of the symptoms associated with MDD are unpleasant, the SNH postulates that depression features a unique, special-purpose form of emotional pain, namely, anhedonia. People suffering MDD often report this emotional flattening, but are typically miserable with it, so we retain the “pain” designation for anhedonia. In concert with a strong tendency amongst depressives to engage in intensified and sensitized social analysis (e.g., see, Edwards et al., 2000; Yost & Weary, 1996; Gannon et al., 1994; Gleicher & Weary 1991), anhedonia helps to focus attention upon onerous social circumstances, via a deviously comprehensive process of elimination of pleasures. More specifically, anhedonia concentrates cognitive resources to motivate social factor analysis. This should illuminate severe mismatches between an individual’s capacities and opportunities for fitness-enhancing activities. Such mismatches, in humans, are usually caused by the steady imposition of social constraints. Whether it is consciously desired or not, anhedonia disengages afflicted individuals from their everyday roles and responsibilities by reducing the basic motivation to perform their socially contracted duties (e.g. going to work, carpooling, housecleaning, proper childcare). It also cuts off access to pleasurable escapes that historically may have made the person’s existing circumstances more tolerable. Anhedonia leaves individuals with nothing but time, energy, and cognitive resources to identify and think of solutions to their fitness-limiting social problem or problems.

In some ways, the psychological pain aspect of depression could be thought of in terms of low mood, or as what used to be referred to as “minor depression.” From a functional perspective, low mood may be all that is needed to solve less complicated problems,

which may involve modifying the individual's own behavior, discovering new methods of negotiating with social partners, or determining that major relational changes are not needed. Likewise, with simple issues low mood and its associated ruminations may not need to be detectable by a majority of social partners to be effective. However, as problems become more urgent and complex, higher levels of depression, including full-blown MDD, might be required to get things rolling.

Psychomotor Disturbance – The Fundamental Physical Symptom of MDD

While psychological pain theory posits that afflictive emotions motivate individuals to change their surroundings, what some severely depressed patients seem to lack the most is motivation: motivation to get up in the morning, motivation to take care of themselves, motivation to do the tasks they normally enjoy (NIMH 2001). This apparent contradiction is where the severe physical symptoms of depression come into play and where the SNH expands on the psychological pain theory. The SNH postulates that if no solutions are found during the more purely ruminative and planning stages of depression, or when plans fail after substantive attempts at implementation, then the more severe and attention getting symptoms of depression, such as anhedonia, emerge. Thus MDD does not motivate the afflicted individual in the usual “get-up-and-go” sense. Instead, it forces the depressive to engage in the next level of depression - its clear, yet patently involuntary *display*.

According to the SNH, depression that forces a display of core symptoms and reduces performance functions to engage members of the depressive's social network to help

solve the problem via (1) honest signaling (Godfray, 1991) and (2) passive involuntary fitness extortion (Watson & Andrews, 2002). In this case, the honest signal of need is the higher level of costly depression symptoms. Extortionary pressures (such as in the form of reduced expected and essential activity by the depressive) are exerted on all social partners who depend on the depressive for some form of fitness-enhancing goods or services. As anhedonia and psychomotor disturbance intensify, the depressive is rendered increasingly incapable of helping himself and, by extension, others. Those individuals in the social network who estimate that the benefits of helping the depressive outweigh the costs will be motivated by the honest signal alone; as long as this social partner actually needs and can profit from the help. Social partners that initially assess that the costs of helping outweigh the benefits, regardless of the depressive's real need, may be forced to reassess the relationship when the depressive is no longer able to deliver his usual socially contracted, or socioeconomic, goods and services. Indeed, such partners face the risk of all the fitness benefits of the relationship being permanently lost if the depressive dies due to self-neglect (a real possibility in the EEA) or self-harm (probably even more possible in modern settings than the EEA, given so many relatively easy suicide options).

Under the SNH, any level of depression that cannot be hidden from social partners, including MDD, functions as a "cry-for-help" (Lewis, 1934). To this venerable old interpretation of MDD, the SNH adds (1) sound theoretical grounds for understanding why a depression-style cry-for-help might be needed, and (2) specification of the reproductive problem for which this particular way of crying for help may be an adaptation -- namely, that of having a severe fitness hindrance that ultimately is caused

by a diffuse, non-point, social constraint on opportunities for fitness enhancing activities. In other words, complex social contracts are hindering fitness opportunities, and the solution to this dilemma requires changes in one's social niche.

Socially Onerous Characteristics of Niche Change

Humans have a social system unique among animals. It is characterized by a high degree of individual socioeconomic specialization and, as a partial consequence, each individual greatly depends upon other group members for his or her own fitness. Humans barter and trade diverse currencies in the course of doing business within their complexly interacting matrix of reciprocal exchange relationships. To help secure and stabilize incoming goods and services from social partners, every individual in a human social group needs to negotiate an array of more or less dyad-specific socioeconomic and political contracts (.e.g., encountering resistance, or bargaining for social contract change). Individuals need to honor their contractual obligations, not only to maintain their own essential helping relationships, but also to maximize occasionally needed help from the community in enforcing contracts when social partners act unfairly. We call this form of sociality “complex contractual reciprocity,” where “complex” connotes the involvement of multiple currencies, and/or multiple interacting partners. The important point, however, is that in the process of establishing their particular matrix of dyad-specific contracts, humans manufacture for themselves a socioeconomic niche. As individuals come to expect certain kinds of explicitly or implicitly negotiated helping behaviors from their social partners, and build their lives around these expectations being reliably fulfilled, the

niche takes on a very real -- not simply psychological -- presence. The niche, or aspects of it, becomes socially sanctioned, but also to some extent *socially imposed*.

The social imposition of niches arises somewhat insidiously from the fact that all or most people in a given matrix of social relationships have *strategic equities in the status quo* socioeconomic position of all or most of their partners therein. Stability of the matrix, or at least the predictability of changes that will occur in it, enables its occupants to more effectively develop and implement plans for navigation toward maximum profitability (inclusive fitness) within their current socioeconomic niche or, when necessary, toward niche change. Individuals should not want the social ground moving under their feet any more than is necessary as they formulate their plays for enhanced fitness. It is best for any person to make strategic moves, whether they be large or small ones, while their partners remain in well-understood socioeconomic and political boxes. Selfishly, the only changes one should welcome are those that certain partners make, possibly under one's own strategic influence, that further one's own fitness enhancing plans. By default, then, most people in a relational matrix will tend to resist when faced with the prospect of any given individual drifting away from contracted reciprocal exchange behaviors. When an individual makes a bid for niche change, by definition, they will be looking to radically change contractual terms with many of their social partners and so will face strong resistance from many people.

Thus, everyone's social niche and its underlying matrix of contracts conveys fitness, but also is a prison. It is the strong social imposition of the niche that makes a bid for niche

change especially difficult to achieve - MDD may have evolved primarily to address this important socioeconomic and thus reproductive problem. During human evolutionary history, problems associated with a changing social niche may have been the selective context that made the most specific and efficient use of MDD's honest signaling functions and, especially, its broadly cast extortionary pressures. Niche change is expected to result in truly extraordinary, albeit potentially subtle, social resistance. This resistance is not difficult to understand: calculating the cost-benefit ratio of helping is unusually complex for social partners of the depressive when (1) it may not be clear at the outset what the endpoint of a niche change effort will look like, and (2) numerous, diverse, and complexly intertwined relationships are likely to be altered by niche change; thereby making many of the cost-benefit loops indirect (e.g., helping Partner A make a change in how they earn a livelihood may earn you a positive or negative response from Partner B because of the impact A's change has upon the socioeconomic relationship between A and B). Helping a partner in novel, extra-contractual ways to change a social niche involves anticipating the behavior of a large web-like, multi-partner system of critical relationships. The ramifications are potentially opaque, especially when compared with the consequences of sticking with prior arrangements, if that is possible. The difficulties of assisting with a niche change may heavily bias normally cooperative, and even loving, social partners to resist a depressive's proposed niche modifications. MDD is designed, according to the SNH, to change partners' minds about resisting and convince them that hanging on to the usual arrangements is not an easier or feasible option.

The Persuasive Power of Depression

According to the SNH, as long as the depressive strategy is maintained and the individual perceives that in the end he or she will recover the short and long term costs of the signal, depression levels will continue to escalate if key social partners are unresponsive to the visible, honest signal of need. It further suggests that the afflicted individual then becomes increasingly listless and anhedonic. At some point, these symptoms become costly not only to the depressed individual, but also to those social partners with whom the depressive have positive fitness relationships, because the individual is rendered incapable of meeting his or her various commitments. The dysfunction of MDD thus generates and broadcasts costs to social partners in order to motivate them to help the depressive, according to the SNH, by creatively and usefully re-negotiating social contracts they were previously unwilling to discuss. As an adaptationist model of MDD must do, the SNH assumes that no matter what the level of depression, conscious and unconscious social analysis goes on and the relative costs and benefits of the depressive strategy are continually revised and updated. Thus, depression always remains environmentally responsive and MDD may go into temporary or permanent remission at any time. Seemingly unresponsive depressions may reverse when interventions are formulated using a model based on the purpose of depression and comprehensive knowledge of the depressives' social milieu and how this affects their ability to pursue fitness.

Depression may be viewed, in part, as an attempt to “defect” from certain costly relationships (Hagen, 1999). Although some partners actually may help the depressive by

choosing to terminate exploitative relationships, in the process lucrative relationships are also put at risk of termination. Under the SNH, social partners are reluctant to help and, as we predict, often feel an aversion to a depressed individual because they are consciously or unconsciously fearful and dubious about how major proposed changes in the depressive's life will affect them. This would have been true in the human EEA, but in today's environment of large, populated cities, the risk of relationship termination may often be even higher since there are greater numbers of others who could potentially take on the depressive's role. However, in the close-knit social environment where human depression most likely evolved, abandonment often may not have been a feasible option. EEA social groups were smaller, more isolated, and inter-individual fitness correlations were stronger. So, it is important to keep in mind that at the time depression evolved its function was more likely one of motivating renegotiation rather than encouraging relationship termination.

In the end, the SNH predicts that the highest levels of depression should occur in situations where the depressive has previously reliable, positive fitness correlates (e.g., family members, friends, and business or political partners) who, this time around, are stubbornly unwilling to help, even though their aid is sorely needed. However, maintaining a relationship with someone who has MDD becomes extraordinarily costly to social partners; thereby motivating them to help resolve the depressive's underlying fitness hindering problem. Thus help is finally given to avoid the extortionary costs of having a positive fitness correlate (the depressive) involuntarily held in a highly dysfunctional state and even at risk of death. Post-depression, many of these social

partners could continue having a profitable relationship with depressives, although possibly in the context of the post-depressives operating within their newly negotiated social niche.

Depression and Deficient Social Support

As discussed above, the SNH postulates that depression solves fitness hindrances by uniting and motivating social allies to help resolve problems. If depression is an adaptation to solve social problems, then those who are depressed should have more severe and higher numbers of fitness-hindering social tribulations than those who are not depressed. Vast amounts of literature support an association between social strife, poor social relationships, and depression (Wildes et al, 2002, Coyne & Downey, 1991). Furthermore, evidence exists that depression levels lessen when social relationships coalesce or solidify (Brown et al., 1988; Andrews & Brown, 1995; Brugha et al., 1997). Along with this finding, several studies suggest that a supportive social network acts as a safeguard against depression (Paykel, 1994). If depression functions to solve fitness hindering issues via social assistance, then depression would not be needed as an honest signal or motivator if an individual's social network was already supportive *in the ways needed to solve the pivotal fitness hindering problem or problems*. It is worth noting that much support coming from a depressive's social network may purposefully, either consciously or unconsciously, (e.g., with the very best of consciously held intentions) manipulate the afflicted individual away from proposed socioeconomic reforms that are costly or risky to other individuals in the social network.

Some clinical studies show that depression increases stress in social relationships and that many social partners begin to avoid and resent depressed individuals (Jacob et al., 1987). At first glance, this criticism appears detrimental to the SNH because it hints that social strife is an outcome of depression -- not an antecedent. However, the SNH actually predicts that weak social relationships trigger a depressive response and that depressive symptoms may further heighten social discord. Since depressives are involuntarily breaking dyad-specific and, potentially, boilerplate cultural contracts, their behavior is none too pleasing to other individuals who suspect that they may be adversely affected by the depressive's actions. Furthermore, the SNH postulates that a majority of a depressive's social network is likely to be unsupportive, especially when niche change is needed. However, there is a possibility that a few supportive individuals may attempt to help the depressive. Unfortunately, if their assistance does not resolve the issues, then higher levels of depression are necessary to attract the attention and motivate the more stubbornly unsupportive social group members. As a result of the heightened depression levels, the few supportive members may become tired of the depressive's behaviors and mood, and begin avoiding them.

As for the uncooperative social group members, they may be avoiding or unhappy with the depressed individual to begin with. Often they are unsupportive of the depressive's wished-for niche change due to the niche change proposal's potential degradation of the former cost-benefit balance in the relationship. Such is the case when the depressive implicitly or explicitly requests that niche members give up a known contracted benefit for a less certain replacement benefit, or incur a novel helping cost. The reluctance of

social partners to honor the depressive's request of renegotiating social contracts stems from the costs and overall uncertainty involved for social partners: when facilitating new social contracts, the level of net benefits are very difficult to estimate. Thus helping the depressive is risky to others since the niche change could result in an unforeseen net cost either directly, to oneself, or indirectly because it influences relatives' or friends' fitnesses. Another possible risk outcome of the depressive's niche change is that it creates a new competitor for the social partner, namely the niche changed post-depressive individual, out of a former ally who has been a strong positive fitness correlate in the past. The avoidance of depressive's by friends and family may arise from the discomfort of being pressured to make potentially risky concessions.

This advance is somewhat analogous of responses to a dripping facet. We often grumble about, or are frustrated by a leaking sink. By ignoring the broken sink's "signals" we may try to avoid the time costs, monetary costs, and less predictable risks (e.g., you might break a major pipe trying to undo a corroded joint) associated with fixing it. At some point, however, the sink's "signal" becomes so strong and costly (e.g., the bathroom becomes flooded) that we are finally motivated to invest in fixing the problem. Multiply the intensity of this simple plumbing situation by 10-100 times, and you have the notion of how a social network may respond to someone who is depressed. Only when members of the social network can no longer endure the costs of depression are they seriously motivated to renegotiate social contracts with the depressed.

Although there is evidence that social problems are a risk factor for depression (Wildes et al, 2002, Coyne & Downey, 1991), this association still does not indicate causation. In fact, many theorists believe that the association between depression and social strife is similar to the question of which came first, the chicken or the egg? Is it that complex social problems occurred prior to the onset of depressive symptoms, thereby causing the depression, or are negative social situations an outcome of oppressive, stigmatizing depression symptomology? Do social problems arise from the depressive style of interpreting events (e.g., discomfoting realism) or by the seemingly dysfunctional physical symptoms and sadness that wears down the patience of others around the depressive? Unfortunately, this conundrum has yet to be solved. Until it is, a critical assumption of the SNH will remain untested: problems rooted in, or capable of being solved by, social intervention *precede* MDD symptomology since such problems initiate the depressive response strategy. Note, however, that *a priori* conflicts need not maintain the same level of intensity once MDD commences. As previously mentioned, the SNH strategy is a risky one. Thus an already bad situation can be made worse, at least for a while, after depression is implemented. Such mid-course escalations of struggle occur in many conflictual contexts, such as active negotiation or coercion to help or resolve a dispute. When starting peace talks, there is always a risk that conflict may intensify before it gets better. In the end, the SNH would be *falsified* if appropriate forms of fitness-hindering social strife were not present in the afflicted individual's life *prior* to MDD, but rather routinely followed the onset of depression symptomology.

Depression as a Response to Complex Social Problems

Social problems can come in an array of forms and severities: from a friend wanting to borrow five dollars to losing a job and becoming financially dependent on family members. Some of these, depending upon life history stage, seem trivial and not worthy of such a drastic and costly response as depression. For instance, being upset about not having designer clothing hardly warrants a costly depressive response from most adults, especially since a depressive response could result in job and income loss that would be negated by the benefits of having the “right” outfit. However, to adolescents, having particular clothing has greater importance since it could open up a whole new pool of more desirable social alliances and mate choices. Thus, to the adolescent mind, not possessing the appropriate clothes could be costly to future life prospects. With this example in mind it becomes clear that defining the type of social problems and life history issues faced by an individual are important to determining what elicits depression.

According to the SNH, depression is a way to help solve complex social problems. For an issue to warrant depression as a response, it must be difficult enough that more sustained cognitive focus than usual must be devoted to developing potential solutions. Everyday we encounter potential social dilemmas that we must disentangle. If you decide to go out for lunch at work do you invite one person or everyone? When is it acceptable to invite only one person and when does it become expected that the invitation be extended to more than one, or to all? Most of us understand that failing to invite someone or a group of people, given certain conditions, can result in social grief and costs being inflicted on us when the non-invited, and their allies, become insulted by our actions. The goal of our lunch decision is to find an acceptable combination of invitees which results with the

benefits (e.g., having a nice meal, taking a break from work, solidifying social bonds with a co-workers) outweighing the costs (social ostracism for not inviting others). In an event such as this, employing major depression as a way to solve the problem would be massively inefficient. It would take much more time and energy to engage in depression symptoms such as anhedonia, psychomotor retardation, and sleep problems than to just quickly play out the scenarios in one's head, or asking 2-minute advice from another person. In other words, this particular social dilemma is simple enough to solve using methods less costly than depression, and extra cognitive efforts are not required.

The SNH postulates that depression is an adaptive response to solve *complex* social tasks that influence fitness – ones that require significant amounts of time, energy, and effort to potentially solve (Watson & Andrews, 2002). In fact, the SNH hypothesizes that some problems may be so complex that the depressed individual himself cannot develop an acceptable answer; thereby falling into a greater level of depression in order to attract the attention of, or persuade others, who could potentially develop a solution (Watson & Andrews, 2002). Several traits characterize the authors' definition of a complex social problem. Since the SNH is based upon evolutionary theory, the complex social problem or its outcome must influence fitness. This complexity would be reflected in the level of importance, or magnitude, the depressed individual places on the event. Beyond this, the dilemma also must be important and difficult enough that engaging in everyday interests and activities takes cognitive energy away for solving the problem thereby becoming an impediment (Watson & Andrews, 2002). In order for the depressive to obtain enough cognitive processing power to solve the issue, the inferential systems normally used in

regulating everyday activities must be re-directed. This would allow allocation of processing power and possibly energy for intense social rumination, but leave little left over for even moderately demanding cognitive or physical activities such as house chores, going to work, and eating properly (leading to weight loss from lack of eating or weight gain by eating quick, poor quality foods). In this manner, the SNH illustrates how cognitive complexity of problems accounts for the core symptom of anhedonia.

Additionally, complex social problems should have obstacles that make them difficult to solve (Watson & Andrews, 2002). For example, getting a college degree can give some individuals the benefit of increased income, but sometimes people can neither get the time off work nor have the funds to go to college. Although not a necessity, often these types of obstacles have social roots in the form of someone who is unwilling to re-negotiate a social role -- thereby trapping individuals in fitness-hindering situations. From the previous example, time and finances can trap individuals from attending college, but individuals in our social niche may set these traps. For instance, an uncooperative boss may be unwilling to modify a work schedule, or a spouse may disagree and dictate how joint funds are allocated. These type of obstinate re-negotiation obstacles would be identified during the rumination phase of depression, but when these complex social problems require much cognitive effort to develop acceptable and attractive solutions, depressed individuals “should perceive their social situation is undesirable and difficult to change” and more severe depression commences (Watson & Andrews, 2002, page 5). For the college example described above, the depression signal, or severity, may need amplification in order to (1) attract the cognitive assistance of social partners with

relevant knowledge or skills, and (2) motivate any unsupportive social partners to help in developing solutions to the complex issue. As previously discussed, severe levels of depression become detrimental not only to those with the depression, but also to those in social contracts with the depressive (e.g., colleagues, friends, and family) because depressed individuals are not holding up their end of their *status quo* social exchange contracts. This cost may call to action somewhat supportive members of the niche or compel unwilling members to renegotiate.

It is important to note that the complex problem and the fitness-hindrance are not necessarily the same. In the above example the fitness problem is not simply an uncooperative employer and a selfish spouse. The socially imposed mismatches between her latent capacities (i.e., getting an education to increase income) versus her inadequate opportunities (caused by time limitations connected to her *status quo* duties and lack of funding) are her real fitness hindrances -- all of which could be resolved with more social support from her employer and spouse. Depression functions to solve fitness hindrances, some of which are social problems *per se*, and some of which are not, *but all of which have socially based solutions*. Thus depression functions to ameliorate socially solvable fitness hindrances.

Social Solutions Involve Social Networks

While a person's overt social problem may appear to be exploitation by a single or small group of individuals (e.g., a bad spouse, or a couple of bullies on the playground), the social solution may call for the concerted action of many key social partners. Depression

is most specific, effective, and efficient (i.e., most adaptation-like) when there is a diffuse, non-point source of social constraint as the basis for a capacity/opportunity mismatch. Possessing problems involving an extensive social network is a unique postulate of the SNH compared to other evolutionary theories of depression (Watson & Andrews, 2002). The “strike hypothesis,” (Hagen 1999) for example, emphasizes the possible role of depression in facilitating an escape from concentrated, dyad-specific issues rather than ones that require mobilization of the social network in general (Watson & Andrews, 2002). The concept of depressives perceiving general problems in their overall social support system in relation to specific capacity /opportunity mismatches is important to the SNH. Since the SNH advocates that depression functions to solve fitness-hindering situations, the social solutions that cause depression to depart should be ones that eliminate the specific fitness-limiting problem *as well as* new problems that threaten to take over as the limits are reduced, and which could prevent fitness-enhancing changes from developing to fruition. Thus, solutions will often involve sorting out and getting in order a complex matrix of social support. Solutions to the kind of problems that the SNH proposes MDD evolved to fix need to simultaneously promote concessions and help from various players in the social network. Thus the SNH emphasizes that depression is designed to automatically *broadcast* costs across the social network.

The Costliness of Depression

Depression is an oppressively costly behavior: loss of interest in otherwise pleasurable activities; hindered productivity; difficulties maintaining hygiene, eating, and sleeping; potential death via suicide. All adaptations have costs necessarily associated with

building, maintaining, and using them. Natural selection favors minimization of these costs in ways that avoid overly compromising the adaptation's effectiveness. The disabling symptoms of depression are odd, however, in that it is their costliness that plays a central role in bringing about the desired effects on the social network. Although natural selection favors maximizing efficiency, in the case of MDD it cannot favor annihilation of the cost, only the regulation of it (i.e., so that the expense is not incurred in the wrong context).

Other adaptations in which the cost is necessary for the adaptation to work include honest signals of need or quality. For example, the begging call of a nestling bird should be related to the bird's real need for food and its ability to transform the nestling into a reproductive machine that will turn out good numbers of high quality grandchildren for its parents. Similarly, a peacock displaying its plumes should only make a show that correlates with its overall quality, and, likewise, its ability to pass on genes that will result in high quality offspring. Such honesty is not for the good of the species. It has been selected for in the context of a coevolutionary arms race between senders and receivers of such signals in which receivers have the ability largely to ignore signals that lack reliable information on the fitness return on a feeding or mating investment. So, while the costs of MDD are not its function, its costs are necessary for fulfilling its function, namely persuading others to assist, whereas in most adaptations the costs themselves are useless, but unavoidable.

Methods for Adaptation Studies: Reverse-Engineering Analysis

Various methodologies can be used to study adaptations. However, the method that forms the foundation for the research programs of most any behavioral ecologist or evolutionary psychologist is that of reverse engineering analysis. Reverse engineering involves deciphering the function of an adaptation based upon its design and how the parts interact. Adaptations do not involve foresight, nor are planned designs built with new materials (as would be the case in forward engineering). Instead, they are the accumulation of mutations that provided a survival or reproductive advantage; thereby facilitating the passage of the characteristic from one generation to the other so that the adaptation becomes more prominent in the population. Furthermore, additional mutations, which are also subject to the forces of natural selection, modify the feature so that the trait becomes shaped and specialized, and gains the appearance of being engineered for a specific purpose (Thornhill, 1997; Williams, 1966). As for reverse engineering analysis, it attempts to test alternative functional design hypotheses about a potential adaptation: Questions such as “What is the benefit of the adaptation?” and “What is it designed for?” help illuminate an adaptation’s purpose (Pinker, 1997; Williams, 1966; Thornhill, 1997). Moreover, psychological explanations using reverse engineering try to incorporate human ecology: age appropriate issues (life history), habitat, sex and gender, and social life (Pinker, 1997).

One common criticism of the reverse-engineering approach is that it involves *post-hoc* analyses, or creates a story around pre-existing information (Thornhill, 1997). However, many advocates of the reverse-engineer perspective believe this critique is inaccurate,

because an “Organism is a historical document” (Thornhill, 1997 page 11), meaning that the methodology does not make up a story, rather it uses concrete evidence from the organism to piece together the history and development of a putative adaptation. Formulating *a priori* hypotheses, some of which involve predictions about how the adaptation should work which do not already exist in “common knowledge,” does this. Furthermore, reverse engineering advocates developing and testing many alternative hypotheses to eliminate other explanations. Notably, the method of reverse engineering is not specific to behavioral ecologists and evolutionary psychologist, but also was used in a centuries worth of advancements in physiology: It was Harvey’s questioning of valve function in veins that furthered our understanding of blood circulation (Mayr, 1983 page 239; Pinker, 1997). In summary, the method of reverse engineering has furthered our understanding of many concepts, and is the primary technique used to study psychological adaptations. It is also the method used to develop many of the different evolutionary hypotheses of MDD. Although the testing of alternative evolutionary and maladaptive hypothesis is crucial to the method of reverse engineering, a review of these is presented in other papers (Watson & Andrews, 2002; Nesse, 2000). The purpose of the below discussion and findings is to introduce one particular evolutionary perspective of depression and to preliminarily determine if its predictions are nullified, thus eliminating it as a potential explanation for MDD.

Evolutionary Adaptationist Predictions Concerning MDD

Depression as an Adaptive Response to Socially Solvable Fitness Hindrances

By definition, adaptations solve specific problems that either directly or indirectly influence reproductive success. Thus, in order for MDD to be approached from an evolutionary perspective, it must first be established that those with depression have a fitness-influencing problem to be solved. Much depression literature reports a positive association between stressful life events and the presence of depression (Wildes et al, 2002, Coyne & Downey, 1991). These stressful life events can range from a move or job change to divorce, and can also be thought of as incidents that directly (by occurring to oneself) or indirectly (by occurring to one's genetic relative) hinder an individual's fitness. For our purpose, fitness hindrances (FH) are defined as events that currently reduce fitness (e.g. loss of job) or hinder actions that potentially increase fitness (e.g. going to college) *and* which are solvable with social network intervention. Moving from one location to a completely different place, for example, results in the severing of formerly influential social alliances that took years to build and having to create new ones - often from scratch. When moving to a new town we are often faced with important decisions and difficult situations: Who is a good doctor in town, where are the best deals, who can we call for a ride if our car breaks down? These questions are easily answered when we have trusting alliances with others and have built up "favor" relationships. However they are daunting when new to an area, and could be costly if choices are uninformed. Furthermore, we no longer reap the benefits of opportunities that arise from our social "connections." People are frequently offered desirable jobs or alliances because of who they know, or because time has built trusting relationships. When these types of social connections are severed, valuable fitness enhancing opportunities are lost, and individuals can be stuck in positions that are undesirable or beneath their abilities.

Although most moves are made because of an overall net gain (e.g., higher paying job, better house), sometimes the move benefits one individual in a relationship more than the other, causing changes in the social niche and agreements that may call for renegotiation in order to avoid one person being stuck with the raw end of the deal. Additionally, the current costs of the move (i.e. having no new social network) may, for a time, overshadow the potential future benefits; leaving people blinded by their current dilemmas. This modern situation can be very dangerous, since it is unlikely in the environment which depression evolved (Tooby & Cosmides 1990) that people habitually found themselves in an entirely new social group with no previously existing fitness correlates (even a young woman leaving to live with her new in-laws, would have fitness correlates with the family she had married into). If depression is an evolved adaptation to address socially solvable fitness problems, it would have evolved in environments where people had positive fitness correlates, and individuals probably would respond to the depression signal. Despite possessing a problem with social solutions and having new people in the environment who are able to solve the issue, when there are no fitness correlates in the new environment there is little benefit or motivation for these individuals to acknowledge the honest signal of need. As a result, depression levels continue to escalate, without having persuasive fitness costs on others. Lack of response from people could result into the ultimate depressive signal, explicit and genuinely dangerous suicide attempts.

When Would Fitness Hindrances Not Lead to Depression?

The answer to this question, according to the SNH, is almost all the time. The vast majority of fitness hindrances are best addressed by profoundly non-MDD-like states of high energy and motivation fueling creative, indefatigable opportunity seeking and social negotiation. Organisms seldom find themselves in situations that are optimal for fulfilling the various missions necessary to maximize lifetime reproductive success. Most psychological adaptations make organisms more willing and able to “try harder” in response. For example, if one has recently lost rank in a social status hierarchy, although there may be good reason to ponder the reasons why, the main adaptive responses will be to devise ways of recovering and, in the meantime, to implement new sets of behaviors that squeeze the most fitness most out of one’s worsened situation. Even the emotions linked to grieving the loss of a loved one often produce dramatically active non-MDD behaviors.

Moreover, the SNH predicts that those who encounter fitness limiting situations, but have a social network that is incapable of solving the problem will not get depressed (Watson & Andrews, 2002). In this way, if an individual encounters a severe fitness-hindering event, but the event either does not have a social solution or the individual has no one in his or her niche who is capable of solving the problem, then a depressive response should not ensue. This stipulation also addresses why some people who face severely hindering events in their life do not get depressed, and why there are cases where other individuals who encounter seemingly less harsh incidents do become severely depressed.

Predictions from the Social Navigation Hypothesis

Four major propositions of the Social Navigation Hypothesis of depression can be extracted from the above review. First, depression functions to channel limited cognitive resources and energy into solving fitness hindering problems that have complex social solutions. So, if depression is present in people then they should also have fitness hindrances. Furthermore, it is expected that severity of depression will vary with the degree of fitness hindrance, that is, the more detrimental the hindrance the more intense the depression symptoms.

Second, the behavior of social networks is predicted to play a key role in depression. If depression functions to motivate the social network, then a non-supportive social network must be present for depression to signal at. The SNH predicts that even seemingly supportive and loving social networks will be discovered to be highly non-supportive in a critical fitness domain causing the perpetuation of a major capacity – opportunity mismatch in the life of the depressive.

Third, the social solutions necessary to address case-specific, fitness-limiting problems in depressives' lives must be complex to obtain, otherwise a costly behavioral response such as MDD would not be necessary. The need to niche change is expected to be a common precursor to MDD, because helping a person re-write the terms of many dyad-specific social exchange contracts, all at once, will have consequences that are extraordinarily hard to predict – to do so requires that one be aware not only of one's own difficult cost-benefit analysis but those of the others.

Fourth, if depression helps solve adaptive problems by motivating social help via honest signaling and fitness extortion, then there should be an expectation on the depressives' part that increased social help could effectively resolve their issues. It is important to remember here that "increased social help" may entail not only quantitative, but also qualitative changes in how the social network invests in the depressive.

More specific predictions for each of these four SNH conditions for depression are further discussed below.

Methods

Participant Demographics

Older adults, aged 50 and above, consisting of community members and clients from local mental health complexes in rural southwestern Mississippi were recruited by newspaper advertisements and health care provider referrals (n = 121). A standardized interview was given to participants that included a standardized depression scale (Geriatric Depression Scale, Yesavage, et al., 1983) and a questionnaire that inquired about FH events and included additional items developed to investigate predictions from the SNH. Demographical and socioeconomic information also were obtained.

Depression Assessment

All participants were orally administered the Geriatric Depression Scale (GDS, Yesavage et al., 1983) by the same researcher. The GDS was developed to gauge depression in

older adults. It is a screening device (not a diagnostic tool) that assesses level of depression experienced and aids in the identification of individuals who may need further evaluation for MDD using DSM criteria. The GDS is unique among existing depression scales in that it contains fewer items on the somatic correlates of depression which are often confounded with age related somatic complaints.

Scores for the GDS are calculated by tallying the number of responses that are consistent with having depression. Scores range from 0 (no depression) to 30 (severe depression).

Scores ≤ 11 are the suggested cut-off point for those adults within a normal mood range while scores of ≥ 12 are considered to be within a depressive range. In this study, all individuals who scored 12 or above on the GDS and also had primary DSM IV diagnoses of MDD from either doctoral or master level mental health professionals were classified as “depressed/depressives.” Those who did not meet both criteria were defined as “non-depressed.” Individuals with conflicting DSM diagnosis or severe mental illnesses (e.g. personality disorders, bi-polar disorder, schizophrenia) were excluded from participating.

Structured Questionnaire

Various items on the questionnaire were developed to examine the distribution of FH among subjects and to test predictions generated by the SNH. Unless stated otherwise, all questions had responses that used a 5 -point Likert scale. In general, we asked one question per prediction. However, in some cases several questions were tallied to obtain a total score for the prediction. Scores from the questions were then compared to depression scores for individuals in two ways. First, scores for the predictions were

correlated with GDS scores to look at the relationships along the full range of depression scores. Then an independent sample-t-test was performed between those classified as depressed (scores ≥ 12 on the GDS) and non-depressed (GDS scores of ≤ 11) to determine if there were significantly different responses to items between depressed versus non-depressed individuals. If no differences occur between depressives and non-depressed individuals then the prediction would be unsupported.

The Presence of Fitness Hindrances

Participants were asked to list currently occurring events in their lives that they felt were hindering them, and then rate how “troubling” this event was using a 5-point Likert scale (1- not troubling at all, 5 = very troubling). Prior to data analysis a rater went through this list and eliminated events that were not considered fitness hindering. For this study, fitness hindrances (FH) are defined as any currently occurring fitness limiting event(s), be it direct, indirect, or inclusive, happening within a 24 month period that individuals still report feeling the repercussions of. The rater classified events as FH if they clearly were likely to have influenced fitness directly, indirectly, or via an impact on relatives (i.e., inclusive fitness effects). Examples of FH include “Job loss,” “Sick or relative is sick,” “Risk of becoming homeless,” “Son may go to jail,” and “Too old to take good care of grandchildren who were left on my doorstep.” Approximately 1% of the events listed by participants to be “hindrances” were disqualified as clearly FH events (i.e. “There’s something missing in my life”). Individuals who had 1-5 FH events scored a “1” while those individuals with no FH events score a “0.” In order for MDD to even be considered an adaptation, there must be an *ongoing fitness problem(s)* that beg for

resolution. If FH circumstances are not significantly more prevalent among depressed versus non-depressed individuals, then an adaptationist interpretation of depression would be unsupported in this sample.

SNH Prediction I: Severity of Depression and Fitness Hindrances

Although tallying the number of FH occurrences and then correlating this total with depression scores might help reveal the relationship between FH and depression, the relationship between FH and MDD is probably more complex. Even though two different events can hinder fitness, they may not have the exact same magnitude of impact on fitness. For instance, Person X is upset over a friend not repaying her the twenty dollars she loaned, while Person Z is upset because a friend crashed his new car and refuses to help pay for the repairs. We would lose predictive power by merely assigning each person one point towards having a fitness hindering event when the events clearly have different magnitudes of costs. This discrepancy between magnitudes of fitness hindering events could account for differences in depression levels because they influence how detrimental, or costly, an event is to a person. Thus depression symptom severity is an adaptively modulated continuum: just as there are varying degrees of physical pain based upon the somatic harmfulness of an event, emotional pain should correlate with “both fitness consequences that are at stake and the cognitive difficulty of the social problem.” (Watson & Andrews, 2002, page 4). In short, as fitness hindrances experienced by individuals increase in number and severity, so should depression levels.

To calculate FH, participants had the opportunity to list up to five fitness-hindering events and rated the magnitude of each using a 5-point Likert scale. These magnitude scores were then summed. Individuals with scores of zero had no FH listed while scores of 1– 25 indicated presence of FH. Higher scores of FH indicated (1) larger numbers of FH events and (2) higher magnitude of FH events. If depression is an adaptation modulated by the degree of fitness hindrances that are occurring, then we would expect a positive correlation between the total magnitude of fitness hindering events and the level of depression.

SNH Prediction II: Attitudes of Social Network and Depression

We often consider our social network to be those individuals we gather with for rest and relaxation. However, we also socialize with family members, colleagues, and those with whom we do business. In truth, our social networks include a vast interacting matrix of people with whom we depend upon to varying degrees and who, in turn, depend upon us to complete our life tasks (e.g., meeting a work deadline, having someone to buy groceries from, or helping to keep the household in order). Those we have expectations of, or with whom we have social contracts are considered our fitness correlates, and constitute our social support. In general, people have very few, if no, expectations from strangers, some expectations of friends (e.g. helping with small tasks, carpool together, etc.), and have even more expectations of family members (e.g., expect them to be on your side, or to help when you are most incapacitated or even do not “deserve” help). Thus the attitudes of friends and family are a good general assessment of overall social support within a social network.

According to the SNH, depression varies depending upon the level of cooperation in the social network. First, depression functions at lower levels to attract the help of social partners who just need an honest signal of need in order to be willing to assist. When this aid is insufficient to solve the problem, depression escalates and becomes increasingly costly to others, potentially extorting aid from uncooperative, or non-supportive, members of the social network. With respect to social support then, high levels of depression occurs in people who feel that their fitness correlates (family and friends) (1) are unsupportive (the SNH postulates that depression functions to motivate help when little or none is given), (2) have the ability to help, since if they could not help there would be no use in depressives signaling, and (3) in majority are unwilling to help thus necessitating a stronger signal and increased costliness to persuade these individuals to help the depressed.

Each of the three separate aspects of social support were tested using questions that utilized a five-point Likert scale. To assess the level of support in the social niche, participants were asked, “In general, how supportive do you feel family and friends are of you?” and chose responses from a five-point Likert scale (1 = not supportive at all, 5 = very supportive). This response was then correlated with GDS scores and an independent sample t-test between depressives and non-depressives was done to determine if those with higher GDS scores had less social support than those with lower GDS scores. As for ability to help, two questions were asked that addressed (1) ability and (2) usefulness of the social network at helping solve problems. The first asked how much help the social

network would be able to give (1= no help, 5 = lots of help) while the second asked how useful family and friends would be at helping solve their problems (1= Not useful at all, 5= Very useful). The responses to these items were summed to create a value (out of 10) for general usefulness of the social network. SNH predicts that as the potential usefulness of the social network at solving extant problems increases, so should depression levels. An ability to assist is critical: Depression does not solve the fitness-hindering problem, even if it succeeds in attracting people who are willing to help, if they are incapable of actually resolving the FH issue (therapists should take special note of this SNH prediction). Finally, the quantity of social group members willing to help was addressed by asking participants “How many in your social network do you think would help you?” (1 = none, 5 = all). The SNH predicts that as more members of the social network are unsupportive, then depression will and its symptoms will be more severe in order to convincingly signal for assistance from others. This item was correlated with GDS scores to reveal if those with less willing to help social networks also had higher depression levels.

SNH Prediction III: Complexity of Problems and Depression

The SNH predicts that as problems increase in cognitive difficulty or complexity, so do depression levels since the obstacles are too complex for the individual to solve alone, and others need to be attracted in order to successfully resolves the issues. Cognitive complexity of problems was assessed by measuring the level of “hope” to solve the problem(s) rather than “difficulty.” The decision to use “hope” rather than “difficulty” was based on several issues. To begin with, many people enjoy challenging problems.

However, just because a problem is difficult to solve does not mean that depression is the only or the best way to solve it, especially when individuals have the ability to do so. For instance, turning around a company's budget crisis might be difficult and challenging, but does not call for depression if one has the intellectual ability and social support to solve it. Furthermore, inquiring about the "difficulty" of a task or problem may lead to individuals assessing difficulty levels of their problems via societal views rather than based upon their own abilities. Many people would not view housekeeping as a difficult task, but some individuals, such as those with physical disabilities, are incapable of doing house chores effectively. If asked, these individuals might not say that their problem is difficult when, in fact, for them it is. For these reasons, complexity, or cognitive difficulty, of problems was assessed by inquiring about "hope" for being able to solve concerns because it encompasses the difficulty of problems as well as individuals' abilities to successfully accomplish the task. People with difficult tasks who also have the ability to solve it still have hope. The SNH predicts that depressed individuals who have difficult issues, but cannot easily solve them on their own should have little hope, and thus need depression to signal others for assistance. With this in mind, participants were asked, "How much hope do you have for being able to solve any of your problems or concerns?" because it is a more complete measurement of issue complexity. This five-point Likert scale item was then correlated with GDS scores to illuminate if those who are less hopeful at solving their own problems have higher depression levels.

SNH Prediction IV: Depression as a Means to Motivate Social Help

The SNH additionally posits that one of depression's functions is to draw the aid of others in solving the depressives' concerns. If this is true, then we would expect depressives to have hope for solving their concerns when family and friends are closer and cooperative. Results revealing that depressives feel hopeless at solving their problems despite others becoming seriously involved would be problematic to the SNH since it predicts that when individuals believe their problems are unsolvable (and thus have no hope what-so-ever - even with possible family and friend involvement), then depression should subside or should not occur in the first place (Watson & Andrews, 2002). The core of the SNH is that depression helps people navigate through their social network and motivate members of their social network to develop revised social contracts that produce an acceptable solution to the fitness hindering issue(s). Thus, depressives should feel more hope at finding a solution when other social partners are willing to help because this indicates possible cooperation and resolution of the problem(s).

Two items were used to assess if depression functions to attract social support in order to help solve problems. Participants were asked to rank, on a 5-point Likert scale (1 = Very hopeless, 5 = Very hopeful), how much hope they would have at solving their problems or concerns if they (1) were closer to family members and (2) had more cooperation from family. Adding the values for each of these questions together created a composite score for the expectation that social support helps solve problems. The composite score was then analyzed with GDS scores. The SNH predicts that depressives should feel more hope at being able to solve existing problems if their social network becomes involved, and that this hope will positively correlate with higher GDS scores.

Results

Fitness Hindrance Predictions

Individuals classified as depressed were significantly more likely to have FH events than those classified as non-depressed ($t(115) = 12.44, p \leq 0.001$). Furthermore, depressives had a mean number of FH events equal to 3.03 (out of five) while non-depressives had a mean number of FH events of 0.25. This difference in means was statistically significant ($t(115) = 12.04, p \leq 0.001$).

SNH Prediction I: Severity of Depression and Fitness Hindrances

As the magnitude of fitness hindrance increases, the degree of depression also rose ($r = 0.81, p \leq 0.001, n = 117$).

SNH Prediction II: Attitudes of Social Network and Depression

It was revealed that those with GDS scores consistent with depression had lower social support than those classified as non-depressed ($t(114) = 8.30, p \leq 0.001$). Furthermore, a significant and negative correlation was found ($r = -.68, p \leq 0.001; n = 116$) between social support and GDS scores. Thus those who report less social support have higher GDS scores than those with more social support. As for perceived potential usefulness of the social network at helping solve problems, this was significantly correlated with higher GDS scores ($r = .33, p \leq 0.001; n = 109$). It was also found that as GDS scores increased, the number of individuals in the social network willing to help decreased ($r = .59, p \leq 0.001; n = 108$).

SNH Prediction III: Complexity of Problems and Depression

As explained above, the cognitive complexity of problems was measured via participants' feelings of hope for solving their problems. Depressed individuals had significantly less hope at being able to solve their problems than did non-depressed individuals ($t(101.17) = 7.126, p. \leq 0.001$; equal variances not assumed). Additionally, as hope decreased, GDS scores increased ($r = -.62, p. \leq 0.001; n = 113$); indicating that those who are depressed have problems that they view are difficult to solve on their own.

SNH Prediction IV: Depression as a Means to Motivate Social Help

Depressed individuals report having more hope for solving their problems and concerns if they had more cooperation from family members ($t(107) = 8.52, p. \leq 0.001$) than do those who were non-depressed. In fact, as hope for solving problems with the assistance of family support increased, so did depression levels ($r = 0.66, p. \leq 0.001; n = 109$).

Discussion*Summaries and Limitations*

Prior to testing specific predictions of any adaptationist hypothesis for MDD, it must first be established that a specific and relevant fitness related problem exists. According to the adaptive model of depression given by the SNH, MDD should be associated with socially solvable fitness hindrances and its intensity should vary with (1) the level of these fitness limitations, and (2) the importance of obtaining social support. If these predictions are not

satisfied, then the SNH perspective suffers, and such results would be consistent with theories positing that depression is a genuine *disorder*.

Thus, it is important to highlight that the results of this study indicate that depressives, more so than non-depressed individuals, do indeed face fitness hindering situations. This finding justifies further investigation of adaptationist approaches to studying and treating depression *in addition* to examining current views of MDD as a cognitive or physiological/neurological dysfunctioning. Interestingly, it was found that as the magnitude of current fitness hindering events increased, so did depression severity. This signifies the potential for fitness hindrances to serve as a predictor of depression.

Survey questions utilized in this study concerned current FH. Stressing the examination of *current* fitness hindrances with *complex social solutions* is important since depressive emotions should configure persons to deal with existing situations, given self-assessed practical limitations, to maximize expected future inclusive fitness. This differs from most other perspectives on depression because it suggests that *past* life events, no matter how awful, should not be *primarily* causal for any ongoing depressive episode. Past issues (e.g., loss of an important political or socioeconomic partner) are relevant only insofar as the fitness effects of this past event remain current.

We offer a case in point. A disabled, low SES older woman in a rural community has three children: two adult, single, and childless daughters and one son. Her son died during childhood from what she believes was low quality and improper medical attention

for a common ailment. Despite the death occurring almost twenty years ago, this woman currently ruminates over the events that lead to and the death of her beloved son, and feels guilty over her inability to have provided better medical care for him when she suspected that he needed more. At first glance, there does not appear to be a *current* fitness hindering situation in this clinical case study. Furthermore, the woman's ruminations, as well as her renewed grief, over her son's death appear dysfunctional. However, after discussing her son, this woman mentions that both of her daughters have been ill recently, and that one of them is soon going in for surgery. She and this daughter are at odds regarding the daughter's choice of medical professionals, and the woman wishes the family had better healthcare coverage and financial help from other relatives to pay for a second opinion. In addition, the facility where the surgery is to take place is far out of town and because the woman's car recently broken down she needs a ride to the hospital, which is 2 ½ hours away, so that she can monitor her daughter's surgery.

Looking at this situation through an evolutionary lens, we understand that being post-reproductive, this woman's fitness will be influenced solely by issues that limit the welfare of her already existing offspring and other relatives, including the future children of her daughters. In this scenario, the *current* fitness hindering event involves her daughters being at risk for further health problems, or even death, from poor medical attention -- just as was her son. Beyond this, her social network is being uncooperative since the daughter is being stubborn with her choice of physicians, and other relatives are not financially contributing for better health care of this woman's daughter, nor are they facilitating her presence at the hospital to scrutinize quality of care.

Although recency of FH events is important, it is also a limitation of this study. The data analyzed here only assesses current presence of FH events. It provides no information on the presence of FH *just prior* to the onset of depression, or the degree of amelioration of FH at depression's resolution. A critical postulate of the SNH is that fitness-limiting events with complex social solutions arouse depression, as an adaptive response to solve the problem, and that when the problem is resolved depression should diminish. Thus from the information collected here, it cannot be concluded that FH events are the precursors and triggers for depression. However, the strong correlation between current FH and depression suggests further investigations should be conducted concerning the causal role of fitness hindrances in MDD.

Another limitation of this study is the measurement of "certified" fitness hindrances. No previously developed, standardized questionnaires evaluating evolutionary theory based fitness hindrances exist. As a result, there are no formal validity and reliability test for this measurement. The lack of FH instruments is primarily due to the novelty of the concept. Thus the goal of this investigative research on fitness hindrances is not to portray FH events in depression as robustly confirmed, but to introduce and suggest that FH and evolutionary perspectives, with regards to Major Depressive Disorder, be topic areas for serious and rigorous examination.

As for the four pivotal propositions of the Social Navigation Hypothesis of depression, all were tested, and all four were supported. One of these supported predictions involved

depressives' perceptions of low social support in their network. The SNH does not purport complete non-support of the social network for the depressive in all areas of life. Rather, it suggests that members of the social network are non-supportive vis à vis some critical, fitness-limiting, socially solvable issue; this combination of circumstances is responsible for triggering MDD. Social partners can be massively supportive in other domains, but not necessarily in the one proposed by the depressive. In fact, offers of support in domains that do not solve the depressive's focal problem may be part of the manipulative tactics social partners use to freeze depressives in their currently contracted social niche.

The finding that depressives suffer low social support would be strengthened by collecting cross validating information on the depressives' perception of social strife, via reports from others in the social network. Cross-validation for accuracy of perceived social support is key for the SNH, because it proposes a ruminative social-planning function for low levels of depression, which helps depressives correctly assess level of social support and how to actively negotiate for more of it. This hypothesis, however, assumes that depressives are more realistic in some aspects of their cognitions. It should be noted that assessments of non-support by depressives often are expected to be quite subjective. "Normals" typically exhibit a social "optimistic bias" (Taylor & Brown, 1998), or a "self-serving bias" (SSB; Sedikides, 1993) in which they ascribe their failures to chance or deficient effort, and successes to their own capability (Sedikides, 1993; Sedikides, et al., 1998). Depressives, on the other hand, seem to lose this bias and attribute their failures to inadequacy and successes to chance (Sweeney et al., 1986).

However, this “depressive attributional style” (Sweeney, et al., 1986) may be more accurate than the self-serving bias. It may leave depressives with a realistic insight into their social relationships (see discussion in Watson & Andrews, 2002), or descends them into a subjective pessimism or paranoia which may help the depressive develop more thoroughly thought out plans for niche change or to pinpoint elements in the social network that are most likely to cause problems to resist solution. Furthermore, if depressives do lose a naturally occurring optimistic bias, and thereby more accurately interpret social scenarios and their level of control over them than “normals,” then it would be difficult to argue alternative hypotheses that depression involves cognitive malfunctioning. *Visa versa*, future research that strongly supports depressives making less accurate social assessments than non-depressives would be problematic for the SNH. To date, studies on the topic of precise perceptions in depressives have mixed conclusions (for reviews see Dobson & Franche, 1989; Haaga & Beck, 1995). The question of “realism” requires resolution in order to more confidently reject cognitive malfunctioning theories of depression for adaptationist hypotheses despite the presence of socially solvable FH events. There is reason to question whether depressive realism can be demonstrated *vis a vis* socially complex problems (e.g., see Pacini et al., 1998). Even at present, however, some evidence suggests that while depression can cause selective cognitive deficit, which accords with the predictions of the SNH, it does not seem to influence global intellectual functioning (Gallassi et al., 2001; Franch, et al., 1998).

Another prediction of the SHN is that problems are socially complex to solve. The results presented here found that depressed individuals felt little hope for solving their own

problems, but had more hope if their social support increased. This suggests that problems were too complex to be handled alone, but were not so complex that depressives felt no solutions existed. Although these are interesting results, there is still an issue as to whether or not depressed individuals have realistic insight into their life. Are depressive's accurately assessing their concerns, or are they pessimistically assessing their problems, which could inflate their ratings of complexity and deflate social support measurements. According to the SNH, however, realistic insight need not be conscious: for both depressed and non-depressed individuals, the most integrated and objective working model of the social and non-social world should reside in the unconscious mental basement. This unconscious model should, in turn, influence the informational and emotional contents of consciousness as is deemed most adaptive under current circumstances. Thus, functional realism, as opposed to displayed realism, may not be easily measured. Moreover, pessimism at any level may not be unwarranted. When taking risks, such as making a bid for social niche change and incurring and broadcasting costs for that purpose, a good amount of worst case scenario building should go on (this perspective might also help explain the frequent association between MDD and high levels of anxiety).

An additional proposal of the SNH is that depression functions to honestly signal need and, if necessary to motivate initially non-supportive members of the social group to respond. The findings here strongly suggest that depressives, more so than non-depressives, have social networks that are less supportive and less willing to help, yet are *capable* of helping. Thus, depressed members of our study population seemingly had

social partners worth signaling to. Furthermore, decreased perceptions of social support positively correlated with higher depression scores. This concurs with the SNH prediction that more apathetic social networks must experience enhanced or extended costs to be motivated to extend aid to the depressive.

In the end, the four predictions tested here provide appreciable, if preliminary support for the SNH's main postulate that depression is an evolutionary adaptation designed to solve fitness hindering problems that have complex social solutions via signaling and motivating an unsupportive social network.

Concluding Remarks

For many decades depression has been considered and treated as a psychological disorder; a perspective that is ingrained in the scientific and health services communities. It thus makes sense for non-dysfunctional, or adaptive, hypothesis of depression to be initially greeted with skepticism and incredulity. Nonetheless, the 2001 strategic plan for mood disorders issued by the National Institute of Mental Health advocated that scientists and mental health institutions reach an “improved understanding, recognition, treatment, and prevention of mood disorders” (NIMH, 2001, p. 5).

There is growing interest in the potential of evolutionary reasoning to add to our understanding of psychological traits traditionally considered psychopathologies (Kennair, 2003). This paper presents two kinds of evidence that evolutionary theory based explanations of MDD warrant consideration. Reverse engineering analyses of

depression strongly suggest that it has a complex social problem solving function, as portrayed by the SNH. Moreover, empirical evidence shows certain important predictions of the SNH are supported, including the association of fitness hindering events and circumstances with MDD. Thus there is justification for much more detailed investigation of evolutionary adaptationist perspectives on MDD.

Improving our understanding of MDD can only be achieved via generating new alternative hypotheses, testing them, and determining which ones still stand. At the very least, then, an evolutionary adaptationist approach to depression may provide novel and helpful insight into MDD. In the end, the goals of those utilizing disease and adaptationist models of depression are the same: finding information which possibly results in one less wasted day, one less period of low mood, one less case of severe depression, one less life lost.

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