

Title: “Human Hierarchy Formation and Its Health Implications”

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ABSTRACT

Stress is an important determinant of socially mediated causes of poor health. Stress can increase the risk of cardiovascular disease, lower immune function, and impair other physiological functions. We review the literature on stress and physiology in primates and other animals in order to extract from it important insights into human health patterns. From this literature, we learn that both dominant and subordinate social status can have negative health consequences, but that low status can have more detrimental, long-term effects on health. Dominant individuals may trade-off between short-term health consequences and the long-term benefits of high status, whereas low status individuals incur high, chronic, and long lasting health costs. Furthermore, human hierarchy formation is hypothesized to be highly dependent on coalitional membership. We build on these findings with a review of some of the human literature on mental health and self-efficacy. Findings suggest that the types and the number of relationships that individuals establish and maintain during their lifetime also influence health. A lack of social support can lead to the perception of lack of control, which, in turn, tends to increase emotional distress, depression, and anxiety. Finally we discuss a few studies suggesting that an individual's cultural background mediates the relationship between social status, social relationships, and health outcomes. We conclude that future research on sociality and human health should focus on multivariate relationships between specific aspects of social hierarchies and alliances, cultural beliefs and values, the stress response, and human health in turn.

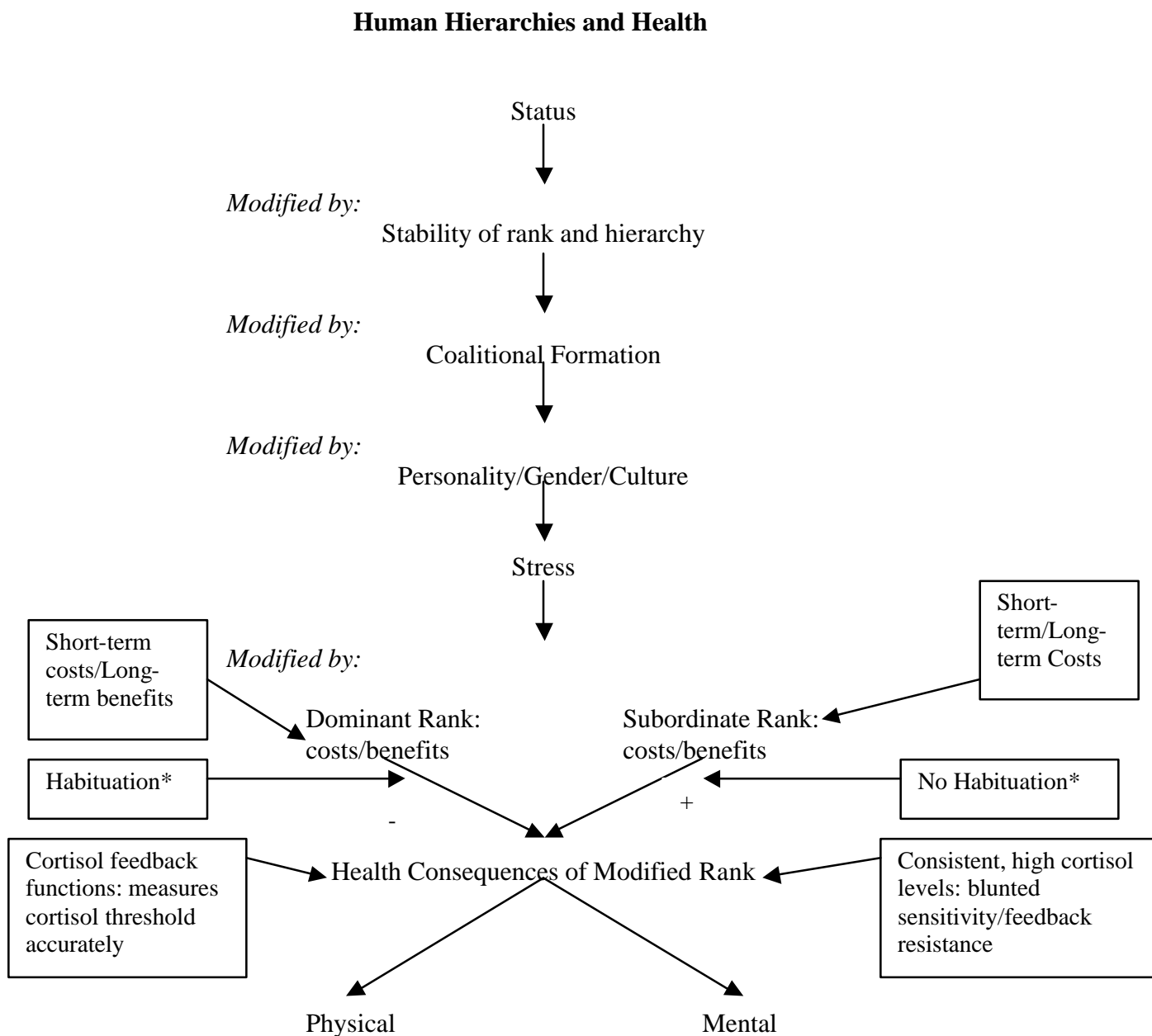
INTRODUCTION

The ways in which humans form dominance relationships and hierarchies are poorly understood; however, the outcomes of these relationships can have significant health consequences. Individuals within a hierarchy may experience different effects depending upon social position and the strategies used to establish a position within the hierarchy. The health problems associated with status are threefold and are expressed physically, mentally, and socially. Given the extensiveness of these problems, discussing hierarchical relationships and their outcomes is extremely important and should be considered a serious public health problem. For the most part, research on sociality and human health has focused on the effect of high status on the stress response while the effect of subordinate social status has been overlooked. Thus, we have much to learn from primatologists and other biologists who have carefully measured the stress response among low ranking individuals. But human health researchers have done studies on the perception of lack of control on health status, and, in our view, lack of control is a useful indicator of relative social standing. In most instances, lack of control is associated with social isolation that co-occurs with depression, anger, and other related mental health problems. Therefore, in this paper we conceptualize the problem of how membership in a dominance hierarchy (i.e., high vs. low status) and its social correlates (e.g., many vs. fewer coalitional allies) affect health as interrelated phenomena that must be examined simultaneously.

Human hierarchies are expected to include characteristics of other primate hierarchical systems as well as uniquely human traits. In addition to status achieved and maintained through resource holding potential (RHP), all human hierarchies are expected to contain a significant coalitional component that becomes vital to the achievement and maintenance of status. RHP can be defined as the ability to individually control access to resources. Regardless of ecological conditions, humans require the aid of others in order to simply survive as well as gain social status. Humans are highly dependent on others; the model shows that status is modified by the stability of the hierarchy and coalition formation. In addition, personal attributes such as personality, gender, and culture also modify status and coalitional formation. Only cultural traits will be explored here. The process of forming coalitions and allies imparts a certain amount of stress on the individual.

We summarize these variables in the model shown in Figure 1.

Fig. 1- Model of Human Hierarchies and Health Relationships



*Behavioral habituation to high rank enables dominant individuals to maintain an accurately functioning cortisol feedback mechanism. Subordinate rank, lacking behavioral habituation, causes perpetually high cortisol levels, which causes feedback resistance as well as blunted sensitivity to cortisol release.

Model adapted from R. Sapolsky: Sapolsky, Robert M. "Hormonal correlates of personality and social contexts: from non-human to human primates." 1999. In *Hormones, Health, and Behavior: A Socio-ecological and lifespan perspective*. C. Panter-Brick and C.M. Worthman, eds.

The model indicates that both dominant and subordinate individuals experience stress, however the way dominants and subordinates experience coalitional and status-related stress differs greatly. In other words, the effects of stress are modified by status. Both dominant and subordinate individuals experience short-term costs of stress, such as increased heart rate and increased hormonal levels. Having habituated to winning, dominants appear to experience only short-term health costs and not long-term costs. Subordinates do not habituate to losing, and thus, experience both short-term and long-term costs of stressful encounters related to status and coalitional formation. These varying conditions lead to negative physical and mental health consequences for subordinate individuals and less so for dominants. Dominant individuals also reap the benefits of high status such as better nutrition, increased cultural success as well as increased reproductive success (i.e., as measured by number of surviving children) (*Betzig 1986*). In this way, dominant individuals appear to be trading-off short-term costs for long-term benefits, which can be a highly successful strategy. Certain cultural traits may act as buffers, reducing the effects of stress related to status and coalitional formation for both dominants and subordinates.

HIERARHICAL RELATIONSHIPS AND STRESS

Numerous studies have linked cardiovascular disease (CVD) with increased heart rate and blood pressure in response to external stressors, specifically socially stressful events (*Dimsdale et al. 1988; Matthews et al. 1986; Lassner et al. 1994; Ewart and Kolodner 1993*). Ewart and Kolodner (1993) revealed that stress could be induced from simple role-play and not only from real events, suggesting that humans, as social animals, are prone to have significant responses to actual social interactions or only perceived

interactions. Smith et al. (1996) found that, in fact, perceived conditions of dominance produced higher systolic blood pressure than actual conditions of dominance verses conditions of submissiveness. The intensity of reaction by simple suggestion of certain social conditions implies that social structure and interactions have strong evolutionary significance for human behavior. Research has shown that dominant individuals react more intensely to stressful events, and thus have increased blood pressure, heart rate, and rates of CVD. Exerting influence over others, either actual or perceived, appears to cause increased levels of stress and health related problems (*Rosenman and Chesney 1985; Kaplan et al. 1993; Smith et al. 1996*).

Despite the correlation between dominance and the negative side effects of increased stress levels, subordination has also been found to have detrimental health effects. The question then arises as to how both dominance and submissiveness can be costly, and does an equilibrium lie somewhere in the middle? If using a mixed strategy of dominance and submissiveness is optimal, then how do we explain the consistent benefits of dominance in regard to survival and reproductive success? This paper tackles these questions by viewing these inconsistencies as trade-offs within an ecological context, rather than contradictions. The above-mentioned studies looked at stress in the short-term and found dominants to be more affected; however, when viewing stress and its outcomes in the long-term, perceptions of dominance, submissiveness, and stress are altered. Dominant individuals may be willing to incur an immediate small cost in order to gain greater benefits in the future, while subordinate individuals may experience long-term costs of stress with few benefits.

COST OF BEING A SUBORDINANT

Senar et al. (2000) explored the long-standing assumption that dominant individuals have to work harder to maintain their dominance than subordinates do; therefore, dominant individuals are expected to have a higher Basic Metabolic Rate (BMR) given increased levels of stress associated with dominant positions (*Roskaft et al. 1986; Hogstad 1987; Metcalfe et al. 1995*). The task of maintaining higher BMR may be an honest indicator of dominance, which could be supported by evolutionary theory (*Johnston and Norris 1993*). However, Senar et al. furthered the evidence by examining the affect of submissiveness on stress and BMR among wild birds. They found that as dominance status increases, as a function of weight, BMR decreases significantly and is most apparent during the day. Nighttime BMR for dominants and subordinates was similar, suggesting that submissive individuals experience more stress associated with social interactions, food procurement, and predation. The results of this study also suggest that dominant birds have more reserves of energy given a lower BMR, which confer benefits by freeing up time and energy to dedicate to other functions, such as reproduction. Submissive birds are more susceptible to stress and have to work harder to maintain themselves, which can be very costly. Long-term conditions, such as these, are expected to have detrimental effects on subordinate birds' fitness. In addition, the authors assert that for a subordinate bird to achieve and maintain a dominant position would be extremely costly and not likely to occur.

Immune Function. Long-term stress has also been connected to decreased immune function, and again, subordinates appear to pay a higher cost than dominant individuals. Several studies have explored this question, but a few in particular have

produced interesting results. The first is a study conducted by Tuchscherer et al. (1998), which looked at immunity of dominant and subordinate pigs in captivity. The researchers hypothesized that dominance would lead to increased cortisol levels, which are responsible for BMR and blood pressure. In support of previous findings, this study found that dominant pigs did not have elevated levels of cortisol, indicating that dominant individuals have lower BMR and blood pressure than subordinates. The results of this study are confounded, however, by the fact that subordinate pigs also showed no increase of cortisol when exposed to stressful events. The authors also found that, “A high-rank position is correlated with enhanced and a low-rank position with suppressed cell-mediated immune reactions” (359).

Lowered immunity can have negative impacts on survival and ultimately fitness in conjunction with other costs incurred by subordinate status, such as increased BMR and general stress. A more recent study conducted by Groot et al. (2001) shows results that partially support Tuchscherer et al. (1998), in regard to antiviral immunity among pigs. In this study, evidence was found connecting stress and decreased immune response against viral infection. Both dominant and subordinate pigs experienced decreased immune function after stressful mixing of unknown individuals; however, dominant pigs showed a more pronounced Th2 skewed response. The Th2 response protects animals from macroparasites and from serious complications following injury or trauma to tissue (*Hurtado and Hill 2003*).

Primate evidence also exists concerning dominance status and stress levels. Margaret Clarke (1996) found that dominant monkeys had increased lymphocyte production allowing for more effective immuno-defense. As a possible explanation of

the association between increased immune system response and dominance, high ranking individuals also exhibited lower levels of cortisol during socially stressful events than lower ranks. This outcome is because cortisol can be an immunosuppressive hormone. Curiously, in this study, baseline cortisol levels did not appear to differ between high and low rank, which contradicts previous studies of bird and pig populations. In another study, Sapolsky (1983) found that dominant male baboons had lower levels of cortisol and testosterone than subordinate males. Dominant baboons enjoy the benefits of high status and reduced levels of circulating cortisol and testosterone.

But not all primates respond to their place in the social hierarchy in the same way. Dominant male chimpanzees have higher levels of cortisol and testosterone, implying higher levels of stress (*Wrangham 1991*). In this case, it appears that being dominant is more costly to maintain. The discrepancy between chimpanzees and baboons may be explained by differing social structures that produce different reaction norms for dominance behavior. A reaction norm is a set of genetic and behavioral options that allow an individual to adapt to ecological conditions.

Baboons live in a large multi-male, multi-female group, and individuals are only occasionally out of sight from other group members. This social setting allows the dominant male to monitor the actions of others, which limits alliance formation and contests of his position. Chimpanzees, on the other hand, often split off from the main group for long periods of time before rejoining the group (i.e., fission-fusion grouping); more specifically, females and their young often feed alone and subordinate males have ample opportunity to form alliances without the dominant male's knowledge (*Wrangham 1984*). The instability of the chimpanzee social hierarchy, in comparison with that of

baboons, increases the costs of maintaining high rank because dominant chimps must travel and reestablish their social rank more frequently. In addition, they experience longer periods of time not knowing if their social rank has changed. That is, they experience a great deal of uncertainty. Unpredictable situations, or a lack of control, can lead to increased levels of stress causing heightened levels of cortisol and testosterone and fewer opportunities to habituate (see below).

DOMINANCE AND HABITUATION

Given the evidence supporting the conclusion that subordinate individuals are more prone to the negative effects of exposure to acute and chronic stress, we must examine the reasons why dominant individuals seem to be healthier. It appears that dominant individuals make trade-offs between temporary, minor stress effects and establishing or maintaining their status. More specifically, what is it about dominance that enables individuals to respond to stress in a more efficient and less damaging way while trading off temporary setbacks with lifetime fitness? One explanation is habituation, which is a process where the individual “mobilize[s] physiological systems to the minimum extent necessary to maintain homeostatic balance during stressful stimulation” (*McCarty et al. 1988*). Habituation can act at the behavioral or physiological level and could explain dominant’s response to stress. Other studies have confirmed the process of habituation (*Natelson et al. 1988; De Boer et al. 1989*).

McCarty et al. (1988) explored the issue of habituation and stress and found conclusive results showing that when repeatedly exposed to the same stimulus, habituation occurred. After time, mice down-regulated their responses to the stressor to maintain homeostasis of physiological processes. In addition, the authors concluded that

the mice were still compromised by chronic stress, which presented itself during exposure to a new stressor. In this case, response to the novel stressor was more sensitive and intense than control groups.

Sgoifo et al. (2001) performed a similar study on habituation using male rats. This study focused on the effects of status on habituation, in which male rats were placed under conditions of dominance status victories or defeats (social victory test and social defeat test). Both male rats experienced stress during these encounters, yet only rats who were consistently victorious habituated to the stress of the social conflict. Defeated rats never showed signs of habituation. Submissive rats continued to experience heightened levels of stress responses even after losing time and time again. Dominants, in contrast, habituated to winning and a consistent dominant status. These results make theoretical sense, in that dominant individuals can afford to habituate to social conflicts of status, while submissive individuals would gain nothing from habituating to defeat given the fitness implications. Most likely, individuals habituating to defeat would not produce many offspring or even live long enough to reproduce. The authors state, "In particular, it has been shown that control vs. lack of control over a stressor has a dramatic impact on subsequent changes in behavior and physiology" (348). In other words, if a situation is reliably controllable, the individual is more likely to habituate to stressful events; while, if a situation is uncontrollable, the individual is less likely to habituate to stress. Processes of habituation may help to explain differences between baboons and chimpanzee hormonal levels, in that, baboons can afford to physiologically and behaviorally habituate to social interactions given a high level of predictability.

Chimpanzee fission-fusion grouping does not allow for habituation and costly steroid hormonal levels remain high.

Habituation to dominant status has physiological implications as well. Sapolsky (1999) shows a relationship between status and cortisol feedback mechanisms. Low rank can cause perpetually high cortisol levels, causing feedback resistance and blunted sensitivity to cortisol release. Lower status individuals appear less able to detect cortisol feedback mechanisms and continue to release cortisol. This condition results in resistance to the effects of cortisol, causing higher levels to be released in the blood and a cyclic pattern involving perpetually elevated cortisol levels. (For a more detailed discussion, see Sapolsky 1999).

This collection of studies contributes considerably to our understanding of stress and health in humans. If subordination, instead of dominance, can be associated with health problems among humans, public health programs can develop better measures of stress and its related health problems. In addition, the concept of habituation can also be applied to humans where dominant individuals become accustomed to typical stressors, while subordinates never experience habituation. Subordinate individuals may also be more likely to suffer from impaired immune function and blunted sensitivity to cortisol feedback systems. All of these studies lead to the conclusion that exerting some amount of control over external factors by way of status appears to lessen the health consequences of stress.

CONTROL, COALITIONS, AND STRESS

Human hierarchy research has received scant attention, so little is known about how humans form hierarchies in general. Much research has been carried out on primate

social structures and hierarchies, which has provided methods to predict and model primate hierarchical formation. Among primates, hierarchies range from despotic and strictly ranked to egalitarian and loosely ranked social systems, all depending on the type of food resources. Resources such as fruit are easily monopolizable by an individual given that fruit grows in defensible clusters; in addition, benefits are high from controlling fruit, because they are highly seasonal, patchy, and high in nutritional status. In circumstances such as these, despotic hierarchies form out of competition for resource acquisition and control. In contrast, if resources are too widespread or abundant to monopolize, costs to do so are too great. Examples of non-monopolizable resources include leaves, and primates subsisting on leaves tend to establish egalitarian hierarchies in which there is less competition and less distinct social ranks. Hierarchy formation based on resource type can adequately help to explain variation in nonhuman primate social systems.

Extrapolating from nonhuman primate to human behavior is frequently done and provides some insights into human behavior. However, resource holding potential (RHP) is not expected to explain a large percentage of the variation seen in human hierarchy formation. A new model is necessary in order to formulate the best understanding of human sociality and status. Humans are an extremely egalitarian species, willing to cooperate with each other, yet we still see considerable variation in hierarchy formation. A hierarchy model specific to humans includes a specific coalition formation element, which may very well become a determining factor in hierarchical formation. This is not to suggest that nonhuman primates do not utilize coalitions in order to increase rank within a social group, such as baboons and chimpanzees (*De Waal 1998; Noë 1995*). The

difference between human and nonhuman coalitional formation lies in the degree of both the use of and the dependence on coalitions. As stated before, individual human status is utterly dependent on coalitional support and nearly all of our hierarchical interactions involve coalitions of the first through n^{th} order (i.e., endless coalitions within coalitions). Only first, second, and third order coalitions have been found among apes and dolphins, while humans form coalitions of much higher orders (*Ridley 1996*).

There is evidence to suggest that human formation of, and reliance on, coalitions are key components to how we form hierarchies (*Harvey and Harcourt 1984; Plavcan and van Schaik 1994; Steele 1996*). Plavcan and van Schaik (1994) present evidence that human evolutionary history included specific adaptations in order to facilitate the formation of allies rather than winning dyadic dominance encounters. Plavcan and van Schaik assert that sexual dimorphism tends to decrease along the hominid line; in fact, australopithecines had reduced male canine size and dimorphism when compared to chimpanzees. In addition to canine size reduction, further evidence suggests that human male testicles in relation to body size are also reduced when compared with chimpanzees. More specifically, human testicle weight is typical of one-male mating systems, where one male has mating access to several females. In this situation, sperm competition is unnecessary and testes tend to be small. As an example, male gorilla testes size is very small in relation to body size. However, humans live in multi-male/ multi-female groups where polygyny is common and many males mate with many females making sperm competition part of a viable reproductive strategy. Given the importance of sperm competition, testes are expected to be larger in relation to body size than one-male

groups. Human social structure is similar to chimpanzees, yet human males have testes typical of gorillas (*Harvey and Harcourt 1984*).

This evidence begs the question of why human testes weight is less than would be predicted by our social structure? James Steele (1996) addresses this question and suggests that testes size is correlated with levels of testosterone, which increases aggressiveness and decreases alliance formation. James Dabbs Jr. (1992) has shown that as occupational status increases, testosterone levels decrease. The author theorizes that occupational status is achieved largely through coalitional networking, with which testosterone may interfere. In addition, acquiring coalitional partners is facilitated by reduced testosterone levels and increased cerebral functioning, providing additional support for the importance of coalitions in human hierarchy systems (*Steele 1996*).

As human society grew increasingly complex and populated, dependence on others intensified out of greater specialization of tasks. Humans have always been specialists in our diet and division of labor, allowing individuals to maximize learning and skills in a certain area, while others did the same in different areas. This beneficial relationship does have a cost, in that one person is no longer able to complete all necessary tasks or process all incoming information. As people become more dependent on each other, coalitions become increasingly important for individual success. In addition, instances may occur which allow for individual or unbalanced coalition control of resources leading to despotic social systems (*Boone 1992*).

COALITIONS AND HEALTH

Coalitions may be particularly important to the way humans form social systems and hierarchies; in fact, coalitions may be so significant that without them, negative outcomes could result. Coalitions can come in many fashions and are imagined to be small sub-units within larger groups. They can include sport teams, academic clubs, cliques, co-workers, marriage, family, and other support groups for the individual. In addition, coalitions can also be alliances formed between factions and nations. Since individual control is expected to be very rare, belonging to a coalition is important for the individual in order to gain status and some control over the ecological context. Alliances with others, whether short- or long-term, are necessary to gain control of resources and other people, receive support and encouragement, and have a general sense of efficacy on the surrounding environment. Social psychology has tackled the issue of belonging, in-group/out-group behavior, self-efficacy, and a sense of control. Lacking these qualities can often have negative mental health effects like depression, anger, and violence, all of which are important public health concerns.

Mental Health. Social psychology has provided valuable contributions to the understanding of interpersonal relations and group dynamics as well as mental health issues. Lacking a sense of control and identity can often lead to abnormal and dangerous outcomes, such as depression, anger, and violence. Many studies have shown the importance of self-identity and a sense of control in regard to interpersonal relationships and group identification (*Tajfel and Turner 1979; Haslam et al. 1992; Gurin 1978; Seligman 1975*). Corey Lee Keyes (1998) authored a nice review on the concept of social identity and well-being. She identifies five dimensions of social well-being: “social

integration, social contribution, social coherence, social actualization, and social acceptance” (121). All of these dimensions pertain to an individual’s perceived and actual relationships with other individuals and society as a whole. Having qualities in common with others, feeling part of society, and trusting or having faith in others are important to social well-being and mental health. In addition, contribution to society and a sense of efficacy are vital to a person’s well-being. Lastly, social coherence can be defined as having knowledge and understanding of society as a whole. Keyes (1998) reviews studies testing the validity of these five dimensions and their effects on social well-being. She concludes that there is enough evidence to show that “the hypothesized five-factor model of social well-being fits the data best...” (133). Healthy individuals exhibit these five dimensions, and their absence can be an important indicator of unhealthy conditions and behaviors. Antonovsky (1994) indicates, too, that a sense of coherence is an essential aspect of health and coping behaviors during stressful events.

Coalitions, Control, and Health Evolutionary theory and human behavioral ecology can add to social psychology research to produce a more complete understanding of human social status relationships in conjunction with stress and mental health. As highly social primates, much of human behavior most likely evolved in response to social interactions, relationships, and alliances. Individuals with a better sense of belonging and control over external contexts are often healthier than individuals lacking these features. Physical and mental health problems resulting from a poor sense of control and social well-being can seriously affect survival and fitness; in addition, individuals more apt at forming alliances and being accepted are expected to more fully enjoy the benefits of group living. Given these conditions, behaviors geared toward high-status and coalition

formation are hypothesized to be an integral part of individual identity, providing the individual with some control over the environment. It is logical to speculate that without social well-being, a person can become disjointed and react abnormally. Gecas (1989) sums up several studies by stating, “high self-efficacy has beneficial and therapeutic consequences for individuals, and low self-efficacy (powerlessness) has negative and maladaptive consequences” (298). In this case, self-efficacy can be defined as perceived control, competence, and belonging to society at large and is a significant component of healthfulness. Like social well being, a lack of self-efficacy may be a leading cause of mental health problems and other negative outcomes.

Several studies have provided important evidence to support the theories presented above. Scott Scheiman (1999) examined the relationship between health, social circumstances, a sense of control, and anger. He hypothesized that levels of anger would decrease with age and found supporting evidence. Scheiman’s questionnaires showed that a higher sense of control and feelings of anger are negatively correlated. Recently, Scheiman et al. (2001) found significant effects of depression and general distress are highly dependent on health and level of control. The study found that older age groups experience “lower control” from a wide variety of factors, including unemployment, retirement, widowhood, and an overall lack of control (80). Each of these factors could be considered a coalition of varying size. Each category includes others who lend support to other members of the union. In this study, Scheiman et al. (2001) found that individuals who were employed reported significantly less depression than unemployed or retired people. In addition, widowhood and less control over decisions were also found to increase depression and overall distress. Individuals not

experiencing these circumstances have significantly lower levels of depression and generalized emotional distress. Mirowsky and Ross (1992) found similar results and showed that lower levels of control contribute to the prevalence of depression and other mental and emotional distress.

Further research by Kee-Lee Chou and Iris Chi (2001) also shows that a sense of control is vital to mental and emotional health. In this study, surveys were conducted in Hong Kong and attempted to find connections between stressful life events and depressions. In fact, individuals with a high sense of control were better able to cope with stressful life events. Moreover, individuals with a support group also had fewer depressive symptoms lending additional support to theories of social well-being and health.

DISCUSSION

This paper attempts to organize current knowledge of status, social relationships, and stress in order to more completely understand the health implications associated with these factors. Dominance has often been associated with elevated stress levels and related health consequences; however, submissiveness also has health implications that actually appear to be more serious than those of dominant individuals. Subordinate individuals have been shown to have higher Basic Metabolic Rate. Given the principles of allocations, energy used for increased BMR cannot be used for other functions, such as the immune system or reproduction. Not surprisingly, subordinate individuals also show long-term impaired immune function in response to stress. Dominants may show increased stress responses in the short-term but appear to be trading this for future benefits, including fewer health consequences and maintenance of status. A few studies

contradict these results but are either biased or incomplete and provide misinformation. Furthermore, dominance appears to increase habituation to stressors allowing the individual to behaviorally and physiologically cope with stress more efficiently. Subordinates who easily habituate to stressors are expected to maintain a submissive position and incur accompanying health consequences.

In addition to physical health problems, mental health concerns can also be explained by human hierarchy formation, specifically by the importance of coalitions or alliances. Forming bonds with other individuals is vital to achieving a sense of control over the environment. Coalition formation is an integral part of human hierarchy formation and status acquisition, and the lack of coalition or support groups are expected to cause serious consequences and reduced control over the environment. Evidence of the importance of social well-being and self-efficacy lend support to the proposed coalition theory. Several studies point out that without a sense of control and social support group, rates of depression, anger, and general distress increase. Coalitions are a fundamental aspect of human hierarchy formation and are expected to play an important role in social functioning. Being a member of a group or alliance enables the individual to gain and exert control over external conditions and social interactions. Without access to a coalition, individuals experience low sense of control often times leading to negative health outcomes. Individuals reporting a low sense of control are often ex-members of alliances such as the workplace and marriage. These individuals also report higher levels of depression and other mental health conditions.

Lastly, these ideas require further investigation given potential biases based on Western values and social systems. The effects of a lack of control on stress may be

specific to Western societies and not applicable to humans in general. Some have noted this potential bias in their studies (*Gecas 1989; Weisz et al. 1984*). Sastry and Ross (1998) challenge the well-supported assertion that a sense of control is an important indicator of health and happiness. They assert that this may tend to be the case among Western individuals with values and social systems based on individualism. Among more collectivistic societies, perceptions of control and lack thereof may not hold as significant implications for mental health. Many Asian cultures de-emphasize individual goals and achievement while placing value on “subordination to the whole” (*Sastry and Ross 1998: 115*). This study provides evidence that the “negative relationships between person control and psychological distress is less for Asians than for non-Asians” (115). Asians in the study reported having low control and low levels of depression and anxiety, which is in opposition to studies conducted in Western contexts. However, a study by Chou and Chi (2001) conducted in Hong Kong, which can be considered a collectivistic society, found that lack of control was associated with higher levels of depression. These intriguing findings suggest that future research must examine the ways in which ethnicity interacts with the relationship between stress and health.

CONCLUSIONS

Future research is necessary to better understand some of the issues explored in this paper. The effects of social status on stress have important health implications that make studying human hierarchy systems important to both theoretical research and public health issues. Low status has been associated with chronic stress and increased levels of circulating steroid hormones. These conditions are connected to lower immune function and decreased efficiency of energy use, which can lead to health concerns. In addition,

coalitional access is hypothesized to be positively correlated with status among humans. Low status individuals are expected to have few allies and less control over the environment. This situation can lead to mental health and behavioral concerns, such as depression, anger, and low self-esteem. Future researchers need to carefully examine the ways in which human social alliances, relative social ranking, and physiology influence health, as well as how these relationships differ across different cultures.

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