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Perception of status: An evolutionary analysis of nonverbal status cues

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PERCEPTION OF STATUS:

AN EVOLUTIONARY ANALYSIS OF NONVERBAL STATUS CUES

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DOCTOR OF PHILOSOPHY

By

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December 1989

I certify that I have read this thesis and that in my opinion it is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

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ABSTRACT

This paper discusses evolutionary psychology: how the concepts of natural selection and adaptation may be applied to studying the mind. It outlines a theory of the evolution of status and dominance hierarchies in terms of competition for resources and discusses implications for studying nonverbal status and dominance cues.

Dominance is defined as ability to control resources in a single situation; *status* as ability to control resources across situations. Two categories are identified within the set of behaviors that have previously been found to signal status or dominance. I hypothesize that *cues of ignoring*, any behavior indicating a lack of attentional engagement, signal a large difference in status between people, whereas *physical dominance cues*, any behavior indicating aggression or exaggerating one's size or strength, signal a smaller difference in status. The evolutionary approach predicts that this will be true for both men and women.

This study was designed to test four hypotheses:

1) cues of ignoring are more effective than physical dominance cues for communicating status,

2) the two types of cues are equally effective for communicating dominance,

3) combining the two types of cues is less effective for communicating status and dominance than using either type alone (non-additivity),

4) the cues will be perceived in the same way when displayed by men and women.

Subjects viewed videotapes of actors in same-sex pairs displaying either ignoring cues, physical dominance cues, or a combination in the context of a dispute over a seat at a concert and rated the actors on several dimensions of dominance and status.

The context of a dispute over a tangible resource seems to have changed the meaning of ignoring cues from ignoring to uncertainty. Since these behaviors did not function as status cues in this context, as they have in past research, the first three hypotheses could not be confirmed. Physical dominance cues did convey dominance. The importance of context in determining the meaning of nonverbal behavior is discussed.

The fourth hypothesis was confirmed. Males and females were perceived as equally dominant when displaying dominance cues. Implications for studying gender, dominance, and nonverbal behavior are discussed.

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CHAPTER 1: INTRODUCTION

> "Just as the human body represents a whole museum of organs, each with a long evolutionary history behind it, so we should expect to find the mind is organized in a similar way. It can no more be a product without history than is the body in which it exists...." -- Carl Jung, *Man and His Symbols*

In *The Selfish Gene*, Richard Dawkins says that the theory of evolution by natural selection is the only scientific answer to the question "Why are people?" (1976). Extending that statement further, evolutionary theory also provides a rich source of answers to the question of why people are the way they are, or for that matter, what way are people? Since these are questions that psychology seeks to answer, psychologists could profit from taking evolutionary theory into account in their investigations. To date, much of psychology has studied behavior without putting it in the context of our identity as a species with a particular evolutionary history and our own unique set of adaptations. But if what psychologists try to discover is what psychological processes people have, then one particularly important source of hypotheses about what to look for is evolutionary theory and a consideration of our species' past. The reason it is important is that evolutionary theory can reliably be used to derive what the functions of our mental processes are.

A physiologist trying to understand the body and its organs would be lost without some knowledge of what those organs' functions are. Knowing that the function of the stomach is digestion or that the function of the lungs is to extract oxygen from the air and put it in the bloodstream has allowed physiology to investigate very specific features of those organs that enable them to accomplish those functions. Without knowing the function, researchers could not have thought to look for those features. For example, it is doubtful that anyone could have discovered how the alveoli work without knowing the lungs' function.

Psychology currently finds itself in the position of trying to investigate mental processes without a good understanding of function, of what purpose it is that those processes accomplish. To say that the mind has a particular function is to say that one can understand the way a certain set of processes are organized, because they are organized to serve that function. To understand function, psychologists may have something to learn from evolutionary biologists. Evolutionary biology concerns itself with adaptations. An adaptation is some characteristic of an organism that has been designed by natural selection to serve some purpose for the organism, in particular, some purpose that promotes the organism's survival and/or reproduction.[1]

If one asked a cognitive psychologist, "What is the function of the mind?", one would probably get the answer, "To process information" (Glass, Holyoak, & Santa, 1986). The follow-up question, "To process information about what?" would probably elicit nothing but a quizzical look, and perhaps the statement that content doesn't matter, that information is information. In the light of natural selection theory, saying that the mind is just an information-processor makes no more sense than saying that the torso is just a fluid-processor. Processing information is too general a function to constrain anything about the way the mind is organized. The only important ends in natural selection are survival and reproductive success. Processing

information about just anything in the world would not necessarily have promoted these ends in our evolutionary past. The mind must be able to process information about a great many specific things related to survival and reproduction, so that an understanding of those specific functions is crucial to understanding how the mind works. In its current state, cognitive psychology studies mechanisms that are overly general and is therefore lost when it comes to questions of function.

When asked the same questions, social and personality psychologists would probably answer that the mind has many functions, and might list some of the mind's social functions: trying to infer causes of other people's behavior, classifying people according to which group they belong to, monitoring and obeying group norms, trying to increase one's self-esteem. Though more aware of the importance of functional explanations than cognitive psychology, social and personality psychology would still give an incomplete and partially erroneous list of the mind's functions, because that list would not be generated by consideration of what the mind was designed by natural selection to do. There are many functions that one could propose for the mind, but only those that are functions in an evolutionary sense, *i.e.*, that promoted survival and/or reproduction in our species' evolutionary past, will have psychological processes specifically organized to accomplish them.

> Since one can arbitrarily partition [people or any organism] in an infinite number of ways -- the overwhelming majority of which will be useless for any sort of biological analysis -- the identification of adaptations is central to the study of the phenomena of life: by identifying adaptations one carves [the organism] at its natural, functional joints (Symons, in press).

Social and personality psychologists are correct in assuming that the mind has multiple specific functions, but relying only on intuition and observation as guides for deciding what are important functions is risky. Some of the functions that have been studied in personality and social psychology are probably very important in an evolutionary sense. Making ingroup/outgroup distinctions, or monitoring group norms could have a very direct effect on one's survival and reproduction. However, some proposed functions may be overly general, or simply off-target. As one example, inferring the causes of other people's behavior in general will not necessarily promote survival and reproduction; rather, the kinds of inferences that would be helpful probably depend very much on one's relationship to the other, *i.e.*, competitor, lover, parent. As another example, it may be the case that what people try to do is not increase their self-esteem, but rather increase their status, since increased self-esteem has no particular fitness consequences, whereas increased status does have fitness consequences. If there is no psychological adaptation to increase self-esteem, then the search for psychological processes organized to increase self-esteem will produce misleading results, whereas the search for psychological processes organized to increase status will prove more fruitful. As long as psychologists do not use evolutionary theory to guide their choices of which functions to study, they run the risk of not being able to find psychological processes organized to accomplish those functions.

In sum, just as the study of physiology has been illuminated by knowing the functions of the body's organs, so can the study of psychology be illuminated by knowing the functions of the mind. Since the brain and therefore the psychological mechanisms underpinning human behavior

have been shaped by natural selection, the question of the mind's functions must be answered in the context of evolutionary theory and our species' past. If psychologists are trying to characterize the nature of human psychological processes, then an evolutionary perspective can tell psychologists what to look for.

Evolutionary Psychology

Evolutionary psychology uses the theoretical tools of evolutionary biology and cognitive psychology to discover and explain regularities in human behavior and thought. Evolutionary theory allows one to identify domains of adaptive importance and to specify constraints on how human psychology might be designed by natural selection to operate in that domain. One problem that any social scientist faces in using evolutionary theory to explain human psychology is that few people outside of the biological sciences have training in the technical details of the theory of natural selection. Some of the technical terms of the theory, such as "fitness" or "adaptive," are used so often in their colloquial sense that they may be misunderstood when used in their technical sense. In the interests of clarity, I would like to outline some of the basic concepts of the theory of natural selection before explaining how it may be applied to studying human psychology.

At the most abstract level, the theory of natural selection is about replicators -- entities that can make copies of themselves (Dawkins, 1976; Williams, 1966). It is the theory of how replicators with certain properties, *i.e.*, those that allow them to better make copies of themselves, become more numerous than replicators with different properties. At a more specific, terrestrial level, the theory is about replicators made of DNA: genes. [2] Here, natural selection is the theory of how genes that have certain properties, *i.e.*, the property of constructing organisms with characteristics that better allow them to make copies of themselves, become more numerous than

other genes with different properties, *i.e.*, the property of constructing organisms with different characteristics. Genes direct the building of proteins. This is the mechanism by which they build organisms with particular types of bodies and brains. The genes in a certain individual organism are the *genotype*; what actually gets built is the *phenotype*.

The phenotype must interact with the outside world and reproduce. If a gene produces phenotypes that survive and reproduce better than the phenotypes produced by different genes, then that gene will come to take up a greater proportion of the total gene pool. This reasoning leads to the following definition of natural selection. Natural selection is the process by which certain genes become more or less numerous relative to other genes, by virtue of the traits those genes produce.

Because it is centered on the gene rather than on the individual organism, this definition sounds different from many popular characterizations of evolution and natural selection. Focusing on the gene vs. the individual is an important distinction to make in order to understand the theory. Natural selection *acts on* individual organisms (phenotypes). The individual is what must survive and produce offspring each generation. However, what natural selection *selects* are genes. They are what become more or less numerous. Individuals, by definition, do not become more or less numerous; each particular unique individual is destroyed each generation; thus it is not individuals that natural selection selects (Dawkins, 1976; Williams, 1966).

Within this framework, "fitness" can take on a value-free meaning. In its technical sense, fitness refers only to the proportion of copies of genes in a gene pool, not to any particular characteristic of an individual. [3] An individual's fitness is the number of his or her or its genes that survive into future generations relative to the number of surviving genes of other members of the population. *Inclusive fitness* is one's own fitness, plus one's influences on the fitness of

relatives other than offspring, with those influences multiplied by one's degree of relatedness to those relatives (Hamilton, 1964). [4] Thus, "survival of the fittest" becomes an almost meaningless tautology, because fitness has no meaning beyond gene survival.

Something is *adaptive* for an organism if it promotes the organism's inclusive fitness. When a genetically based trait confers a reproductive advantage on average on those who possess it, it can spread through an entire population over many generations, and so may become a species-typical trait, or adaptation. The concept of adaptation is central to evolutionary psychology. There are several important points in defining an adaptation (Tooby & Cosmides, in press):

1) It is a characteristic of the phenotype that is manufactured developmentally according to instructions in its genes. It may be produced by one gene or many.

2) The characteristic produced by that genetic basis became typical of the species, *i.e.* all members of the species have it, because it interacted with stable features of the environment in a way that promoted the inclusive fitness of any individual that possessed it.

3) An adaptation has design features that mesh with features of the environment in a highly nonrandom way in order to allow the organism to accomplish some specific purpose, *i.e.*, the features are there *because* of their effect on gene replication.

Not all genetically based characteristics of the phenotype are adaptations. Evolution also produces concomitants of adaptation, that is, features of the phenotype that are species-typical because they are tied to features of the adaptation but which have no fitness-promoting effect themselves, and random effects, that is, features of the phenotype that are the result of mutation or environmental change (Tooby & Cosmides, in press). The criteria listed above can be used to distinguish adaptations from non-adaptations. As an example to clarify these definitions and distinctions, consider stomachs. A stomach is a complex adaptation the function of which is

digestion -- breaking down food into molecules that the body can use. This is what having a stomach enables an organism to do. All of the features of the stomach related to this function are what constitute the adaptation, *e.g.*, a substance that breaks down the food chemically, a mechanism to hold the food in the stomach for the amount of time it takes for the food to be broken down chemically. Something like the color of the stomach lining, however, is simply a concomitant of some part of the adaptation. It is determined by whatever the functional properties of the stomach lining are, but the color itself is unrelated to digestion.

Thought experiments can be useful in determining whether a feature is related to a particular function or not -- one can ask whether the feature could be changed arbitrarily and still accomplish the function. If the color of the stomach lining were changed without changing any other properties, the stomach could still digest. However, if the chemical inside the stomach were changed from hydrochloric acid to water, the stomach could not digest. The functional properties of the stomach (and their concomitants) will not vary between individuals. Exact size and shape of individual stomachs may vary within a certain fixed range, because variation in those properties within that range will not affect the stomach's function. Whether a stomach is the smallest or the largest within that range, it can still digest. However, the features of the stomach related to digestion will be the same for all individuals within a species. There is no appreciable genetic variability in the functional properties of adaptations; where there is variability, it lies within a fixed range. [5] The term adaptation refers to something that has a genetic basis that has already spread through the population -- this is called going to fixation in a population -- so that every member of a species has the same adaptations.

Evolutionary psychology is the study of psychological adaptations. These are psychological processes that:

1) have a genetic basis that does not vary between individuals;

2) have the form they do because in our species' past, these psychological processes, on average, produced adaptive behavior[6] in the range of environments in which humans evolved;

3) have specific design features that enable the phenotype to accomplish a particular function, such as navigating in three-dimensional space, selecting a mate who is healthy and willing to invest in offspring, or competing for resources.

By defining the adaptive problems that humans would have faced over our evolutionary past, one can predict what functions human psychological processes are designed to accomplish. Knowing these functions constrains what design features one would expect human psychological adaptations to have.

Cognitive psychology is useful for describing in a precise way the design features of these adaptations: what we attend to, what we remember easily in which contexts, what information we can combine easily to make certain inferences, what information will be used in making certain choices. Having identified a domain of adaptive importance, *e.g.*, mate selection or resource competition, one can then develop what David Marr (1982) called a "computational theory" of that domain. A computational theory states what must be true of an information-processing system if a given problem is to be solved (Cosmides & Tooby, 1987). It states *what* is to be computed and *why* (Marr, 1982). The "why" is the function of the information-processing

system, and from that, one can derive the constraints that must be satisfied for that function to be accomplished. Specifying constraints involves specifying the information that exists in the environment, the information that is needed before a computation can be performed, and the possible outputs of a computation (Marr, 1982).

Evolutionary theory provides exactly what is needed to develop computational theories of human psychology. Natural selection can be used to specify the function of a psychological mechanism, and knowing its adaptive function allows one to derive the design features it must have to accomplish this function. Just as one could predict something about the design features of the stomach from knowing that its function is digestion, one can predict something about the design features of a given psychological mechanism by knowing what its function is, *e.g.* finding a mate who is healthy and willing to invest in offspring or competing successfully for some valued resource. The dynamics of natural selection constrain these design features; for example, the motivation to invest in a child should be dependent on one's certainty that the child is one's own. Thus, evolutionary theory can be used to build computational theories about human psychology in specific domains. A computational theory leads to specific empirical predictions about the design features of human psychological mechanisms, including affective and motivational aspects of processing.

One assumption of this perspective is that many psychological mechanisms are specific to particular content domains. To produce adaptive behavior in a given situation, it would be advantageous to process relevant information quickly and reliably. However, the information that one would need to process most readily in one situation, *e.g.*, when trying to detect infidelity in a mate, may be very different from that in another situation, *e.g.*, when trying to decide whether or not to help someone. Sexual jealousy and reciprocal altruism are different domains.

Natural selection makes different processing demands in different domains -- what counts as adaptive behavior in one domain may be maladaptive in another. Thus, the constraints placed by natural selection on the design of a psychological mechanism may vary widely from one domain to another, and information will be processed differently depending on the content of the information. This assumption implies that there are different psychological mechanisms for different domains, the design of each mechanism depending on what natural selection shaped it to do. Cognitive psychologists generally treat such psychological processes as memory and attention as domain-general processes that can be described by a few simple laws, whose operation does not vary with content. From an evolutionary perspective, however, one would expect the operation of these processes to vary a great deal with content. A domain-specific approach may give a more accurate account of human psychological processes than the domain-general approach taken by many cognitive psychologists, by being able to account for different performance in different domains.

Furthermore, cognitive psychologists assume that these general laws of cognition have the form they do independent of affect and motivation. If content makes a difference, however, then one must consider affective and motivational aspects of processing to understand cognition. This does not mean understanding how emotion and motivation affect information processing, as if emotion, motivation, and cognition were somehow separate. Rather, it means that many of our psychological mechanisms are designed to process information that is of strong personal significance, and therefore that emotion and motivation are inherent parts of much of our cognitive processing. The presence of strong affect or motivation is evidence that a psychological adaptation is operating.

Evolutionary psychology also puts a new perspective on the nature/nurture controversy. Traditionally, this controversy has been about which aspects of our psychology are innate and which are learned. One problem in this controversy is that "innate" is not a well-defined concept; it has several meanings. Making these explicit should clarify the issue. For some people, "innate" means "heritable" -- that some amount of variance in a trait is accounted for by genetic variance. Since evolutionary psychologists are concerned with adaptations, which have no appreciable genetic variance in their functional properties, this sense of "innate" is not useful in any evolutionary analysis. For some people, saying that something is innate means that it develops in a fixed way, impervious to environmental influences. It is doubtful that much, if any, of our psychology is innate in this sense. In fact, one could argue that very little of our physiology is innate in this sense, because the development of the body depends on a certain range of environments and on certain kinds of nutritional inputs. It is not at all impervious to environmental influences. Similarly, the brain's development probably depends on certain kinds of informational inputs. A third sense of "innate" is something like "maturational" -- that a characteristic develops in a relatively fixed way given the inputs that one can expect in a normal range of environments. Language, for example, is innate in this sense. At this point, however, the distinction between innate and learned seems rather fuzzy, since "learned" means that something develops the way it does because of particular environmental inputs. Given these meanings, it would make some sense to say that everything in human psychology is innate and everything is learned. I think it is best to dispense with the word "innate" altogether, and instead use Ernst Mayr's distinction between open and closed systems (Mayr, 1976). A closed behavior program is one that is not influenced by the environment; and an open behavior program is one that is influenced by the environment. Psychological adaptations are open systems.

Deciding what is "innate" and what is "learned" is not really an evolutionary question. To an evolutionary psychologist, learning is simply the way that a phenotype gets to a particular adaptive outcome. Of course, humans do not learn all things equally well; we are not equally open to all environmental inputs. Deciding what a particular species can learn and why it learns that set of things as opposed to some other are appropriate evolutionary questions. Evolutionary psychology seeks to specify the kinds of things we learn easily and reliably -- language, or cooperation, or how to decide who is attractive -- and in particular tries to characterize the kinds of psychological processes that should result from this learning.

> Nature selects for *outcomes*. Natural selection acts to select genomes that, in a normal environment, will guide development into organisms with the relevant adaptive characteristics. But the path of development from the zygote stage to the phenotypic adult is devious, and includes many developmental processes, including ... various aspects of experience (Lehrman, 1970, p. 36).

Evolutionary psychology tries to discover the features of psychological adaptations. Part of this enterprise is specifying developmental processes -- what kinds of environmental inputs are needed in the development of an adaptation. Another part of the enterprise is specifying what characteristics the mature form of the adaptation should have, and making predictions about what kinds of psychological processes adults have.

Status and Dominance

An evolutionary approach to status is different from the approach usually taken in social science. Most thinking about status has assumed the existence of social hierarchies, and then looked at how those hierarchies affect the individuals within them. An evolutionary approach

seeks to understand how social hierarchies came to exist, which means understanding how individuals affect social structure. Since natural selection selects genes and acts on individuals built by those genes, this means studying individual psychology, not group structure. Even kin-directed altruism and reciprocal altruism can be explained as individuals acting in their genes' best interests (Hamilton, 1964; Trivers, 1985). These strategies enabled individuals in the past to leave behind more copies of their genes than individuals who did not use these strategies. Thus, genes that produced psychological mechanisms for such strategies spread through the population, and those psychological mechanisms produce our social behavior when we decide whether or not to help another person. A social structure such as a hierarchy is an emergent property of interactions among a set of individuals with certain psychological mechanisms. It can best be understood not by studying the group *per se*, but by studying the relevant features of the psychology of individuals, that is, their psychological adaptations. From an evolutionary perspective, this level of analysis is the most useful for understanding social phenomena, and a higher level of analysis may be misleading. This makes the evolutionary approach very different from approaches taken in most other social sciences.

One of the most central problems for any species is that some vital resources are limited and therefore, members of a population are always in competition for those resources (Darwin, 1859). This simple fact can lead to the emergence, first, of dominance hierarchies, and then of status hierarchies, and to the evolution of psychological mechanisms for assessing and negotiating dominance and status. Though the terms have frequently been used interchangeably in the literature, I distinguish status from dominance. I use *status* to refer to an ability to control resources across many situations. Status is something that endures beyond a single interaction. I use *dominance* to refer to an ability to control resources within a single interaction. A thought experiment may make the evolutionary analysis of this problem clear. The thought experiment

consists of imagining the idealized evolution of a group of organisms to note what is necessary for dominance and status to evolve. This is not a theory of how these things evolved in the past, but is simply meant to illuminate essential features of the psychology of dominance and status.

Stage 1. I begin with a few assumptions about a hypothetical population of organisms: 1) they all need some limited resource to survive and reproduce; 2) there are no differences between them in their ability to acquire that resource, so that the outcomes of competitions for the resource are randomly determined; 3) as far as engaging in competitions, each individual is equally likely to compete with any other individual; 4) they all value the resource equally. Over many generations, there will not be any enduring differences in the characteristics of individuals that get more of the resource and those that get less, because who gets it in a given situation is determined by chance. On average, competition for the resource has no differential effect on the inclusive fitness of any members of the population and therefore will not select for any reliable differences between individuals. For these organisms, competition for the resource is not a factor in natural selection.

Stage 2. Imagine one small change in these organisms -- a mutation that produces some characteristic that does affect ability to compete for the resource. Imagine furthermore that this characteristic and the genetic basis underlying it are binary -- an individual either has the characteristic or does not, and parents always pass it on to their offspring. Those individuals who have it will get more of the resource than those that do not. Over many generations, those individuals with this characteristic will survive and reproduce better than those without it, because they will have more of the resource. Thus, they will become more numerous in the population. Eventually, this characteristic will spread through the entire population, because those individuals without it will be at a disadvantage and will cease to reproduce in sufficient

numbers. The characteristic will then no longer give a relative advantage, because everyone will have it. When it has reached fixation in the population, this characteristic will be a species-typical adaptation whose function is to obtain the resource.

Stage 3. Now suppose that these organisms vary in size within a certain range, that the larger ones are more likely to be successful in competing for the resource, and that a larger individual can inflict more costs than a smaller one in a competition. However, suppose also that these organisms cannot perceive size differences. Again, each individual will be equally likely to engage in competitions with every other individual. Within a single generation, larger individuals will get more of the resource and incur fewer costs competing than will smaller individuals, but these differences will not accumulate over many generations into any appreciable selection pressure. This is because large individuals can have small offspring, and small individuals can have large offspring.[7] Size *per se* cannot be selected for. Thus, we are essentially in the same situation as in Stage 1: competition for the resource is producing no selection pressure on these organisms. One could say that these organisms now have dominance, because different individuals are differentially likely to obtain the resource. However, dominance is not something that is recognized by any individual in the population, since they cannot perceive size differences, so the kind of dominance these organisms have will not affect any one's likelihood of entering into a given competition.

Stage 4. Now suppose that a mutation occurs that produces the ability for an individual to calculate the size difference between himself or herself and a potential opponent and to decide not to compete when the other is larger. Individuals that have this ability will tend to engage in lower-cost competitions than those without the ability, who are equally likely to engage in a competition with anybody. Over many generations, individuals with this perceptual ability will

increase their inclusive fitness more than those without it, and the ability will spread through the population. It is an adaptation not for obtaining the resource, but for avoiding costly competitions. With the addition of this perceptual ability, larger individuals now have more of an advantage than just their size. In Stage 3, larger individuals incurred fewer costs than smaller ones, but still had to incur some costs when competing with smaller competitors. Now, however, when confronting a smaller competitor, they can circumvent the costs of competing altogether, because the smaller one backs down. One can say that these organisms have true dominance contests, because some individuals are more likely to get the resource than others, and all individuals in the population are able to recognize who will win a contest when they confront a potential competitor.

Stage 5. Imagine that another mutation occurs that enables an individual to manipulate the impression of his or her size to appear bigger than he or she is, and produces the tendency to do this whenever an individual is potentially in a contest. This ability will confer an advantage on those who have it, because, at very little cost, they can win a greater proportion of contests than those that rely on their true size to get others to back down (Dawkins & Krebs, 1978; Rohwer, 1982). Thus, this "bluffing" ability will spread through the population. This situation is similar to Stage 2 -- a mutation that enables an individual to get more of the resource than individuals without the mutation will become a species-typical adaptation. However, whereas the mutation in Stage 2 was directly related to obtaining the resource, this kind of bluffing is more indirectly related. It allows an individual to obtain more of the resource by taking advantage of existing features of the nervous systems of other members of the population. If their nervous systems did not have those features, this adaptation could not evolve. In this case, it is the ability to perceive size that is manipulated. More generally, once any perceptual ability exists in a species, there is the potential for it to be manipulated by some kind of deceptive display.

Stage 6. Consider another mutation occurring in this population that produces a new perceptual mechanism enabling an individual to detect this deception and assess an opponent's true size. Individuals with this ability will cede fewer contests, on average, than those without it, and will therefore get more of the resource. Thus, this ability can spread through the population and become an adaptation as well.

Stage 7. There are, of course, other factors besides size that could affect an opponent's ability to win a competition: fighting ability, level of fear, level of aggression. Any ability to detect these in an opponent will produce a selective advantage in exactly the same way as did the ability to detect size differences in Stage 4. Furthermore, one way to get around being deceived by the kind of bluffing display in Stage 5 is to use some other cue that is more reliable. This will produce a selective advantage just as in Stage 6 above -- individuals with the ability to use more reliable cues will cede fewer contests and get more of the resource than those who rely only on size and are subject to deception.

Thus, there can be a kind of "arms race" in the evolution of dominance signal systems, from manipulation of existing perceptual mechanisms to detection of deception or assessment of dominance by other means, to new strategies of manipulation, and so on (Dawkins & Krebs, 1978). In this way, a repertoire of dominance signals and dominance cues can evolve. This kind of "arms race" may be one reason why there are so many redundant dominance cues.

In all of the variations on these organisms from Stage 3 to Stage 7, one other good predictor of how likely an opponent is to win a dominance contest is how successful he or she has been in such contests in the past. In none of the stages considered so far do the organisms have the capacity to remember this. Making use of such information requires that the individual be able to remember and recognize other individuals, and to remember their history of winning or losing

dominance contests. The ability to recognize individuals will evolve only in species with a certain kind of social structure. In species where the group is large and membership constantly changing, *e.g.*, in bird species that live in large flocks, the probability of any two individuals encountering each other multiple times is very small (Rohwer, 1982). The ability to recognize particular other individuals in this kind of social environment confers no selective advantage and therefore could not evolve.[8] In fact, species with this kind of social structure do not recognize specific others, whereas species that live in smaller groups with more constant membership can do so (Rohwer, 1982).

Stage 8. Let us now endow this population of hypothetical organisms with some new properties. Assume that they do live in small enough groups with constant enough membership that the probability of any two of them encountering each other multiple times is significant. Also, suppose that a new mutation occurs that produces certain memory abilities: the ability to recognize others with whom one has had dominance contests, and the ability to remember the outcomes of such contests. This knowledge is a very useful predictor of whether or not to compete with a specific other, perhaps more useful than other dominance cues. Any individual who uses this information to avoid costly contests will have an advantage over those who do not. Thus, these memory abilities will become adaptations just as did the perception of other dominance cues in Stages 4, 6, and 7. At this point, these organisms can be said to have not just a dominance hierarchy, but something like a status hierarchy, because they recognize the ability to control resources across situations. Of course, when an individual encounters others with whom he or she has never had a previous contest, he or she will have to rely on the dominance cues of Stages 4 through 7. Thus, a particular individual's status is not necessarily something that is recognized by all members of the group. It is recognized only by those members whom the individual has encountered before.

Stage 9. Imagine another mutation occurring that produces the ability to remember who the winner is when one sees a contest between two other individuals besides oneself. Individuals with this ability will have an advantage over those without it, because they can avoid costly contests not only with others whom they have encountered before, but also with dominant individuals with whom they themselves have not previously had a contest. Thus, this mutation will also spread through the population and become an adaptation. At this point, these organisms have a true status hierarchy. An individual's history of dominance encounters is recorded in the memories of all the other members of his or her group, and thus his or her status is recognized by the group.

Status can now become a resource in and of itself. If low status individuals almost always defer to those with higher status, then high status individuals can make use of this feature of their social environment. Someone with high status may not have to acquire the resource that group members compete over for himself or herself; rather, he or she can wait for a lower status group member to get some, and take it, since he or she can count on the lower status one deferring. High status individuals, by being able to influence others, can essentially recruit the muscle power of lower status individuals for their own interests. Thus, although it is not a tangible resource, status is an extremely valuable resource, because it can be the route to obtaining many other tangible resources. It can be thought of as a resource instantiated in the nervous systems of one's social group. Like any other resource, one can have more or less of it. Since status is relative, it is inherently a limited resource. Therefore, members of a group must compete for it.[9] Once status hierarchies emerge, then not all competitions between individuals will be over tangible resources; many competitions will be over status itself.

Stage 10. Status cues can now emerge, just as dominance cues did in Stages 4-7. Of course, since a large component of status is having won many dominance contests, status cues and dominance cues will be largely overlapping sets. However, they will not be identical. The sorts of things that will be status cues will be anything that indicates having won dominance contests, *e.g.*, displaying no fear when challenged, displaying that one has a lot of resources. The same kind of "arms race" can occur as did with dominance cues, from manipulation and bluffing, to detection of deception and using other means of assessing status, to new strategies of deception, *etc.* Thus, these organisms will also have a repertoire of redundant status cues.

This exercise is meant to make clear how, through natural selection, social hierarchies can emerge from a group of organisms each of whom acts in its own individual interest. The social structure does not exist to benefit the group. Rather, hierarchy emerges because of particular psychological adaptations that benefit individuals over the course of evolution. The thought experiment is also meant to make clear what the prerequisites are for dominance and then status to emerge. For dominance, there needs to be some characteristic that makes some individuals more likely to win competitions over resources than others. This characteristic must vary between generations so that a parent cannot necessarily pass it on to offspring or else that characteristic, if advantageous, would go to fixation in the population. Also, individuals must be able to recognize differences in this characteristic and choose competitions accordingly. Once these prerequisites are met, a repertoire of dominance cues can emerge. Status hierarchies cannot evolve unless members of a species live in small enough groups with stable enough membership that there is a significant chance of any two of them encountering each other more than once or twice, and unless they can recognize each other as individuals and can remember the history of dominance interactions between members of the group.

Once status hierarchies do exist, then another question is how an individual can behave adaptively within the hierarchy. What is the most adaptive strategy for acquiring resources within the hierarchy? As mentioned above, one way is for an individual to simply take resources from others of lower status, assuming that they will defer and not challenge him or her to an actual competition. Another way is to compete with others in the hierarchy either for the resources they have or for some resource that no one has yet claimed. This situation then poses an adaptive problem for the organism. The problem is to choose to enter competitions from which one will probably gain the most while incurring the fewest costs. (This is like maximizing expected value.)

Competing for resources can be costly. This is obvious in the case of aggressive competition, but even non-aggressive competition involves costs in time and energy taken away from other fitness-relevant activities (Maynard Smith, 1974; Maynard Smith & Price, 1973). By "competition" I mean something that is extended over time and takes energy. Thus, simply taking something from someone else is not "competing." An individual should be willing to compete for a particular resource only when the probable benefits of gaining access to it outweigh the probable costs of competing. The most adaptive competitive strategy is to compete only with those close to oneself in a hierarchy. The reasons that it is either adaptive or not adaptive for an individual to compete are different for high and low status individuals; however, an analysis of these reasons leads to the same predictions about perception of status cues for both. A mathematical analysis of the problem is presented in Appendix A; the essence of the analysis is explained below.

First consider the situation from the point of view of a low status individual. Competing with others much higher in status could potentially yield huge benefits in terms of both resources

and status. However, high status individuals, by having won more dominance contests than lower status individuals, have demonstrated a greater ability to compete successfully. Thus, if one competes with others who are much higher in status, the potential benefits may be large, but the probability of success is small, and the potential costs of the competition are large. One's "expected value" in such a situation is negative; therefore competing with others much higher in status is not adaptive. However, competing with those just a little higher in status will increase substantially one's probability of competing successfully, and decrease the probability of incurring large costs in the competition. One's "expected value" is greater in such a situation. Thus, it is advantageous for a lower status individual to be able to distinguish when another is much higher in status than they are and when another is just a little higher in status, because that is what distinguishes situations in which he or she has enough of a chance of winning that it is adaptive to compete.

If a high status individual competes with a contender much lower in status, he or she is almost certain to succeed. Not all conflicts between two such individuals will be extended enough to truly be considered "competitions." However, since he or she can easily have access to resources without engaging in an extended competition or fight with this low status individual, he or she stands to gain little by engaging in such a competition. The lower status individual may put up a fight if he or she values the resource more than the high status individual. The expected value from such a competition for a high status individual is essentially zero: little to gain, and some cost to pay by engaging in the competition. Furthermore, high status individuals can easily maintain their status position without competing with others much lower in status. As far as competitions for status *per se* go, it may not increase one's reputation for formidability much to triumph over someone much lower in status. However, when the contender is only a little bit lower in status, the probability of winning is not so large. If the contest is over a resource, the

higher status individual might not be able to get the resource without competing with the contender. Also, he or she may not necessarily be able to maintain his or her status position without competing. Not competing could be seen as submitting, which would lower his or her status position. Thus, it is most adaptive for high status individuals to expend their time and energy competing with challengers close in status. In fact, in olive baboons, one thing that distinguishes those that maintain their status position successfully from those that do not is the ability to distinguish threatening from nonthreatening challenges (Sapolsky & Ray, 1989). Although for different reasons than for those low in status, it is also advantageous for high status individuals to be able to distinguish when a competitor is very different from themselves in status and when a competitor is only a little different in status. In sum, the most adaptive strategies are for high status individuals to avoid competitions that they will certainly win, and for low status individuals to avoid competitions that they will certainly lose. [10]

Another factor that should at least be mentioned in understanding status and dominance hierarchies is gender. Sex differences emerge in evolution only when the fitness interests of the two sexes are different. It is not a factor in the evolution of dominance and status hierarchies, because both sexes engage in competition for resources. The fitness interests of the two sexes do not differ -- both have an interest in obtaining as much of some vital resource as possible. Which resources are vital for males and females may differ, but the dynamics of competition do not, and thus the psychological mechanisms for negotiating hierarchies should not differ between the sexes.

It has traditionally been thought that males engage in physical dominance contests more than females. However, this is overly general. Both males and females of many species compete physically for vital resources; they simply tend to compete most with members of the same sex

(Hrdy, 1981). Reproduction, of course, is the most important activity for propagating one's genes. One vital resource for reproduction is the opposite sex. Here there does seem to be a sex difference; males in many species compete physically for females, while it is very rare to find females of a species competing physically for males (Dawkins, 1976; Symons, 1979). Furthermore, in humans, female choice of mates is based in part on status and dominance *per se*, whereas this is not true of male choice of mates (Symons, 1979; Buss, 1989). This may be why it has been thought that males engage in physical dominance contests more than females; however, this conclusion should be limited to cases of sexual competition. In situations of sexual competition, there may be some sex differences in the psychology of status and dominance. In general, however, psychological mechanisms for perceiving and negotiating status should be the same for both genders.

Nonverbal Status and Dominance Cues

This thought experiment should make clear how one can distinguish status and dominance, and how one can distinguish status cues from dominance cues. Nonverbal signals can be characterized in terms of which psychological mechanisms they take advantage of. Dominance signals take advantage of mechanisms for assessing another's ability to win a competition; status signals take advantage of mechanisms for assessing whether another seems to have won a lot of dominance contests. Information about another's status is also information about dominance, since status affects the likelihood of winning in a particular situation. Thus, since part of status is having won dominance contests, status cues and dominance cues will not be completely distinct.

One way in which a person can signal *status* is to convey a lack of fear or concern when challenged. If one truly has high status and has in fact won many competitions, then one can have confidence about winning in any new competition. In this case, a challenge from a lower

status person is not really a threat. Thus, displaying security and confidence in one's status position when challenged is a way of signalling that one is sufficiently higher in status than the other that his or her challenge is not a threat. One could do this by appearing relaxed and calm, or by seeming amused by the other's challenge, or by not paying much attention to the other. Someone who is threatened by others will need to monitor them, pay attention to what they are doing, and be prepared to respond. Thus, physical tension (readiness to respond) should make one appear threatened, and therefore not that much higher in status, whereas lack of physical tension should make one appear not threatened and therefore higher in status. In fact, relaxed posture is a dominance or status cue (Henley, 1977; Mehrabian, 1981). Monitoring the other person should also make one appear threatened, whereas ignoring them should make one appear unafraid.

I am particularly interested in a set of status cues that I call "cues of ignoring", that is, any nonverbal behavior that indicates a lack of attentional monitoring, or a failure to engage the other person in some way, anything that indicates one is ignoring, not attending to the other person. Several behaviors that have been found in the literature to be status cues seem to fit in this category of ignoring: turning one's body slightly away, not facing the other directly (Mehrabian, 1968), turning one's back (Mehrabian, 1981), looking away while the other is speaking (Dovidio & Ellyson, 1982; Exline, Ellyson, & Long, 1975). I hypothesize that "cues of ignoring" take advantage of psychological mechanisms for detecting fear. Only someone who has nothing to fear from another person can afford to ignore them. A person much higher in status than someone else has little to fear from that other person, because the high status person has a high probability of winning a competition. Thus, cues of ignoring signal that one is sufficiently higher in status than another that there is no real possibility of conflict or competition. This signals a large distance between the two people in a status hierarchy.

One way to signal *dominance* is to convey one's ability to win a physical competition. Any behavior that signals aggression or that exaggerates the impression of a person's size or strength would convey this. I call such behaviors "cues of physical dominance." Several dominance cues that have been studied in the past seem to fit in this category: aggressive gestures (Harper, 1985; Henley & Harmon, 1985; Maynard Smith, 1974), body postures that exaggerate one's size or strength (Harper, 1985; Popp & DeVore, 1979; Weisfeld & Beresford, 1982) and aggressive facial expressions such as thrusting one's chin out or lowering one's brows (Dovidio, Brown, Heltman, Ellyson, & Keating, 1988; Keating, 1985). Physical dominance cues take advantage of psychological mechanisms for assessing an opponent's physical prowess and level of aggressive intent. However, the need to signal in such a direct way one's ability to win a physical competition indicates that the signaller is not sufficiently higher in status that a challenge is not threatening. Thus, one can infer that if nonverbal cues of physical dominance are used in an interaction, then the individuals involved recognize each other as potential competitors. This signals that they are close enough to each other in status that the lower status person has a substantial probability of competing successfully with the other.

These two types of cues, cues of ignoring and cues of physical dominance, have not previously been distinguished in the literature. I propose that they are separate categories of cues, and that they are functionally distinct, *i.e.*, they convey different information. Cues of ignoring are *status* cues and as such, also carry some information about dominance, whereas cues of physical dominance are *dominance* cues.

The literature on nonverbal status cues has found a great number of cues that signal either high or low status, dominance or submissiveness. There are a few basic paradigms in which this research is done. One is to show subjects a person using some cue and ask them to judge how

dominant the person is, or to show the person using the cue with other people and ask which person is most dominant or higher status. A second is to have subjects act as if they are interacting with someone higher or lower in status and observe their posture, *etc.* A third approach is to observe people who actually differ in status, and note what kinds of nonverbal cues they use. These approaches provide convergent evidence on what perceptual information signals dominance or high status and what signals submissiveness or low status.

The conceptual organization of this area of research reads a bit like a catalogue, but there are two ways these cues have been divided into categories. Ridgeway, Berger, and Smith (1985) have proposed a division of cues into two types: *categorical cues*, which are not behaviors, but aspects of behavior, speech, or appearance that may indicate status characteristics, and *task cues*, which are behaviors or signs that are read as giving information about an actor's competence. Since I am interested in nonverbal *behavior*, I will be focusing on what they call task cues. More typically, nonverbal behavior is divided into categories based on which part of the body is involved: body postures and gestures, visual behavior, facial expressions, and paralinguistic behavior[11] (Ellyson & Dovidio, 1985; Harper, 1985). Neither of these categorizations, however, classifies cues according to their specific function, *i.e.*, what kind of information about status or dominance they communicate. Rather, they divide cues into different ways to communicate the same information.

There are several assumptions implicit in this area of research. First, empirical results tend to be reported in terms of which cues indicate high status or dominance and which cues indicate low status or submissiveness, even if the dependent measure is a continuous one such as a rating scale of dominance or a measure of proportion of time spent talking (Berger, Webster, Ridgeway, & Rosenholtz, 1986; Dovidio *et al.*, 1988; Harper, 1985; Mehrabian, 1981; Ridgeway, Berger, &

Smith, 1985). This way of reporting the data treats these cues as if they convey only binary status or dominance information, not continuous information about degree of dominance or status. In expectation states theory, one of the major theories of status processes in sociology, this binariness assumption is made explicit. In the mathematical formulations of this theory, status characteristics and status cues are assigned to one of two states, one positively valued and one negatively valued (Berger, Fisek, Norman, & Zelditch, 1977; Berger *et al.*, 1986). Second, since results are often reported in this way, and not in terms of how strong an impression of status or dominance each cue creates, cues are treated as if they all have the same signal strength. These first two assumptions of binariness and equal signal strength are usually implicit in the way research is reported rather than explicit in theory, and when they are made theoretically explicit, it is with the caveat that this is a simplification (Berger, Fisek, Norman, & Zelditch, 1977; Berger, Webster, Ridgeway, & Rosenholtz, 1986). Thus, these are not serious theoretical tenets held by researchers in this area.

Third, and perhaps more serious in its consequences for how this area of research is organized, the terms "status cues" and "dominance cues" have not been differentiated. Sociologists tend to talk about status cues (Berger *et al.*, 1986; Ridgeway, Berger, & Smith, 1985), whereas social psychologists and ethologists tend to talk about dominance cues (Dovidio & Ellyson, 1982; Harper, 1985; Henley & Harmon, 1985; Keating, 1985; Mehrabian, 1981; Weisfeld & Beresford, 1982). In many cases, they are studying the same behaviors. The failure to distinguish status and dominance cues is not really an assumption made in the literature. It is not that anyone would insist that these two things are the same, but rather that there is a great deal of variation between researchers in how the terms "status" and "dominance" are used.

Finally, if these cues are all treated as if they have the same signal strength -- as if they convey an equal amount of information about status -- then the only way to communicate higher status is by using more cues. Thus, there is an assumption that these nonverbal cues are additive in their effects on impressions of status or dominance. This assumption of additivity is explicit in theoretical formulations, and has been studied. Additive signal strength has been found to make a difference in judgments of dominance. For instance, people who interrupt more often or talk more are seen as higher status (Hall, 1984; Ridgeway, Berger, & Smith, 1985). In one study, Henley and Harmon (1985) specifically tested the additive model. They selected four different nonverbal dominance cues: invading someone's space, standing over someone while he or she was seated, touching, and pointing. Subjects saw pictures of two people interacting, in which one person used anywhere from one to four of these cues, and they judged how dominant each person looked. The results were roughly linear, with actors being judged more dominant the more cues they used. These cues were chosen for how easy they were to portray in static photographs, rather than for theoretical reasons, so the conclusions of this study may be limited to certain kinds of cues. Also, all of these cues can be seen as communicating *physical* dominance. The additive model has not been tested for other types of nonverbal dominance or status cues.

Given an evolutionary perspective on status and dominance, all four of the above assumptions need to be re-examined. If it is adaptive for individuals to be able to distinguish someone close to them in status from someone far from them in status, then this distinction should be reflected not just in the amount, but also in the *kind* of nonverbal behaviors used to signal status. Specifically, if some signals communicate that there is a large status difference and some communicate that there is a small status difference, then these will be functionally distinct categories of cues, because they convey different kinds of information. Thus, they will convey much more than binary information, and they will also differ in their signal strength.

Cues of ignoring and cues of physical dominance communicate different information about both status and dominance, and should have different effects on subjects' perceptions of status and dominance. First, they reflect different degrees of status differentiation. Cues of ignoring should be more powerful status cues than are cues of physical dominance, because they indicate a greater difference in status between the people interacting. They should have a greater signal strength for signalling *status*. Cues of physical dominance will create an impression of status, since part of status is having won dominance contests. However, since cues of physical dominance indicate the ability to win only one competition -- the current one -- whereas cues of ignoring indicate having won several contests in the past, they should not create as strong an impression of status. For signalling *dominance*, both types of cues should be effective. Cues of physical dominance indicate the ability to win a current dominance competition. If cues of ignoring indicate having no fear and therefore having confidence about one's ability to win a dominance contest, then they will also indicate ability to win in a current competition. Thus, I predict no differences in the impressions of dominance created by these two types of cues.

The additivity assumption in the literature -- that using more cues means looking more dominant -- implies that any dominance or status cues can be combined in a display to create a more dominant impression. However, one cannot necessarily combine cues from two functionally distinct categories. Cues of ignoring and cues of physical dominance are often behaviorally incompatible. One cannot simultaneously ignore someone and signal aggressive intent towards him or her. If the two kinds of cues do take advantage of different psychological mechanisms, and if they do convey different meanings about status, then they will not necessarily be additive in their effects on perceptions of status or dominance. Using a cue of ignoring sends the message that there is no possibility of real competition. Therefore, using any other cue that

does indicate the possibility of competition will "dilute" the message given by the cue of ignoring, or even change the behavior's meaning -- ignoring cues cannot mean ignoring if the person is also signalling aggressive intent. Based on past research, it is reasonable to expect these cues to be additive within each type, though this has not been established empirically for cues of ignoring. However, instead of being additive when used together, I predict that cues of physical dominance will have a subtractive effect on perceptions of status when used with cues of ignoring. If the meaning of the ignoring behavior is changed by adding cues of physical dominance such that it is no longer a status cue, then ignoring cues should also have a subtractive effect on perceptions of dominance when used with physical dominance cues.

The evolutionary perspective on status and dominance predicts that since both males and females compete for resources, psychological mechanisms for perceiving status should be largely the same for men and for women. Thus, these two types of nonverbal status and dominance cues should be perceived in the same way when displayed by a male towards a male or by a female towards a female. However, the situation is different when members of the opposite sex interact. Since males and females are important resources for each other, a very salient resource for each in a mixed-sex interaction would be the member of the other sex. Since reproduction is what genes build phenotypes to do, few other resources would be as salient. In that case, both people may engage in displays of sexual attractiveness or interest (or lack of interest) as much if not more than displays of dominance and status. Thus, nonverbal cues can take on a different meaning in the context of an interaction between men and women. Some cues of physical dominance may operate differently between members of the opposite sex than they do between members of the same sex. Berger *et al.* (1986) note that while sustained eye contact is dominant when used by a man towards another man, it is seen as flirtatious when used by a woman towards a man. Women may also see sustained eye contact from a man as a sign of sexual interest. Henley

and Harmon (1985) found that overall, displaying dominance cues made men appear dominant, but made women appear sexual. There was no effect of sex of observer. They do not present separate analyses for each of the four cues in their study, however, so it is not clear that this would be the case for all physical dominance cues. It is possible that two of the cues they used, invading personal space and touching, could more easily be seen as sexual than could other cues of physical dominance which are more clearly aggressive or which simply exaggerate size. Furthermore, the conclusion that men are seen as dominant and not sexual when using these cues is overstated. It is well-documented that dominance and status are important aspects of a man's sexual attractiveness to women in many cultures (Buss, 1989; Symons, 1979). Thus, for men, dominance displays *are* sexual displays. However, because some dominance cues may imply sexual approach or interest rather than the possibility of competition when used in a mixed-sex interaction, the predictions of this study are limited to same-sex interactions. In interactions between members of the opposite sex, a different set of psychological mechanisms may be activated. Studying only same-sex interactions allows one to focus on situations where psychological mechanisms for status and dominance are primarily what is activated.

CHAPTER 2: METHOD

Overview

Subjects viewed several scenes on videotape in which actors used various cues of ignoring, cues of physical dominance, or combinations of the two types of cues, and then rated the appearance of the actors on several dimensions of dominance and status. Four cues of each type were selected from the status and dominance cues that had been studied previously in the literature. Actors were then videotaped in a context in which people might use these cues -- a dispute over who gets a seat at a general admission rock concert. The same scene was filmed over and over again, with one of the actors using different nonverbal behaviors in each scene. Each of the four cues in each category was shown once being used by itself and once being used in combination with each of the four cues in the other category. In one scene, the actors used no explicit nonverbal dominance cues at all. Subjects watched two videotapes with twenty-seven scenes each, one with two male actors in the scenario and one with two female actors in the scenario. The verbal and nonverbal behaviors in the two videotapes were the same. After each scene, subjects answered seven questions concerning the target actor's dominance or status. The design of the study was within-subjects: each subject saw all the nonverbal displays performed by both male and female actors, and answered all seven questions about each scene.

Stimuli

Selection of Nonverbal Cues. Past research has not differentiated status and dominance cues into cues of ignoring and cues of physical dominance. Thus, the choice of which behaviors to be used in the study was based on independent judges' categorization of nonverbal behaviors into these two categories. The literature on nonverbal status and dominance cues was used to compile a list of twenty-five cues that have been found to signal dominance or high status. A questionnaire was then constructed which listed these cues and asked judges to classify each cue as a cue of ignoring, a cue of physical dominance, both, or neither (see Appendix B). The questionnaire defined the two categories of cues as follows:

cues of ignoring: These involve failure to engage the other person in some way, ignoring, not attending to the other person.

cues of physical dominance: These are anything symbolic of physical dominance, or intimidation, specifically, anything that signals aggression or that exaggerates the impression of a person's size or strength.

The judges were also asked to rate each cue for how powerful a dominance or status cue it was, from 1 ("would create a strong impression of dominance or status") to 5 ("would not create much of an impression of dominance or status"). Twenty-seven graduate students in the Stanford University Psychology Department participated as judges in this preliminary phase.

Four behaviors in each category were selected for the study. The difference in how many judges said that a behavior belonged to one category as opposed to the other was used as a measure of agreement on which category that behavior belonged in. The behaviors for which this difference was the greatest were those selected, based on the data presented in Tables 1 and 2.

The four cues of ignoring were: "turning slightly away from the other, not facing them directly," "turning one's back on the other," "looking at the other while speaking, but looking away when they speak," and "looking away from the other while they do something." The four cues of physical dominance were: "pushing one's chest out," "erect posture, standing to one's full height," "moving close to the other," and "speaking loudly." "Speaking in an angry tone of voice" was more often classified as a cue of physical dominance than any other cue except "pushing one's chest out". However, the behaviors to be used in the study had to be behaviors that the actors could display individually, without displaying other nonverbal cues simultaneously. In practice, it is very difficult to speak angrily without also displaying other nonverbal dominance cues, particularly facial cues such as lowering one's brows. For this reason, this cue was eliminated and the next highest, "speaking loudly" was selected instead. On average, judges did not rate one category of cue as being stronger than the other. The average rated strength of cues of ignoring was 2.70, and of cues of physical dominance was 2.76 ($t(25) = 0.27, p = 0.79$).

Filming Stimuli. The scenario chosen as the context in which to portray these cues was a dispute over a seat at a general admission rock concert. This situation has several features which made it seem appropriate. In many social settings, there are strong social norms against using physical dominance cues to resolve disputes. This is particularly true of situations within institutions such as school or the workplace, because the legitimated authority structure of such institutions provides an alternative to physical means for settling disputes. Thus, the use of physical dominance cues in such a situation has an extra meaning, which is that the person using them feels strongly enough to violate a social norm. So that none of the nonverbal behaviors that the actors used would carry this extra meaning, a context outside of everyday institutions, for

which there was no legitimate authority to resolve the dispute was chosen. A general admission rock concert is such a situation. Since there are no assigned seats, it is up to the people involved to resolve who gets any one seat.

An additional feature of this situation is that no social structure exists that defines the status relationship of the two people involved in the dispute. Since they are strangers, their relative status is something to be negotiated. In an institutional situation, one of two strangers might have higher status by virtue of having greater access to the authority structure of the institution. Outside of that sort of structure, the relative status of two strangers could be based on who has more friends and allies, or on having sufficient physical prowess to have won many physical dominance contests. As filmed, the two people in the situation each seemed to be alone, since the people in the surrounding seats did not respond to them. Thus, in this situation, status could only be based on ability to be dominant. Thus, status and dominance will overlap greatly in this situation. Though cues of ignoring are predicted to be stronger *status* cues than are cues of physical dominance, in a situation such as this in which status and dominance are so closely related, the two types of cues may create equally strong impressions of status and dominance. Given the close relationship between status and dominance in this study, both cues of ignoring and cues of physical dominance may convey their particular meanings most strongly when used in response to a physical challenge. Cues of ignoring can make one appear unconcerned about the possible physical threat, and cues of physical dominance can make one appear ready to respond to the challenge. Thus, the actor who was not displaying the different nonverbal cues appeared challenging.

The scene was as follows: Four people were shown sitting at an outdoor rock concert, with one empty seat between them. The two actors both approached the seat at the same time. One actor said, "I think this is my seat." The other actor leaned forward to appear challenging, pointed at the seat and said, "Oh, no, this is my seat. I'm sitting here." The first actor replied, "This isn't your seat. This is my seat," while using either a cue of ignoring, a cue of physical dominance, or some combination of the two. The scene ended without showing who gets the seat. In almost all of the scenes, the verbal behavior was exactly the same, and only the nonverbal behavior varied. Not saying anything in response to the other person seemed as if it would be a cue of ignoring, although it has not been documented as a status cue. Therefore, if the actors had displayed the nonverbal cues of ignoring without speaking, they would have been displaying two cues of ignoring simultaneously. To avoid this possible confound, the actors displayed the cues of ignoring while using the same verbal behavior as in the other scenes, saying "This isn't your seat. This is my seat." In order to use not speaking as one of the cues of ignoring, the cue "looking away from the other while they do something" was displayed in the following way: the first actor simply looked away when the second actor spoke, kept looking away and did not respond verbally.

Some of the cues of ignoring and cues of physical dominance could not be displayed simultaneously: turning slightly away from the other and moving close to the other, and turning one's back on the other and moving close to the other. In this case, they were done sequentially, and were filmed in both orders. For example, in one case the first actor would turn his or her back while the other was speaking, and then turn around and step close to the other actor while saying his or her line. In the other case, the first actor would step close to the other while saying his or her line, and then turn his or her back.

The scene was filmed repeatedly with several "takes" of each behavior and combination of behaviors. One example of each was chosen to put on the final stimulus videotape. The examples chosen were those in which the actors appeared to be displaying only the nonverbal cue of interest and not "leaking" other nonverbal cues. Examples of each behavior that were not chosen to be stimuli were those in which the actors simultaneously displayed other status or dominance cues, such as putting hands on hips, deepening the voice, speaking louder (except when they were supposed to), scowling or lowering the brows, looking down their noses at the other actor, or those in which they used cues that signalled submissiveness or low status, such as hesitating, smiling, looking down, fidgeting, or putting hands in pockets.

There were twenty-seven scenes with different behaviors and combinations of behaviors: one scene with each cue of ignoring, one scene with each cue of physical dominance, one scene with neutral behavior (no nonverbal dominance cues), sixteen scenes with each of the cues of ignoring combined with each of the cues of physical dominance, and two more scenes for the alternative orders of the cues that had to be done sequentially (turning away and approaching, and turning one's back and approaching). These twenty-seven scenes were put onto the final stimulus videotapes in a random order with ten seconds of black screen between each scene. The same random order was used for the tape of the men and the tape of the women.

Subjects

Forty-two undergraduates in an introductory psychology class at Stanford University participated for course credit. There were nineteen men and twenty-three women.

Procedure

Subjects were run in mixed-sex groups of 5-10 people. The experimenter gave subjects the following instructions verbally: "We're interested in how people influence each other in social situations, in how people get their way. When you're interacting with someone else, how is it that you get influenced or are able to influence the other person? When you're watching an interaction, how can you tell which person seems more influential, or more likely to get their way? We're interested in what information people use to tell these things."

"People are really good at looking at situations and telling which person is likely to be able to get their way. So we'd like to take advantage of all the intuitive knowledge about social situations that you have, and have you watch some people interacting on videotape and see what your impressions are."

"The situation you'll be seeing on the videotape is this: A general admission rock concert. Two people come up to a single empty seat at the same time, and both think they have a claim to it. It's a really good band, and the seat is a really good seat, so they both want to sit there. You'll be seeing a dispute over who gets the seat. You'll be seeing the same people saying the same things over and over again, but there are differences between each scene. The people act a little different in each scene. Even though you'll be seeing the same scene over and over again, please try to view each one independently. Each one is a little different. I'd particularly like you to pay attention to the behavior of the person wearing the black shirt in each scene. It will either be a man in a black t-shirt or a woman in a black shirt. You'll have a few questions to answer about each scene you see -- those questions are on the questionnaire in front of you. Some of these questions may seem a little odd, or a little confusing, or might not seem to 'fit' each scene, but do your best to answer each one. In particular, the question about status -- I don't mean

socioeconomic status by that. I'm interested in what you think that means. Don't agonize over any of the questions, just give me your impressions. There are no right answers, obviously."

"This is going to be a bit of a difficult task to do. In everyday life, we're used to seeing ongoing situations, but I'm not going to show you a whole ongoing situation. What I'm interested in are specific behaviors, sort of the components of an ongoing interaction. So I'm going to show you very short little bits of a situation and see what your impressions are of those."

"As I said, this will be difficult because you'll see just a few seconds of these two people together, and then the screen will go blank. I'm interested in what you can pick up from that brief a presentation. It goes by quickly, so pay close attention to it and focus on nuances. Some of the information in these brief clips is very subtle."

"There will be five practice trials first, so you can get used to doing this."
After giving the instructions, the experimenter left the room, and a research assistant ran both the practice trials and real trials. A trial consisted of watching a scene with one of the nonverbal cues or combinations of cues and then answering all seven questions.

Five of the behaviors were selected at random to be used as practice trials. Subjects watched the tapes of both the male actors and the female actors. Half of the subjects saw the men first; half saw the women first. If subjects were going to see the tape of the men first, then they saw practice trials with women; if they were going to see the tape of the women first, then they saw practice trials with men. After each tape, subjects were asked to answer two questions on the back of their questionnaire packet: 1) Do you think the two people in these scenes have ever seen each other before? and 2) Do you think these two people will ever run into each other again? This was to check that subjects saw these two people as strangers.

Afterwards, the experimenter debriefed subjects by explaining what cues of ignoring and cues of physical dominance are, and what the hypotheses were about how these cues would look when used in combination.

Dependent Measures

Subjects were asked to make seven ratings about each scene they saw. In each videotape, the actor who was using the different nonverbal behaviors was wearing a black shirt, so each question referred to him or her by the color of the shirt. The questions asked were:

- How likely do you think it is that the man/woman in the black shirt will get the seat in this scene?

1 = much less likely to get the seat than the other man/woman, 4 = equally likely, 7 = much more likely to get the seat than the other man/woman

- How sure of himself/herself does the man/woman in the black shirt seem to be in this scene?

1 = not at all sure of himself/herself, 7 = very sure of himself/herself

- How relaxed does the man/woman in the black shirt seem in this scene?

1 = not at all relaxed, 7 = very relaxed

- How intimidating does the man/woman in the black shirt seem to be in this scene?

1 = not at all intimidating, 7 = very intimidating

- How high status does the man/woman in the black shirt seem to be in this scene?

1 = not at all high status, 7 = very high status

- Based on this scene, how often do you think the man/woman in the black shirt usually gets his/her way?

1 = hardly ever gets his/her way, 7 = usually gets his/her way

- How dominant does the man/woman in the black shirt seem to be in this scene?

1 = not at all dominant, 7 = very dominant

The order in which these questions were asked was counterbalanced in a Latin-square design, so that there were seven different orders in which the questions could be asked. These were created from the order listed above by moving the first question to the end, then taking that order and moving the new first question to the end, *etc.* Six subjects got questionnaires with each order.

These questions were chosen to try to tap different aspects of dominance and of status. It was my intuition that subjects would interpret the question about how dominant the person seems to be in terms of physical dominance. Thus subjects should interpret the questions about how intimidating the person seems to be and how dominant the person seems to be in the same way. Other questions were designed to be about status. Status has been defined as the ability to have access to resources across different situations, which means being dominant in many different situations. This experiment concerned the impressions of status that subjects would have from watching only one situation. Thus, there were several questions on different aspects of status. One question asked subjects directly about how high status the person seemed to be. This was an attempt to discover what subjects thought "status" meant. Since status means having been dominant in many situations, and expecting to be dominant in most situations, people with high

status should be relaxed and confident in their position. Thus other questions asked how relaxed the person seemed to be and how sure of himself or herself the person seemed to be. Subjects were also asked whether they thought that the person usually got his or her way or not. This was a way of asking subjects about something very close to the definition of status. Finally, status and dominance both have to do with access to resources. Thus, one question asked whether the person seemed much more or less likely to get the seat than the person challenging them for it, as a measure of subjects' impressions of the person's access to the valued resource.

CHAPTER 3: RESULTS

Data from forty-two subjects, nineteen men and twenty-three women were used in the analyses. Male and female subjects did not differ in the pattern of their responses. There were also no significant differences based on gender of the actors in the stimulus material.

Dependent Measures

Five out of the seven dependent measures proved to be highly intercorrelated (correlation coefficients equal to at least .75), indicating that they were measuring similar aspects of status and dominance, whereas two of the measures seemed to be measuring quite different dimensions. The intercorrelations between the measures are shown in Table 3. The five measures that produced similar results were:

- How likely do you think it is that the man/woman in the black shirt will get the seat in this scene?
- How sure of himself/herself does the man/woman in the black shirt seem to be in this scene?
- Based on this scene, how often do you think the man/woman in the black shirt usually gets his/her way?
- How intimidating does the man/woman in the black shirt seem to be in this scene?
- How dominant does the man/woman in the black shirt seem to be in this scene?

The first three of these five measures produced identical patterns of results. The other two measures -- how dominant and how intimidating the person seemed -- produced patterns of results that were identical to each other, and similar to but slightly different from the other three measures.

The remaining two dependent measures were:

- How high status does the man/woman in the black shirt seem to be in this scene? and
- How relaxed does the man/woman in the black shirt seem to be in this scene?

The patterns of results on these two measures were quite different from those on the other measures. Also, these two measures produced different patterns of results from each other. Thus they seem to be measuring different dimensions. Results for these two measures will be discussed separately, after results on the other five measures.

Cues of Physical Dominance vs. Cues of Ignoring

Main Effects: The hypothesis was that cues of ignoring and cues of physical dominance would both create equally strong impressions of dominance and that cues of ignoring would create a stronger impression of status. However, only physical dominance cues created an impression of dominance or status; cues of ignoring had the opposite effect. There was a main effect of use of cues of physical dominance, such that the target actors were rated higher on these five measures when they displayed cues of physical dominance than when they did not. Thus, using physical dominance cues by themselves produced higher ratings than did using no nonverbal behavior, and using physical dominance cues in combination with cues of ignoring produced higher ratings than using cues of ignoring by themselves. There was also a main effect of use of cues of ignoring. Contrary to expectation, target actors were rated lower on these five

measures when they displayed cues of ignoring than when they did not. Cues of ignoring produced lower ratings than did using no nonverbal cues, and used in combination with physical dominance cues, produced lower ratings than using physical dominance cues alone. The relevant means are displayed in Table 4. Significance levels and effect sizes for main effects on all five dependent measures are displayed in Table 5.

In sum, the actors were rated highest on these measures in scenes in which they used only cues of physical dominance. They were rated lowest on these measures in scenes in which they used only cues of ignoring. By themselves, cues of ignoring created less of an impression of dominance or status than using no nonverbal cues at all. Using a combination of the two types of cues produced an impression of dominance or status that was intermediate between the impression created by using cues of physical dominance alone and using cues of ignoring alone.

The use of physical dominance cues seemed to strongly influence impressions of "how dominant" or "how intimidating" the actors were, such that any nonverbal display including these cues increased ratings on these measures. The actors appeared more dominant and more intimidating when using a combination of the two types of cues than they did when using no nonverbal dominance cues. The other three dependent measures behaved differently. The actors appeared more likely to get the seat, more sure of themselves, and more like they usually got their way when using no nonverbal cues than when using a combination. (See Table 4.)

Interactions: Combining the two types of cues does decrease impressions of dominance or status. Mean ratings on all five dependent measures for displays combining the two types of cues were lower than they would be if the two main effects were simply added. With the main effects for cues of physical dominance and cues of ignoring taken out, the interaction between the two types of cues is as predicted, such that they are not additive, but subtractive when used together.

Table 16 displays the interaction by showing the means for each type of nonverbal display with the main effects taken out. Significance levels and effect sizes for the interaction on all five dependent measures are displayed in Table 5.

Specific Cues Within Each Type

Main Effects: Within each category of nonverbal cue, particular cues created different impressions. Cues of physical dominance differed significantly from each other. Of the cues of physical dominance, moving close to the other person -- invading his or her personal space -- was the most powerful nonverbal cue. The actors were rated higher on all five dependent measures when using this cue than when using any other physical dominance cue. Means for each individual physical dominance cue on each dependent measure and *F*-values for these differences are displayed in Tables 11 through 15.

The cues of ignoring differed greatly. Two of the cues -- turning one's back on the other and looking away from the other and not responding verbally -- seem to account partially for the weakness of cues of ignoring. On each of the five dependent measures, turning one's back and not responding produced lower ratings than did the other two cues of ignoring. Furthermore, turning one's back and not responding produced lower ratings on these measures than did using no nonverbal dominance cues at all, whereas the other two cues of ignoring were comparable to using no nonverbal cues. Means for each cue of ignoring on each dependent measure and significance levels and effect sizes for the differences between the cues are displayed in Tables 6 through 10.

One possibility is that the two weakest cues were not seen as dominant whereas the other two ignoring cues were, that is, that the weakness of cues of ignoring is entirely due to these two cues. To test this, for each dependent measure, a linear contrast comparing the two weakest cues of ignoring and the two strongest was performed. Contrast weights of +1 (indicating a positive effect on impressions of dominance) were assigned to the means for not facing the other directly and looking away while listening and looking while speaking, and weights of -1 (indicating a negative effect on impressions of dominance or status) were assigned to the means for the other two cues. The overall *F*'s for differences among the cues of ignoring are large and highly significant, providing some protection for these contrasts from Type I errors. Four out of the five contrasts were highly significant, though the actual significance levels are lower since this is a *post hoc* analysis. The contrast for the question about whether the target actor usually gets his or her way was significant at $p = .05$. Because this is a *post hoc* analysis, the true significance level is lower, and therefore this contrast is not significant. The effect sizes for all of the contrasts were small, however. Since the contrast accounts for so little variance, the weakness of cues of ignoring does not seem attributable to the two weakest cues. Significance levels and effect sizes for the contrasts are presented in Tables 6 through 10.

Sequence of Cues of Ignoring and Cues of Physical Dominance

Two of the combinations of nonverbal cues could not be done simultaneously -- turning slightly away from the other and moving close to the other, and turning one's back on the other and moving close to the other -- and thus were performed sequentially, and shown to subjects in

both orders (ignore first, then physically dominate, and physically dominate first, and then ignore). There was no systematic effect of using one type of cue first and then switching to the other.

Results for Remaining Two Dependent Measures

According to the hypotheses of this study, the question "How high status does the man/woman in the black shirt seem to be?" should have been affected positively by cues of ignoring and less strongly by cues of physical dominance. However, physical dominance cues did not affect it, and ignoring cues decreased ratings on this measure. The only significant main effect was for cues of ignoring. Again, contrary to expectation, the actors were rated as more high status when not using cues of ignoring than when using cues of ignoring (F (1, 26) = 82.61, $p < .001$, *eta* = .87). Whether or not actors used cues of physical dominance had no effect on this measure (F (1, 26) = .554, $p = .457$, *eta* = .14). The two types of cues did not interact.

Again, there were significant differences among the cues of ignoring (overall F (4, 164) = 33.12, $p < .0001$). Two of the cues produced the lowest ratings: turning one's back and looking away and not responding verbally, as shown in Table 17.

The question "How relaxed does the man/woman in the black shirt seem to be in this scene?" was intended to be a measure of status. However, this measure showed a very different pattern of results from any of the other measures. It was negatively affected by both types of nonverbal displays. There were significant main effects for both types of cues, as shown by the means in

Table 4. The actors appeared less relaxed when they displayed physical dominance cues than when they did not (F (1, 26) = 74.91, $p < .001$, *eta* = .86.) They also appeared less relaxed when they displayed cues of ignoring than when they did not (F (1, 26) = 41.45, $p < .001$, *eta* = .78.) There was also a significant interaction between the two types of cues (F (1, 26) = 21.76, $p < .001$, *eta* = .67.) With the main effects taken out, the interaction residuals show that cues of ignoring by themselves and physical dominance cues by themselves produced lower ratings of relaxed appearance than did a combination of the two types of cues. Table 19 shows the means with the main effects taken out.

As on all the other measures, there were significant differences among the cues of ignoring (overall F (4, 164) = 23.12, $p < .0001$.) Turning one's back and looking away and not responding verbally made the actors appear less relaxed than the other two ignoring cues, as displayed in Table 18.

Follow-up Questionnaire

Cues of ignoring have been found in the past to be status cues. In this study, however, they were clearly not functioning as status cues. To ascertain what kind of impression they were creating, a brief follow-up questionnaire was given to a separate group of twelve subjects. Subjects viewed scenes from the tapes of both the male and female actors showing displays of each of the cues of ignoring and each of the cues of physical dominance, as well as the scene with no nonverbal dominance cues. None of the combinations of the two types of cues were shown. Subjects were asked whether the behavior in each scene "makes the person look like he or she is

submitting, giving in to the other person," "does not make the person look like he or she is submitting, giving in to the other person," or "makes the person look like he or she is unsure of what to do." They were told that they could check off more than one response for each scene. This questionnaire appears in Appendix C; the results are tabulated in Table 20.

Cues of Physical Dominance: No subjects said that any of the physical dominance cues looked submissive. Almost all said that the actors did not look submissive when using these cues. Only one subject said that any of the physical dominance cues made the actors appear unsure of what to do.

Cues of Ignoring: Only cues of ignoring were seen as submissive, and it was predominantly turning one's back and looking away and not responding verbally that were seen as submissive. Mostly, subjects said that these two cues made the actors appear unsure of what to do. Nine out of twelve subjects said that looking away and not responding verbally made the actors seem uncertain; three of these subjects also said this made them seem submissive. All twelve subjects said that the male actor looked unsure of what to do when turning his back; half of these also said it made him look submissive. Six subjects said that the female actor looked unsure when turning her back; three of these said she also looked submissive. Three other subjects said only that this made her look submissive.

No Nonverbal Dominance Cues: No subjects said that this display looked submissive. Most said it did not look submissive, and a few said it made the actors appear unsure of what to do.

This questionnaire shows a sharp distinction between cues of physical dominance and cues of ignoring. Cues of physical dominance clearly create an impression of dominance. The cues of ignoring, however, seem to indicate either uncertainty or submissiveness. All of the displays of

cues of ignoring made at least some subjects say that the actors appeared uncertain. Displays of the two weakest cues, turning one's back and looking away and not responding verbally, produced the greatest agreement that the actors looked uncertain, and also made the actors appear submissive to some subjects. Thus, the displays of ignoring cues in this study were not conveying ignoring, but uncertainty or submissiveness.

CHAPTER 4: DISCUSSION

The hypotheses of this study were 1) that cues of ignoring would be more effective than cues of physical dominance for communicating status, 2) that the two types of cues would be equally effective for communicating dominance, 3) that using the two types of cues in combination would be less effective for communicating status and dominance than using either type by itself, that is, that the two types of cues would not be additive, and 4) that gender of the person displaying the nonverbal cues would not affect how the cues were perceived. This study remains inconclusive with respect to the first three of these hypotheses, because the subjects did not see the cues of ignoring in this study as status or dominance cues. The follow-up questionnaire indicates that the cues of ignoring conveyed uncertainty and possibly submissiveness. Previous studies have found these behaviors to be status cues. Two factors that changed the meaning of the cues of ignoring may account for this disparity between how cues of ignoring have been perceived in past studies and how they were perceived in this study. One factor is how cues of ignoring appeared in the specific context portrayed -- a dispute over a tangible resource. The other factor is how the combination of verbal and nonverbal behavior affected the total message conveyed by the cues of ignoring. This study did, however, support the fourth hypothesis that dominance cues will be as effective when a female interacts with another female as when a male interacts with another male.

Dependent Measures

The dependent measures had been selected with the hope that status and dominance could be measured separately, that some of the measures would reflect judgments of status and others, judgments of dominance. Instead, status and dominance seemed to overlap almost completely. Five of the measures were highly intercorrelated, and two of the measures had low correlations with the other five measures and with each other. It is unclear whether subjects considered the five highly intercorrelated measures to be measures of dominance, the ability to get one's way in the particular situation shown in the tape, or status, the ability to get one's way in many situations. In form, some of the measures refer explicitly to dominance. The questions about how dominant and how intimidating the person seems to be refer to how the person appears in this particular situation. Also, getting the seat in this one situation is not necessarily a predictor of getting a seat in other similar situations. Seeming sure of oneself could be a cross-situational measure -- it presumably reflects one's knowledge of how well one has handled such conflicts in the past. Only the question about whether the person usually gets his or her way explicitly refers to other situations besides the one being viewed. Dominance and status are almost completely confounded in the situation shown in this study: the people are strangers, there is no authority structure which can settle the dispute, and relative socioeconomic status is irrelevant to who gets the seat. The relative status of the people in the situation can be based only on ability to be dominant. Thus, in retrospect, it is not surprising that the dependent measures do not distinguish the two concepts. This is perhaps an inherent difficulty in studying nonverbal behavior. To study it, one has to show a particular situation, which makes measuring a cross-situational concept such as status difficult.

The question "How high status does the man/woman in the black shirt seem to be?" was the only dependent measure that asked explicitly about status. It is possible that it measured status and not dominance, since it was correlated with the five measures that clustered together, but correlated less highly with these than they did with each other (see Table 3). However, since so few variables affected this measure, it is difficult to interpret. Subjects were told that the question did not refer to socioeconomic status, so that it was up to them to decide what "status" meant. Several subjects mentioned that they found the question confusing and that it was the most difficult of the seven questions to answer. This question may have been measuring something like status as defined in this paper, because it had a higher correlation with "usually gets way" ($r = .54$) than with any other dependent measure, and whether someone usually gets his or her way is closest to my definition of status. The only variable that affected this measure was the use of cues of ignoring, which produced lower ratings. Since the displays of ignoring in this study seemed to convey uncertainty rather than status or dominance, one conclusion is that uncertainty makes one appear lower in status.

It is interesting that displays of physical dominance cues did not affect this measure. Mean ratings on the measure for displays of physical dominance cues and no nonverbal cues at all were almost the same (see Table 4). The irrelevance of physical dominance cues for this direct judgment of status could reflect the notion that if one is truly high status, one does not have to rely on physical dominance at all, making such displays unnecessary. A famous quote from Isaac Asimov's *Foundation* series captures this notion: "Violence is the last refuge of the incompetent." If physical dominance displays do not affect this measure, then one direction for future research would be to investigate the kinds of displays that would affect it: displays of resources, showing the target actor in a group with others who are deferential, and other nonverbal status cues. It remains to be seen how cues of ignoring, when perceived as status cues,

would affect judgments on this measure. If they did affect it positively, whereas cues of physical dominance did not affect it, then there would be strong support for the hypothesis that cues of ignoring are stronger status cues than are cues of physical dominance.

Past research has found that higher status people appear more relaxed than lower status people (Henley, 1977; Mehrabian, 1981). Thus the question "How relaxed does the man/woman in the black shirt seem to be?" was intended to reflect subjects judgments of status. Since the correlations between this measure and all of the other measures were so low, this question may have been measuring something quite different from the other measures. Any display of either kind of nonverbal cues made the actors appear less relaxed. Thus, this may have been measuring something like activity.

Cues of Ignoring

The hypotheses were that cues of ignoring would be more effective for communicating status and just as effective for communicating dominance as physical dominance cues. The results of this study are inconclusive with respect to these hypotheses, because the cues of ignoring in this study did not seem to be perceived as status cues. Since these behaviors have been found in the past to be status cues, there is clearly something different about the way these cues appeared in the stimuli used in the present study. Although two of the cues -- turning one's back and looking away and not responding verbally -- produced lower ratings than the other two ignoring cues on all the dependent measures, the weakness of cues of ignoring as status and dominance cues is only partially attributable to these two. The hypothesis that these two cues were not seen as dominant and that the other two cues were seen as dominant was tested using

linear contrasts comparing the mean ratings for these two cues with the mean ratings on the other two ignoring cues for each dependent measure. These contrasts were significant but accounted for only 3% - 11% of the variance on the dependent measures (see Tables 6 through 10).

Two aspects of this study can explain why the cues of ignoring appeared as they did: the way that verbal and nonverbal behaviors were combined may have changed the message conveyed by the cues of ignoring, and the specific situation shown in the stimulus videotapes may also have affected the meaning of these behaviors. The meaning of nonverbal behavior depends on the verbal behavior with which it is being used in more complex ways than the design of this study had taken into account. This study was designed with the assumption that one could hold verbal behavior constant and vary nonverbal behavior without affecting the meaning of the nonverbal behavior. This assumption was an oversimplification of a complex aspect of communication. The meaning of nonverbal behavior can change when used with different verbal behaviors, and vice versa. The target actor's final statement, "This isn't your seat; this is my seat," is an explicit claim to the resource and thus is a dominance and status cue in itself. It is a verbal rather than a nonverbal cue. The assumption that status and dominance cues can be looked at atomistically, one cue at a time, is probably wrong. There are many aspects of a person's behavior that convey an attitude of ignoring or of physical dominance, and these can perhaps not be studied in complete isolation from one another. These behaviors are not usually performed one at a time; rather, several aspects of behavior convey the same message.

However, studying status and dominance cues atomistically may change the meaning of the cues enough that one is studying a substantially different phenomenon. My definition of cues of ignoring is "any nonverbal behavior that indicates a lack of attentional monitoring, or a failure to engage the other person in some way, anything that indicates one is ignoring, not attending to the

other person." Most of the displays involving cues of ignoring in the stimulus videotapes were displays in which the actors simultaneously did something nonverbal to indicate ignoring and spoke to the other person, responding directly to his or her claim to the seat. The total message conveyed by such a display is not one of ignoring. If one speaks to someone else and responds directly to what the other person has said, one cannot appear to be ignoring the other. Combining a verbal status and dominance cue with a nonverbal cue of ignoring changes the meaning of the ignoring behavior.

One prediction was that cues of ignoring and cues of physical dominance would be subtractive in effects on impressions of status and dominance when used in combination, because one cannot simultaneously ignore someone and signal aggression towards them. In the same way, one cannot simultaneously ignore someone and respond to their challenge verbally. Thus, one problem with the way verbal and nonverbal behavior was displayed in this study is that there is not any pure ignoring behavior in any of the scenes in which the target actor made a verbal claim to the resource; there is only the combination of a verbal dominance cue and nonverbal ignoring behavior. This combination lowered ratings of dominance and status because it changed the meaning of the ignoring behavior. This is exactly the kind of lack of additivity that my original hypothesis was about.

The study could be modified to address these problems. Two kinds of verbal cues could be crossed with the nonverbal behaviors: not saying anything to the other person and making an explicit claim to the resource. Thus, in addition to the sorts of displays used in the current study, there would be displays of nonverbal cues of ignoring combined with the "verbal" cue of ignoring of not saying anything, and displays of physical dominance combined with not saying anything.

This would enable a systematic analysis of how verbal dominance cues combine with nonverbal cues of ignoring and physical dominance and how verbal ignoring cues combine with both types of nonverbal cues.

The way verbal and nonverbal behavior combine is not a complete explanation for the way that the cues of ignoring appeared in this study, however. One nonverbal cue of ignoring was specifically chosen so that it did not involve a verbal claim to the resource -- looking away while the other is speaking and not responding verbally. This cue produced the lowest ratings on measures of dominance and status, and so clearly was not interpreted as a status cue. On the follow-up questionnaire, a few subjects said that looking away and not responding verbally looked submissive, but most said it made the actors appear unsure of what to do. One subject in the main study remarked about this scene (for the male actors), that "it made him look like he was trying to decide whether or not to haul off and punch the guy." Many subjects on the follow-up questionnaire also said that turning one's back made the actors appear unsure of what to do. Thus, the message conveyed by these cues was not ignoring, but indecisiveness.

The specific situation portrayed in the videotapes can explain why these behaviors that have been found in the past to convey status or dominance convey indecisiveness in this study. None of these cues have been studied in the context of a direct conflict over a tangible resource. Turning one's back has been documented as a status cue by naturalistic observations of people not in conflict who actually differ in status (Mehrabian, 1981). Looking away has been documented by observing people who actually differ in status (ROTC cadets and officers)

working together on a problem-solving task (Exline, Ellyson, & Long, 1975), or by showing subjects videotapes of two people working together on a task and getting their judgments of relative dominance (Dovidio & Ellyson, 1982). In these contexts, these cues function as status cues.

However, when there is a dispute over a tangible resource, the most obvious way to ignore the other person and resolve the dispute may be to go ahead and take the resource in spite of the other person's challenge. The actors in this study were not shown taking the resource. They made a verbal claim to it and displayed nonverbal cues, but the outcome of the situation remained ambiguous, in order to assess how the nonverbal displays would affect subjects' impressions of what the outcome would be. However, in this context, the actor's not taking the resource may be informative in and of itself. If someone were truly confident and truly high status, he or she would simply sit down in the seat and ignore the other's challenge. That the actors do not do so indicates uncertainty, which in turn may indicate that they are not sufficiently higher in status than the other to be able to take the resource. Additional support for this interpretation comes from the fact that these two cues also produced the lowest ratings on relaxed appearance. They may have made the actors appear tense, nervous, and uncertain.

Thus, context can change the meaning of nonverbal cues. When used in a situation in which there is no tangible resource, these cues are status displays. One original hypothesis was that cues of ignoring would seem most powerful as status cues when used in response to a direct threat or challenge. In that situation, they would convey a lack of fear most strongly. In a context in which there is a tangible resource, however, these cues may not convey status or a lack of fear unless used while taking the resource. One important conclusion from this study, then, is that

there is a danger in studying nonverbal behavior in one social context and concluding that the behavior always means the same thing. Nonverbal communication shows a sensitive dependence on context.

This study could also be modified to address this problem of how not taking the resource makes the actors appear. One possible change would be for the actor to already be in possession of the resource, and to maintain possession while responding to a challenge from another person by using either cues of ignoring or cues of physical dominance or both. Having the resource is itself a status and dominance cue, but the nonverbal cues should not change meaning when used in combination with this cue. Another way the study could be done is to show the target actor respond to a challenge for the resource by taking it and simultaneously using cues of ignoring or cues of physical dominance or both. A third way to change the study would be to show the actors in a dispute over some resource that is not present, or is not tangible.

Interaction Between the Two Types of Cues

With such strong main effects, the interaction between the two types of cues is difficult to interpret. The mean rating on each dependent measure for nonverbal displays combining the two types of cues is lower than it would be if the positive effects of cues of physical dominance and the negative effects of cues of ignoring were simply added (compare Tables 4 and 16). Many of the displays looked odd, *e.g.*, turning one's back on the other person and claiming very loudly "This is my seat," or looking away from the other person and pushing one's chest out at the same time. These are unnatural things to do. Some subjects found these displays funny. Had any of the ignoring cues been seen as dominant and as ignoring, the interaction would have provided partial support for my hypothesis that dominance or status cues of different types cannot be used together to create an effective dominance or status display. As the results stand, the only

conclusion about this significant interaction is that combining a physical dominance cue with a verbal dominance cue and a display of indecisiveness appears odd and unnatural, and that this unnaturalness lowers ratings on measures of dominance and status.

Gender and Dominance Cues

Previous research has found differences in how men and women are perceived when displaying dominance cues (Henley & Harmon, 1985). An evolutionary perspective, however, leads to the prediction that men's and women's displays of dominance will not be perceived differently in many contexts. As discussed in Chapter 1, both men and women compete for many vital resources. Thus, the evolutionary prediction is that the psychology of status and dominance will not differ between the sexes except in those contexts in which males and females competed for different resources in our evolutionary past, *e.g.*, in contexts of sexual competition. Thus, in same-sex interactions, my hypothesis was that nonverbal status and dominance cues would be perceived in the same way for both sexes. This prediction was confirmed by this experiment. Gender of the actors had no effect on how these cues were perceived. The same pattern of main effects and interactions was obtained for both the male and female actor. As in Henley and Harmon's study, subjects' gender had no effect on ratings of dominance or status, nor were there interactions between gender of actor and gender of subject. Cues of physical dominance had as strong a positive effect on the female actor's appearance of dominance and status as on the male actor's appearance. In fact, she was rated as a little more dominant and intimidating than the male actor, but the difference was not close to significance. Thus, the results of this study confirm the expectation that men and women will not be perceived differently when using dominance cues in a same-sex interaction.

These results are quite different from those of Henley and Harmon (1985), and they call into question Henley and Harmon's generalization that women are seen as less dominant than are men when using dominance cues. They found that women were seen as more sexual than men when using these cues, so their explanation of their results is that such nonverbal displays make women appear sexual rather than dominant. Since these authors do not report separate results for each of their four nonverbal dominance cues -- invading another's space, touching, pointing, and standing over someone who is sitting -- it is unclear whether they found the same results for all four cues. Invading space and touching seem as if they could most easily be seen as sexual. Standing over someone could be seen as sexual, but it seems doubtful that pointing was seen in that way. Because of the way their results are reported, direct comparisons between specific nonverbal cues in the two studies are difficult, but I will assume that Henley and Harmon found their results at least for the cues of invading space and touching. The only nonverbal cue used in both studies was invading another's space. The results of the current study were quite different from Henley and Harmon's results for this cue. In the present study it was the most powerful physical dominance cue, and was equally effective for both the male and female actors in creating an impression of dominance or status. Even pushing one's chest out, which could easily make a woman appear sexual rather than dominant, made male and female actors appear equally dominant.

Henley and Harmon (1985) do not report separate results for how dominant their actors appeared when interacting with members of their own sex. It is unknown whether men gesturing towards men were seen as significantly more dominant than women gesturing towards women. They do report that the greatest difference in dominance ratings was between men gesturing towards women and women gesturing towards men. Thus, it is possible that the women appeared sexual rather than dominant only when interacting with men. Given the results of the current

study for same-sex interactions, this seems to be a reasonable assumption. Chapter 1 discusses why certain nonverbal behaviors might change their meaning from power to sexuality when used in mixed-sex interactions. The current study indicates that physical dominance cues are equally effective for men and women when used with others of their own sex.

There was little social context provided for the subjects in Henley and Harmon's study. The instructions to their subjects said that they would be seeing some scenes with two people interacting, that they were to assume that the people have a relationship outside this scene, and that their behavior reflects this relationship. With no information about social context whatsoever, a reasonable first assumption when one sees a picture of a man and a woman close together is that there is a romantic or sexual component to their relationship, and that their behavior reflects this. Thus it was not unreasonable for their subjects to have interpreted some nonverbal gestures in that way. There remains the question of why women were seen as more sexual than men. This may have to do with the fact that dominance displays are displays of sexual attractiveness for men. It would be interesting to know if the subjects had been asked how attractive the man looked whether he would have been rated as more attractive the more dominance gestures he used.

It is possible that Henley and Harmon's (1985) results would have been different if they had given their subjects instructions to focus them on the dimension of power and status: "these are two co-workers in a dispute" or "these are two people arguing over who is going to get some resource." A modification of the current study would be to show the same situation -- a dispute over a seat at a rock concert -- between a man and a woman to see if dominance cues are perceived differently depending on the sex of the gesturer. In that context, they might be perceived in the same way. Without knowing how men's and women's nonverbal displays of

dominance and status are interpreted in different specific social contexts, it is premature to make generalizations about gender, power, sexuality, and the nonverbal language of oppression. Henley and Harmon's conclusion that women are denied the perception of power and instead seen as sexual when using dominance cues should be more limited. This conclusion can only be made for the particular nonverbal behaviors for which they found this effect and to interactions between members of the opposite sex. Furthermore, their conclusions apply only to displays for which the social context is unknown, which is not true of most nonverbal displays in life outside the laboratory. Overall, the lack of gender differences in the current study underlines the importance of considering whether one can generalize from one's experimental context to real-world situations before making strong conclusions about gender and nonverbal dominance behavior.

Conclusions

This study has highlighted some of the subtleties of doing research on nonverbal behavior. In particular, the results indicate that the way verbal and nonverbal behavior are used together can change the meaning of nonverbal cues. Also, this study highlights the importance of specific contexts for determining the meaning of nonverbal behavior. Dependence on context is a point that is rarely discussed in the literature on nonverbal status and dominance cues; rather, behaviors are discussed as if they will convey status and dominance in all contexts. Perhaps the most important conclusion from the results of this study is that nonverbal behavior cannot be studied atomistically. It is impossible to isolate one behavior at a time. The very fact that no other behavior is going on is taken as behavioral information in itself, *e.g.*, the fact that the target actor

did not simply take the seat was information in itself. Thus, tightly controlled experiments that vary one behavior at a time will not give an accurate understanding of how nonverbal cues are perceived, because one cannot really vary one behavior at a time.

An evolutionary perspective can provide a new framework for understanding research on nonverbal status and dominance cues. It enables the conceptual distinction of status and dominance. If status and dominance cues can be distinguished, then research can discover what kinds of variables affect one, as opposed to the other. This has not been studied previously. The evolutionary approach also gives a very different perspective on gender and nonverbal status and dominance cues. This perspective might enable researchers to discover in what contexts nonverbal behavior can make both men and women appear powerful. Current approaches to this topic provide little guidance for discovering those contexts. Evolutionary psychology can provide new directions for research on this topic by leading one to consider variables and hypotheses that one would not consider from a more conventional perspective. It is my hope that it will prove to be a very powerful theoretical tool for guiding our understanding of one of the most central aspects of human psychology: status.

Footnotes

1. A more complete definition of adaptation is given below.

2. A gene is really an informational entity, a set of instructions for building an organism. DNA is the medium in which this information is represented (Dawkins, 1976; Williams, 1966).

3. Each gene can only exist at a certain locus on the chromosome. Genes that compete for that locus are called rival *alleles* (Dawkins, 1976). In each individual, there can be only one of those rival alleles. Thus, a gene's success can be measured by the number of copies of itself relative to the number of copies of rival alleles in the gene pool, or by the proportion of copies of itself in the gene pool.

4. One way in which a gene can become more numerous is for it to produce a tendency to help relatives who will probably also carry that gene (Hamilton, 1964).

5. There is one exception to this. Some properties of adaptations are *frequency-dependent*, that is, whether a particular property promotes inclusive fitness depends on the frequency of other properties in the population. For example, in some bird species, the frequency of a particular kind of marking that signals subordinate status depends on the frequency of the marking that signals dominant status (Rohwer, 1982).

6. Behavior that promoted inclusive fitness.

7. I am assuming that this is a sexually reproducing species which means that there is genetic recombination with each generation. (Individuals in an asexually reproducing species produce "offspring" that are identical to themselves, by undergoing mitosis.)

8. In biology, it is not the case that "more information is always better." More information is better only when it promotes the inclusive fitness of those individuals that have it.

9. Since status is recognized only in reference to a particular group, and one competes for it only with members of one's own group, it is locally determined. Members of different groups can only have dominance relationships, not status relationships.

10. This is not as asymmetric as it sounds. There are simply very few cases in which individuals in the top few positions in a hierarchy are likely to lose, or where individuals in the bottom few positions are likely to win.

11. Aspects of speech that do not have to do with the verbal content, *e.g.*, accent, hesitations, volume.

References

Barchas, P. R. & Fisek, M. H. (1984). Hierarchical differentiation in newly formed groups of rhesus and humans. In P. R. Barchas (Ed.), *Social hierarchies* (pp. 23-44). Westport, Connecticut: Greenwood Press.

Berger, J., Fisek, M. H., Norman, R. A., & Zelditch, M. Jr. (1977). *Status characteristics and social interaction: An expectation states approach.* New York: Elsevier Scientific Publishing Co..

Berger, J., Webster, M., Ridgeway, C., & Rosenholtz, S.J. (1986). Status cues, expectations, and behavior. *Advances in Group Processes, 3,* 1-22.

Buss, D.M. (1989). Sex differences in human mate preferences: Evolutionary hypotheses tested in 37 cultures. *Behavioral and Brain Sciences, 12,* 1-49.

Chase, I. D. (1984). Social process and hierarchy formation in small groups: A comparative perspective. In P. R. Barchas (Ed.), *Social hierarchies* (pp. 45-88). Westport, Connecticut: Greenwood Press.

Cosmides, L. & Tooby, J. (1987). From evolution to behavior: Evolutionary psychology as the missing link. In J. Dupré (Ed.), *The latest on the best: Essays on evolution and optimality* (pp. 277-306). Cambridge, Massachusetts: MIT Press.

Darwin, C. (1859). *The origin of species.* London: John Murray.

Dawkins, R. (1976). *The selfish gene.* New York: Oxford University Press.

Dawkins, R. & Krebs, J.R. (1978). Animal signals: Information or manipulation? In J.R. Krebs & N.B. Davies (Eds.), *Behavioural ecology: An evolutionary approach* (pp. 282-309). Sunderland, Massachusetts: Sinauer Associates.

Dovidio, J. F., Brown, C. E., Heltman, K., Ellyson, S. L., & Keating, C. F. (1988). Power displays between women and men in discussions of gender-linked tasks: A multichannel study. *Journal of Personality and Social Psychology, 55*, 580-587.

Dovidio, J. F. & Ellyson, S. L. (1982). Decoding visual dominance behavior: Attributions of power based on the relative percentages of looking while speaking and looking while listening. *Social Psychology Quarterly, 45*, 106-113.

Ellyson, S. L. & Dovidio, J. F. (1985). Power, dominance, and nonverbal behavior: Basic concepts and issues. In S. L. Ellyson & J. F. Dovidio (Eds.), *Power, dominance, and nonverbal behavior* (pp. 1-27). New York: Springer-Verlag.

Exline, R.V., Ellyson, S.L., & Long, B. (1975). Visual behavior as an aspect of power role relationships. In P. Pliner, L. Krames, & T. Alloway (Eds.), *Advances in the study of communication and affect* (pp. 21-52). New York: Plenum Press.

Fisek, M. H. & Ofshe, R. (1970). The process of status evolution. *Sociometry, 33*, 327-346.

Glass, A. L., Holyoak, K. J., & Santa, J. L. (1986). *Cognition*. Menlo Park, California: Addison-Wesley.

Hall, J. A. (1984). *Nonverbal sex differences*. Baltimore: Johns Hopkins University Press.

Hamilton, W.D. (1964). The genetical evolution of social behavior, I & II. *Journal of Theoretical Biology, 104*, 451-471.

Harper, R. G. (1985). Power, dominance, and nonverbal behavior: An overview. In S. L. Ellyson & J. F. Dovidio (Eds.), *Power, dominance, and nonverbal behavior* (pp. 29-48). New York: Springer-Verlag.

Henley, N. M. (1977). *Body politics*. Englewood Cliffs, New Jersey: Prentice Hall.

Henley, N. M. & Harmon, S. (1985). The nonverbal semantics of power and gender: A perceptual study. In S. L. Ellyson, & J. F. Dovidio (Eds.), *Power, dominance, and nonverbal behavior* (pp. 151-164). New York: Springer-Verlag.

Hrdy, S.B. (1981). *The woman that never evolved.* Cambridge, Massachusetts: Harvard University Press.

Keating, C. F. (1985). Human dominance signals: The primate in us. In S. L. Ellyson, & J. F. Dovidio (Eds.), *Power, dominance, and nonverbal behavior* (pp. 89-108). New York: Springer-Verlag.

Lehrman, D.S. (1970). Semantic and conceptual issues in the nature/nurture problem. In L.R. Aronson, & E. Tobach (Eds.), *Development and Evolution of Behavior* (pp. 17-52). San Francisco: W.H. Freeman and Company.

Marr, D. (1982). *Vision.* New York: W.H. Freeman and Company.

Maynard Smith,J. (1974). The theory of games and the evolution of animal conflicts. *Journal of Theoretical Biology, 47,* 209-221.

Maynard Smith,J. (1982). *Evolution and the theory of games.* Cambridge: Cambridge University Press.

Maynard Smith,J. & Price, G. R. (1973). The logic of animal conflict. *Nature, 246,* 15-18.

Mayr, E. (1976). Behavior programs and evolutionary strategies. In E. Mayr (Ed.), *Evolution and the diversity of life: Selected essays* (pp. 87-104). Cambridge: Harvard University Press.

Mehrabian, A. (1968). Inference of attitudes from the posture, orientation, and distance of a communicator. *Journal of Consulting and Clinical Psychology, 32,* 296-308.

Mehrabian, A. (1981). *Silent messages.* Belmont, California: Wadsworth.

Popp, J. L. & DeVore, I. (1979). Aggressive competition and social dominance theory. In D. A. Hamburg & E. R. McCown (Eds.), *The great apes* (pp. 317-340). Menlo Park, California: Benjamin Cummings Publishing Company.

Ridgeway, C. L., Berger, J., & Smith, L. (1985). Nonverbal cues and status: An expectation states approach. *American Journal of Sociology*, 955-979.

Rohwer, S. (1982). The evolution of reliable and unreliable badges of fighting ability. *American Zoologist, 22*, 531-546.

Rosa, E., & Mazur, A. (1979). Incipient status in small groups. *Social Forces, 58*, 18-37.

Sapolsky, R. M. & Ray, J.C. (1989). Styles of dominance and their endocrine correlates among wild olive baboons. *American Journal of Primatology, 18*, 1-13.

Symons, D. (in press). On the use and misuse of Darwinism in the study of human behavior. In J. Barkow, L. Cosmides, & J. Tooby (Eds.), *The adapted mind: Evolutionary psychology and the generation of culture*. Oxford: Oxford University Press.

Tooby, J., & Cosmides, L. (in press). On the universality of human nature and the uniqueness of the individual: The role of genetics and adaptation. *Journal of Personality, 58*.

Trivers, R. (1985). *Social evolution*. Menlo Park, California: Benjamin Cummings Publishing Company.

Weisfeld, G. E. & Beresford, J. M. (1982). Erectness of posture as an indicator of dominance or success in humans. *Motivation and Emotion, 6*, 113-131.

Williams, G.C. (1966). *Adaptation and natural selection*. Princeton, New Jersey: Princeton University Press.

Table 1

Categorization of Nonverbal Cues: Behaviors Used in Study

	Number of Judges Who Categorized this Behavior As:	
	Cue of Ignoring	Cue of Physical Dominance
Turning slightly away from the other, not facing him or her directly	24	0
Looking at the other while speaking, but looking away when he or she speaks	18	3
Turning one's back on the other	22	1
Looking away from the other while he or she does something	21	1
Erect posture, standing to one's full height	0	22
Pushing one's chest out	0	25
Moving close to the other	0	23
Speaking loudly	0	23
Speaking in an angry tone of voice	0	25

Table 2

Categorization of Nonverbal Cues: Behaviors Not Used in Study

	Number of Judges Who Categorized this Behavior As:	
	Cue of Ignoring	Cue of Physical Dominance
Standing with hands on hips	1	20
Interrupting	10	9
Gesturing	0	13
Tilting one's head back while looking at the other	0	15
Approaching the other directly and swiftly	1	20
Touching the other	0	19
Speaking first in an exchange	2	5
Lowering one's brows	1	9
Staring	0	19
Moving in a relaxed manner	0	3
Pointing at the other	0	20
Standing with a relaxed posture	0	2
Being the last to look away when both people look each other in the eye	0	17
Holding one's shoulders out, not hunching them or slumping	0	17
Occupying more space than the other	0	18
Not smiling	2	9

Table 3: Intercorrelations Among Dependent Measures

	Likely to Get Seat?	Sure of Self?	Usually Gets Way?	Intimi-dating?	Dominant?	High Status?	Relaxed?
Likely to Get Seat?	1.0000	0.8117	0.8133	0.7774	0.8260	0.4841	0.1354
Sure of Self?	0.8117	1.0000	0.7901	0.7702	0.7945	0.5337	0.2393
Usually Gets Way?	0.8133	0.7901	1.0000	0.7506	0.7892	0.5404	0.1631
Intimidating?	0.7774	0.7702	0.7506	1.0000	0.8258	0.4250	0.0928
Dominant?	0.8260	0.7945	0.7892	0.8258	1.0000	0.4698	0.1250
High Status?	0.4841	0.5337	0.5404	0.4250	0.4698	1.0000	0.3055
Relaxed?	0.1354	0.2393	0.1631	0.0928	0.1250	0.3055	1.0000

$p < .001$ for all above correlations, $df = 40$

Table 4

Means for Each Type of Nonverbal Display on Each Dependent Measure

	Physical Dominance Cues Only	Ignoring Cues Only	Combination of the Two Types	No Nonverbal Cues
Likely to Get Seat?	5.19	3.88	4.17	4.31
Sure of Self?	5.40	3.91	4.15	4.46
Usually Gets Way?	5.20	3.98	4.24	4.30
Dominant?	5.10	3.57	3.98	3.80
Intimidating?	5.00	3.40	3.96	3.50
High Status?	4.30	3.71	3.65	4.25
Relaxed?	3.50	3.68	3.18	4.90

Table 5

F-Values, Significance Levels, and Effect Sizes for Each Dependent Measure

	Main Effect for Using Physical Dominance Cues[1]	Main Effect for Using Ignoring Cues[2]	Interaction Between the Two Types of Cues[3]
Likely to Get Seat?	F (1, 26) = 27.37 p <.001 *eta* = .72	F (1, 26) = 133.52 p <.001 *eta* = .91	F (1, 26) = 9.02 p = .003 *eta* = .51
Sure of Self?	F (1, 26) = 17.83 p <.001 *eta* = .64	F (1, 26) = 154.36 p <.001 *eta* = .92	F (1, 26) = 9.34 p = .002 *eta* = .51
Usually Gets Way?	F (1, 26) = 24.80 p <.001 *eta* = .70	F (1, 26) = 112.83 p <.001 *eta* = .90	F (1, 26) = 9.26 p = .002 *eta* = .51
Dominant?	F (1, 26) = 55.43 p <.001 *eta* = .82	F (1, 26) = 136.35 p <.001 *eta* = .92	F (1, 26) = 20.92 p <.001 *eta* = .67
Intimidating?	F (1, 26) = 81.79 p <.001 *eta* = .87	F (1, 26) = 110.10 p <.001 *eta* = .90	F (1, 26) = 19.08 p <.001 *eta* = .60

[1] - Each of these measures was rated higher when the target actor used physical dominance cues than when he or she did not.

[2] - Each of these measures was rated lower when the target actor used cues of ignoring than when he or she did not.

[3] - In addition to the main effects for cues of ignoring and cues of physical dominance, the combination of the two types of cues lowers ratings on these five measures, that is, the combination is sub-additive.

Table 6

Mean Ratings of "How Likely Target Actor Is to Get Seat" For Each Cue of Ignoring

	No Nonverbal Cues	Turning Away, Not Facing Other Directly	Turning One's Back	Looking Away While Listening, Looking While Speaking	Looking Away and Not Responding Verbally
Cue Used Alone	4.31	4.58	3.55	4.38	2.99
Cue Combined with Cues of Physical Dominance[1]	5.19[2]	4.76	4.12	4.70	3.25
Overall Mean for this Cue	--	4.72	4.01	4.64	3.20

[1] - Average of combination of this cue of ignoring with all four physical dominance cues

[2] - Average of all four physical dominance cues when not combined with anything

Overall F for differences among cues of ignoring:

$F\ (4, 164) = 70.08, p < .0001$

Linear contrast comparing two weakest to two strongest cues:

$F\ (1, 164) = 14.93, p < .001, eta^2 = .08$

Table 7

Mean Ratings of "How Sure of Self Target Actor Seems" for Each Cue of Ignoring

	No Nonverbal Cues	Turning Away, Not Facing Other Directly	Turning One's Back	Looking Away While Listening, Looking While Speaking	Looking Away and Not Responding Verbally
Cue Used Alone	4.46	4.77	3.40	4.35	3.12
Cue Combined with Cues of Physical Dominance[1]	5.40[2]	4.82	3.83	4.72	3.23
Overall Mean for this Cue	--	4.81	3.74	4.65	3.21

[1] - Average of combination of this cue of ignoring with all four physical dominance cues

[2] - Average of all four physical dominance cues when not combined with anything

Overall F for differences among cues of ignoring:

$F(4, 164) = 68.15, p < .0001$

Linear contrast comparing two weakest to two strongest cues:

$F(1, 164) = 16.14, p < .001, eta^2 = .09$

Table 8

Mean Ratings of "Whether Target Actor Usually Gets Way" for Each Cue of Ignoring

	No Nonverbal Cues	Turning Away, Not Facing Other Directly	Turning One's Back	Looking Away While Listening, Looking While Speaking	Looking Away and Not Responding Verbally
Cue Used Alone	4.30	4.62	3.55	4.34	3.40
Cue Combined With Cues of Physical Dominance[1]	5.20[2]	4.68	3.92	4.67	3.56
Overall Mean for this Cue	--	4.67	3.85	4.60	3.53

[1] - Average of combination of this cue of ignoring with all four physical dominance cues

[2] - Average of all four physical dominance cues when not combined with anything

Overall F for differences among cues of ignoring:

$F\ (4, 164) = 53.00, p < .0001$

Linear contrast comparing two weakest to two strongest cues:

$F\ (1, 164) = 4.45, p < .05, eta^2 = .03$

Table 9

Mean Ratings of "How Dominant Target Actor Seems" for Each Cue of Ignoring

	No Nonverbal Cues	Turning Away, Not Facing Other Directly	Turning One's Back	Looking Away While Listening, Looking While Speaking	Looking Away and Not Responding Verbally
Cue Used Alone	3.80	4.36	3.00	4.10	2.83
Cue Combined With Cues of Physical Dominance[1]	5.10[2]	4.55	3.56	4.56	3.14
Overall Mean for this Cue	--	4.51	3.45	4.47	3.08

[1] - Average of combination of this cue of ignoring with all four physical dominance cues

[2] - Average of all four physical dominance cues when not combined with anything

Overall F for differences among cues of ignoring:

$F(4, 164) = 79.83, p < .0001$

Linear contrast comparing two weakest to two strongest cues:

$F(1, 164) = 20.96\ p < .001, eta^2 = .11$

Table 10

Mean Ratings of "How Intimidating Target Actor Seems" for Each Cue of Ignoring

	No Nonverbal Cues	Turning Away, Not Facing Other Directly	Turning One's Back	Looking Away While Listening, Looking While Speaking	Looking Away and Not Responding Verbally
Cue Used Alone	3.50	3.96	3.01	3.86	2.78
Cue Combined With Cues of Physical Dominance[1]	5.00[2]	4.48	3.52	4.56	3.15
Overall Mean for this Cue	--	4.38	3.42	4.42	3.08

[1] - Average of combination of this cue of ignoring with all four physical dominance cues

[2] - Average of all four physical dominance cues when not combined with anything

Overall F for differences among cues of ignoring:

$F\ (4, 164) = 61.62, p < .0001$

Linear contrast comparing two weakest to two strongest cues:

$F\ (1, 164) = 16.68\ p < .001, eta^2 = .09$

Table 11

Mean Ratings of "How Likely Target Actor Is to Get Seat" for Each Physical Dominance Cue

	No Nonverbal Cues	Pushing One's Chest Out	Standing to One's Full Height	Speaking Loudly	Moving Close to the Other (Invading Space)
Cue Used Alone	4.31	4.49	5.12	5.10	6.04
Cue Combined With Cues of Ignoring[1]	3.88[2]	3.79	3.60	4.19	5.06

[1] - Average of combination of this physical dominance cue with all four cues of ignoring

[2] - Average of all four ignoring cues when not combined with anything

Overall F for differences among cues of physical dominance:

$F(4, 164) = 95.57, p < .00001$

Table 12

Mean Ratings of "How Sure of Self Target Actor Seems" for Each Physical Dominance Cue

	No Nonverbal Cues	Pushing One's Chest Out	Standing to One's Full Height	Speaking Loudly	Moving Close to the Other (Invading Space)
Cue Used Alone	4.46	4.66	5.48	5.18	6.15
Cue Combined With Cues of Ignoring[1]	3.91[2]	3.79	3.64	4.17	4.98

[1] - Average of combination of this physical dominance cue with all four cues of ignoring

[2] - Average of all four ignoring cues when not combined with anything

Overall F for differences among cues of physical dominance:

$F\ (4, 164) = 69.12, p < .00001$

Table 13

Mean Ratings of "Whether Target Actor Usually Gets Way" for Each Physical Dominance Cue

	No Nonverbal Cues	Pushing One's Chest Out	Standing to One's Full Height	Speaking Loudly	Moving Close to the Other (Invading Space)
Cue Used Alone	4.32	4.54	5.13	5.14	5.84
Cue Combined With Cues of Ignoring[1]	3.98[2]	3.88	3.77	4.29	4.89

[1] - Average of combination of this physical dominance cue with all four cues of ignoring

[2] - Average of all four ignoring cues when not combined with anything

Overall F for differences among cues of physical dominance:

$F\ (4, 164) = 77.62, p < .00001$

Table 14

Mean Ratings of "How Dominant Target Actor Seems" for Each Physical Dominance Cue

	No Nonverbal Cues	Pushing One's Chest Out	Standing to One's Full Height	Speaking Loudly	Moving Close to the Other (Invading Space)
Cue Used Alone	3.78	4.38	4.93	5.04	6.04
Cue Combined With Cues of Ignoring[1]	3.57[2]	3.58	3.36	4.02	4.86

[1] - Average of combination of this physical dominance cue with all four cues of ignoring

[2] - Average of all four ignoring cues when not combined with anything

Overall F for differences among cues of physical dominance:

F (4, 164) = 136.47, $p < .00001$

Table 15

Mean Ratings of "How Intimidating Target Actor Seems" for Each Physical Dominance Cue

	No Nonverbal Cues	Pushing One's Chest Out	Standing to One's Full Height	Speaking Loudly	Moving Close to the Other (Invading Space)
Cue Used Alone	3.54	4.19	4.78	4.94	6.06
Cue Combined With Cues of Ignoring[1]	3.40[2]	3.48	3.30	4.08	4.85

[1] - Average of combination of this physical dominance cue with all four cues of ignoring

[2] - Average of all four ignoring cues when not combined with anything

Overall F for differences among cues of physical dominance:

$F(4, 164) = 139.29, p < .00001$

Table 16

Means for Each Type of Cue Display With Main Effects Removed

	Physical Dominance Cues Only	Ignoring Cues Only	Combination of the Two Types	No Nonverbal Cues
Likely to get seat?	4.88	4.96	4.75	4.46
Sure of self?	4.43	4.43	4.29	3.87
Usually gets way?	4.45	4.45	4.32	3.94
Dominant?	4.22	4.21	4.04	3.50
Intimidating?	4.17	4.17	3.98	3.42

The adjusted means for displays of physical dominance cues only were obtained by taking the corresponding means from Table 4 and subtracting the following terms:
(mean for displays with physical dominance cues - overall mean) and
(mean for displays with no ignoring cues - overall mean)

The adjusted means for displays of ignoring cues only were obtained by taking the corresponding means from Table 4 and subtracting the following terms:
(mean for displays with ignoring cues - overall mean) and
(mean for displays with no physical dominance cues - overall mean)

The adjusted means for displays combining both types of cues were obtained by taking the corresponding means from Table 4 and subtracting the following terms:
(mean for displays with ignoring cues - overall mean) and
(mean for displays with physical dominance cues - overall mean)

The adjusted means for displays with no nonverbal dominance cues were obtained by taking the corresponding means from Table 4 and subtracting the following terms:
(mean for displays with no ignoring cues - overall mean) and
(mean for displays with no physical dominance cues - overall mean)

Table 17

Mean Ratings of "How High Status Target Actor Seems" for Each Cue of Ignoring

	No Nonverbal Cues	Turning Away, Not Facing Other Directly	Turning One's Back	Looking Away While Listening, Looking While Speaking	Looking Away And Not Responding Verbally
Cue Used Alone	4.25	4.33	3.21	4.06	3.25
Cue Combined With Cues of Physical Dominance[1]	4.28[2]	3.88	3.39	3.99	3.30
Overall Mean for this Cue	--	3.97	3.35	4.00	3.29

[1] - Average of combination of this cue of ignoring with all four physical dominance cues

[2] - Average of all four physical dominance cues when not combined with anything

Overall F for differences among cues of ignoring:

F (4, 164) = 33.12, $p < .0001$

Table 18

Mean Ratings of "How Relaxed Target Actor Seems" for Each Cue of Ignoring

	No Nonverbal Cues	Turning Away, Not Facing Other Directly	Turning One's Back	Looking Away While Listening, Looking While Speaking	Looking Away And Not Responding Verbally
Cue Used Alone	4.90	4.25	3.21	4.06	3.18
Cue Combined With Cues of Physical Dominance[1]	3.50[2]	3.47	2.85	3.42	2.98
Overall Mean for this Cue	--	3.63	2.92	3.55	3.02

[1] - Average of combination of this cue of ignoring with all four physical dominance cues

[2] - Average of all four physical dominance cues when not combined with anything

Overall F for differences among cues of ignoring:

$F\ (4, 164) = 23.12, p < .0001$

Linear contrast comparing two weakest to two strongest cues:

$F\ (1, 164) = 6.07, p < .025, eta^2 = .04$

Table 19

Mean Ratings of "How Relaxed Target Actor Seems" for Each Type of Cue Display With Main Effects Removed

	Type of Nonverbal Cue Display:	
	No Cues of Ignoring	Cues of Ignoring
No Physical Dominance Cues	3.96	3.24
Physical Dominance Cues	3.24	3.42

See note on Table 16 for an explanation of how these means were obtained.

Table 20

Tabulation of Results on Follow-up Questionnaire

	Number of Subjects who Said the Behavior in this Scene:					
	Makes Actor Look Like He Is Submitting, Giving in	Makes Actor Look Like She Is Submitting, Giving in	Does Not Make Actor Look Like He Is Submitting	Does Not Make Actor Look Like She Is Submitting	Makes Actor Look Like He Is Unsure of What to Do	Makes Actor Look Like She Is Unsure of What to Do
Actor:	Male	Female	Male	Female	Male	Female
Standing to One's Full Height	0	0	11	12	1	0
Pushing One's Chest Out	0	0	11	12	1	1
Speaking Loudly	0	0	11	11	1	1
Invading Other's Space	0	0	11	12	1	0
Not Facing Other Directly	0	0	10	10	4	2
Looking Away When Listening, Looking When Speaking	1	1	9	10	4	2
Looking Away and Not Responding Verbally	3	4	4	4	9	9
Turning One's Back	6	6	2	5	12	6

Appendix A: Analyzing Fitness Costs and Benefits of Competing in a Hierarchy

Consider two individuals engaging in a competition over some resource. It could be a tangible resource or it could be status. Call one of them the actor, and the other the competitor. The following analysis concerns how competing with the competitor will affect the fitness of the actor. The net effect of the competition on the actor's inclusive fitness can be expressed mathematically as follows:

$$expected\ value = E = p_s B_c - (1 - p_s) C_c - T_c \qquad (1)$$

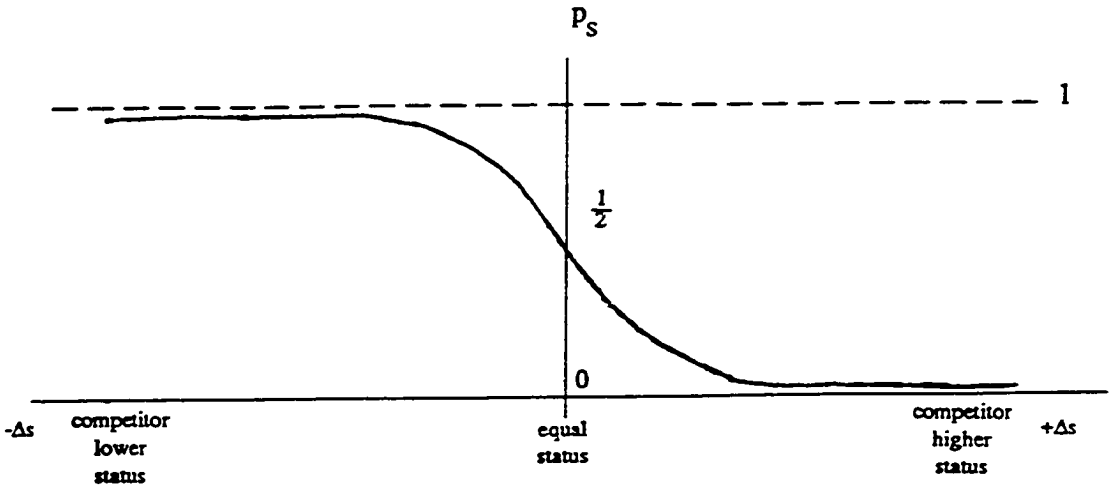
The term p_s represents the probability of the actor winning a competition against the competitor. The term B_c represents the increase in inclusive fitness that would result from gaining access to the resource by winning the competition. C_c represents the cost of losing the competition, the resultant decrease in inclusive fitness, and T_c represents the cost of competing *per se*, that is, the time, energy, and, if it is a physical competition, the possible injury involved in competing, regardless of who wins.

The competitor and the actor will have some status difference, Δs. This value is negative when the actor is higher in status than his or her competitor, zero when they are equal in status, and positive when the actor is lower in status than the competitor. In any actual social group, the status difference between two individuals, Δs, would be able to take on a limited range of values determined by the absolute status levels of the highest and lowest status members of the group. One's absolute status is also relevant in determining what the most adaptive behavior is. For the sake of simplicity, however, this analysis deals only with relative status, Δs, and treats it as if it were unbounded. The status difference between actor and competitor will affect all of the terms

of equation (1) -- the probability of winning, the probability of losing, the degree of benefit to be gained if the actor wins against the competitor, the degree of cost if the actor loses, and the cost of the competition itself. Thus, each of the terms in equation (1) can be written as a function of Δs, the status difference between the actor and competitor.

The probability of the actor's competing successfully, p_s, should decrease as Δs increases, because an actor much lower in status than his or her competitor is not very likely to win a competition. As Δs decreases and becomes negative, p_s should increase, because an actor much higher in status is very likely to win against a competitor. Since p_s is a probability function, it will be bounded between 0 and 1. One plausible functional form is

$$p_s = \frac{k}{(k + ke^{\kappa \Delta s})} \quad k, \kappa \text{ constants} > 0 \qquad (2)$$



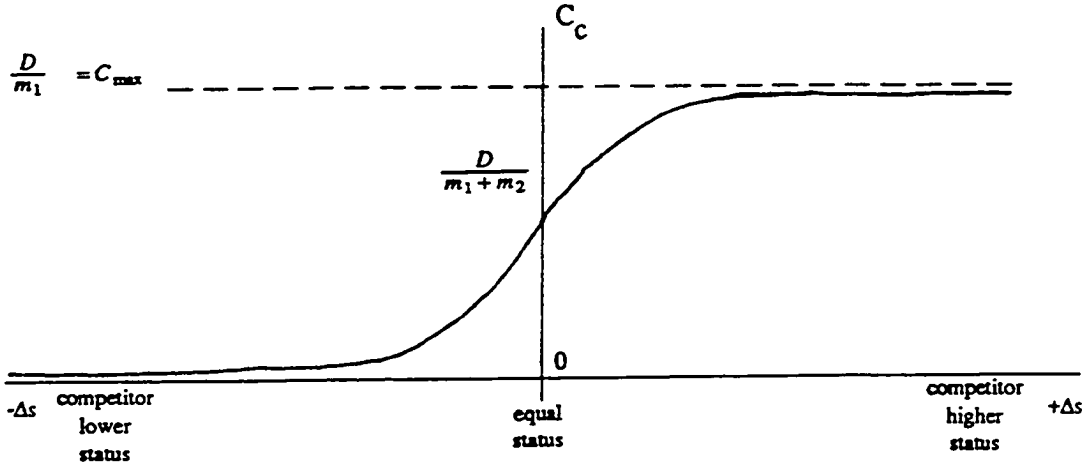
The probability of the actor winning the competition approaches one asymptotically as the competitor is lower in status, and approaches zero asymptotically as the competitor is higher in status.

The cost of losing the competition, C_c, should be a function with three features:

- it should always be positive, because there is always some decrease in inclusive fitness with losing a competition
- it should increase as the competitor is higher in status than the actor
- it should asymptote at some maximum cost (death, perhaps).

A plausible functional form that has these features is one that is bounded between zero and the maximum cost, C_{max}.

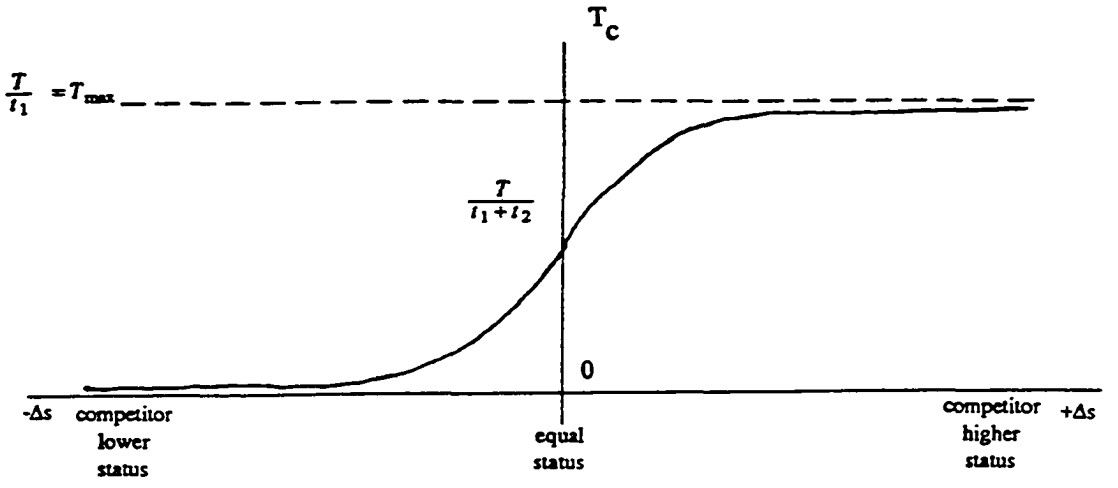
$$C_c = \frac{D}{(m_1 + m_2 e^{-\mu \Delta s})}, \quad C_{max} = \frac{D}{m_1}, \quad D, m_1, m_2, \mu \text{ constants} > 0 \qquad (3)$$



T_c, the cost of the competition *per se* regardless of whether the actor wins or loses, could either be a constant, or could vary with Δs just as C_c does, approaching zero when the competitor

is much lower in status and approaching some maximum cost, T_{max}, when the competitor is much higher in status.

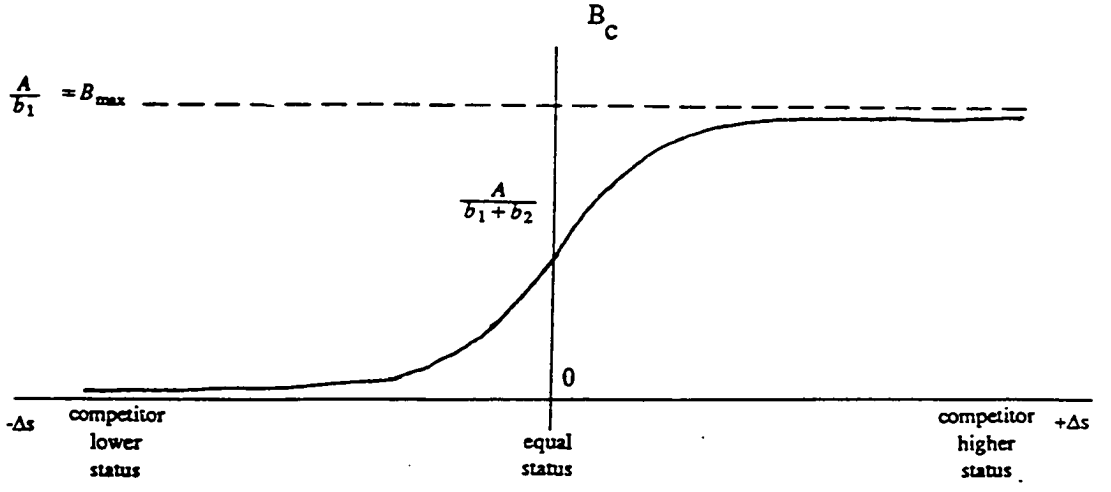
$$T_c = \frac{T}{t_1 + t_2 e^{-\tau \Delta s}}, \quad T_{max} = \frac{T}{t_1}, \quad T, t_1, t_2, \tau \text{ constants} > 0 \qquad (4)$$



The benefit of gaining access to the resource, B_c, could vary with status difference, Δs, in several ways. One feature that any of these possible functions should have is that B_c should always be positive -- an individual always increases his or her inclusive fitness by obtaining more resources. Three possibilities for the form of B_c seem particularly interesting. B_c could asymptote, so that beyond a certain degree of status difference between competitor and actor, there would not be much more for the actor to gain by competing with ever higher status competitors. Where all high status people in a group have roughly the same amount of a resource, this might be the case. For example, food resources in a hunting and gathering society might be distributed in this way. The highest status person might not have that much more food

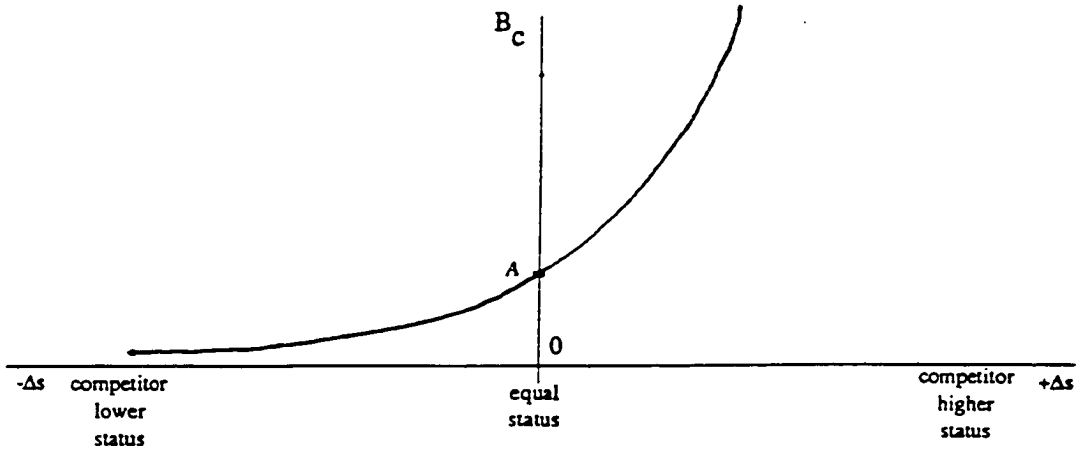
than the fifth highest status person, because there is a limit to how well food will keep when stored. Food resources cannot be stockpiled in the way that other resources can. In a situation such as this in which the amount of resources asymptotes at a certain status level, B_c would be the same sort of exponential function as C_c and T_c, bounded by zero and the maximum benefit, B_{max}.

$$B_c = \frac{A}{(b_1 + b_2 e^{-\beta \Delta s})}, \quad B_{max} = \frac{A}{b_1}, \quad A, b_1, b_2, \beta \text{ constants} > 0 \qquad (5)$$



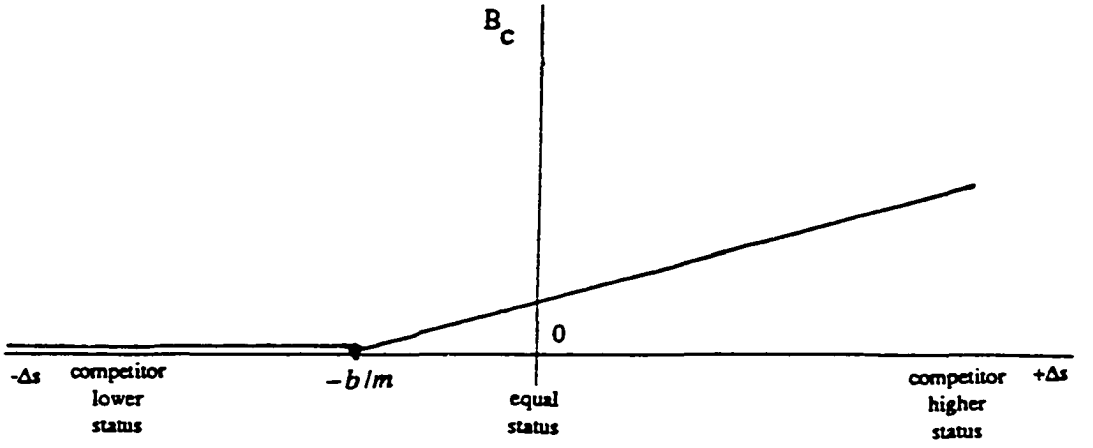
B_c could also increase exponentially with Δs, so that as the competitor is much higher in status, the benefits to be gained by winning a competition against him or her are greater and greater. This could be written as

$$B_c = Ae^{\alpha \Delta s} \quad A, \alpha \text{ constants} > 0 \tag{6}$$



A third possibility is that B_c could increase roughly linearly with Δs, so that each increment in status difference between the actor and the competitor would entail a uniform increment in the benefit to be gained by competing successfully.

$$B_c = \begin{cases} m\Delta s + b & \text{if } \Delta s > -b/m \quad m, b \text{ constants} > 0 \quad (a) \\ \varepsilon & \text{if } \Delta s < -b/m \quad 0 < \varepsilon << 1 \quad (b) \end{cases} \qquad (7)$$



Since B_c must always be positive, it can be defined as the line in equation (7a) only when the values of B_c on that line are positive. Solving (7a) for $B_c = 0$, this is the case when Δs is greater than -b/m. For values of Δs smaller than this, the function is simply constant at a very small value, ε. Thus, when the competitor is enough lower than the actor in status, there is little to be gained by competing with him or her. A more realistic representation would be that below some value of Δs, the function B_c asymptotes to 0, rather than being discontinuous at some value of Δs as above. However, for the sake of mathematical simplicity, this sort of functional form for B_c can be written as (7a) and (7b).

The above equations can be used to discover the expected value of a competition if the actor competes with others of varying degrees of status difference. Expected value is the outcome in

the long run of repeatedly engaging in competitions of a similar type. These equations can be used to predict what would happen to an actor who consistently engaged in competition with others of much higher status, or much lower status, or others close to him or her in status. Equation (1) can be rewritten in terms of Δs, and taking the limit of this expression as Δs becomes large and positive should predict what would happen if the actor competed with others much higher in status. Taking the limit as Δs becomes large and negative should predict what would happen if the actor competed with others much lower in status. Taking the limit as Δs approaches zero should predict what would happen if the actor competed consistently with others of roughly equal status.

There are three cases, depending on the functional form of B_c.

Case I: Benefit to be Gained Asymptotes with Increasing Status Difference

If B_c asymptotes, so that equation (5) applies, then equation (1) can be rewritten as:

$$E = \left[\frac{k}{k + ke^{\kappa\Delta s}}\right]\left[\frac{A}{b_1 + b_2 e^{-\beta\Delta s}}\right] - \left[1 - \frac{k}{k + ke^{\kappa\Delta s}}\right]\left[\frac{D}{m_1 + m_2 e^{-\mu\Delta s}}\right] - \left[\frac{T}{t_1 + t_2 e^{-\tau\Delta s}}\right]$$

When Δs is large and positive, the limit of each term becomes:

$$\lim_{\Delta s \to \infty} p_s = \lim_{\Delta s \to \infty} \left[\frac{k}{k + ke^{\kappa\Delta s}}\right] = 0$$

$$\lim_{\Delta s \to \infty} (1 - p_s) = 1$$

$$\lim_{\Delta s \to \infty} B_c = \lim_{\Delta s \to \infty} \left[\frac{A}{b_1 + b_2 e^{-\beta \Delta s}} \right] = \frac{A}{b_1}$$

$$\lim_{\Delta s \to \infty} C_c = \lim_{\Delta s \to \infty} \left[\frac{D}{m_1 + m_2 e^{-\mu \Delta s}} \right] = \frac{D}{m_1}$$

$$\lim_{\Delta s \to \infty} T_c = \lim_{\Delta s \to \infty} \left[\frac{T}{t_1 + t_2 e^{-\tau \Delta s}} \right] = \frac{T}{t_1}$$

$$\lim_{\Delta s \to \infty} E = \lim_{\Delta s \to \infty} p_s B_c - (1 - p_s) C_c - T_c = 0 \cdot \frac{A}{b_1} - 1 \cdot \frac{D}{m_1} - \frac{T}{t_1} = -\left[\frac{D}{m_1} + \frac{T}{t_1} \right]$$

Thus, competing against others much higher in status leads to a net decrease in inclusive fitness.

When Δs is large and negative, the limit of each term becomes:

$$\lim_{\Delta s \to -\infty} p_s = \lim_{\Delta s \to -\infty} \left[\frac{k}{k + k e^{\kappa \Delta s}} \right] = 1$$

$$\lim_{\Delta s \to -\infty} (1 - p_s) = 0$$

$$\lim_{\Delta s \to \infty} B_c = \lim_{\Delta s \to \infty} \left[\frac{A}{b_1 + b_2 e^{-\beta \Delta s}} \right] = 0$$

$$\lim_{\Delta s \to \infty} C_c = \lim_{\Delta s \to \infty} \left[\frac{D}{m_1 + m_2 e^{-\mu \Delta s}} \right] = 0$$

$$\lim_{\Delta s \to \infty} T_c = \lim_{\Delta s \to \infty} \left[\frac{T}{t_1 + t_2 e^{-\tau \Delta s}} \right] = 0$$

$$\lim_{\Delta s \to \infty} E = \lim_{\Delta s \to \infty} p_s B_c - (1 - p_s) C_c - T_c = 1 \cdot 0 - 0 \cdot 0 - 0 = 0$$

Thus, competing against others much lower in status does not increase an actor's inclusive fitness.

When Δs is zero, the limit of each term is:

$$\lim_{\Delta s \to 0} p_s = \lim_{\Delta s \to 0} \left[\frac{k}{k + k e^{\tau \Delta s}} \right] = \frac{k}{2k} = \frac{1}{2} \quad \text{(for equal status competitors)}$$

$$\lim_{\Delta s \to 0} (1 - p_s) = \frac{1}{2}$$

$$\lim_{\Delta s \to 0} B_c = \lim_{\Delta s \to 0} \left[\frac{A}{b_1 + b_2 e^{-\beta \Delta s}} \right] = \frac{A}{b_1 + b_2}$$

$$\lim_{\Delta s \to 0} C_c = \lim_{\Delta s \to 0} \left[\frac{D}{m_1 + m_2 e^{-\mu \Delta s}} \right] = \frac{D}{m_1 + m_2}$$

$$\lim_{\Delta s \to 0} T_c = \lim_{\Delta s \to 0} \left[\frac{T}{t_1 + t_2 e^{-\tau \Delta s}} \right] = \frac{T}{t_1 + t_2}$$

$$\lim_{\Delta s \to \infty} E = \lim_{\Delta s \to \infty} p_s B_c - (1 - p_s) C_c - T_c = \frac{1}{2} \left[\frac{A}{b_1 + b_2} \right] - \frac{1}{2} \left[\frac{D}{m_1 + m_2} \right] - \left[\frac{T}{t_1 + t_2} \right]$$

Obviously, whether this expression will be positive, zero, or negative depends on the relative size of the constants. If A, which is related to the maximum benefit, is large relative to D and T_{max}, which are related to the maximum costs, and if m_1, m_2, b_1, b_2, t_1, t_2, are of comparable magnitude, then an actor can increase his or her inclusive fitness by competing. Since for some values of these constants, *i.e.* in some situations, an actor can increase his or her fitness by competing against status equals, and since for no values of these constants can an actor increase his or her fitness by competing with others much higher or lower in status, competing against others close in status is a more adaptive strategy than competing against others distant in status.

Case II: Benefit to be Gained Increases Exponentially with Increasing Status Difference

If B_c increases exponentially with Δs, equation (6) applies, and equation (1) can be rewritten as:

$$E = \left[\frac{k}{k + ke^{\kappa\Delta s}}\right]\left[Ae^{\alpha\Delta s}\right] - \left[1 - \frac{k}{k + ke^{\kappa\Delta s}}\right]\left[\frac{D}{m_1 + m_2 e^{-\mu\Delta s}}\right] - \left[\frac{T}{t_1 + t_2 e^{-\tau\Delta s}}\right]$$

When Δs is large and positive, the limit of each term is:

$$\lim_{\Delta s \to \infty} p_s = \lim_{\Delta s \to \infty} \left[\frac{k}{k + ke^{\kappa\Delta s}}\right] = 0$$

$$\lim_{\Delta s \to \infty} (1 - p_s) = 1$$

$$\lim_{\Delta s \to \infty} B_c = \lim_{\Delta s \to \infty} Ae^{\alpha\Delta s} = \infty$$

$$\lim_{\Delta s \to \infty} C_c = \lim_{\Delta s \to \infty} \left[\frac{D}{m_1 + m_2 e^{-\mu\Delta s}}\right] = \frac{D}{m_1}$$

$$\lim_{\Delta s \to \infty} T_c = \lim_{\Delta s \to \infty} \left[\frac{T}{t_1 + t_2 e^{-\tau \Delta s}} \right] = \frac{T}{t_1}$$

$$\lim_{\Delta s \to \infty} E = \lim_{\Delta s \to \infty} p_s B_c - (1 - p_s) C_c - T_c = 0 \cdot \infty - 1 \cdot \frac{D}{m_1} - \frac{T}{t_1} = -\left[\frac{D}{m_1} + \frac{T}{t_1} \right]$$

As in Case I, the expected value is negative. Competing with others much higher in status lowers one's inclusive fitness.

When Δs is large and negative, the limit of each term is:

$$\lim_{\Delta s \to -\infty} p_s = \lim_{\Delta s \to -\infty} \left[\frac{k}{k + k e^{\kappa \Delta s}} \right] = 1$$

$$\lim_{\Delta s \to -\infty} (1 - p_s) = 0$$

$$\lim_{\Delta s \to -\infty} B_c = \lim_{\Delta s \to -\infty} A e^{\alpha \Delta s} = 0$$

$$\lim_{\Delta s \to -\infty} C_c = \lim_{\Delta s \to -\infty} \left[\frac{D}{m_1 + m_2 e^{-\mu \Delta s}} \right] = 0$$

$$\lim_{\Delta s \to \infty} T_c = \lim_{\Delta s \to \infty} \left[\frac{T}{t_1 + t_2 e^{-\tau \Delta s}} \right] = 0$$

$$\lim_{\Delta s \to \infty} E = \lim_{\Delta s \to \infty} p_s B_c - (1 - p_s) C_c - T_c = 1 \cdot 0 - 0 \cdot 0 - 0 = 0$$

Competing with others much lower in status has no effect on one's inclusive fitness.

When Δs is zero:

$$\lim_{\Delta s \to 0} p_s = \lim_{\Delta s \to 0} \left[\frac{k}{k + k e^{\kappa \Delta s}} \right] = \frac{k}{2k} = \frac{1}{2} \quad \text{(for equal status competitors)}$$

$$\lim_{\Delta s \to 0} (1 - p_s) = \frac{1}{2}$$

$$\lim_{\Delta s \to 0} B_c = \lim_{\Delta s \to 0} A e^{\alpha \Delta s} = = A$$

$$\lim_{\Delta s \to 0} C_c = \lim_{\Delta s \to 0} \left[\frac{D}{m_1 + m_2 e^{-\mu \Delta s}} \right] = \frac{D}{m_1 + m_2}$$

$$\lim_{\Delta s \to 0} T_c = \lim_{\Delta s \to 0} \left[\frac{T}{t_1 + t_2 e^{-\tau \Delta s}} \right] = \frac{T}{t_1 + t_2}$$

$$\lim_{\Delta s \to \infty} E = \lim_{\Delta s \to \infty} p_s B_c - (1 - p_s) C_c - T_c = \frac{1}{2} \cdot A - \frac{1}{2} \left[\frac{D}{m_1 + m_2} \right] - \left[\frac{T}{t_1 + t_2} \right]$$

As above, whether or not competing with equal-status others is adaptive will depend on the values of these constants. However, unlike competing with others much higher or lower in status, there are some situations in which competing with those close in status will increase an actor's fitness.

Case III: Benefit to be Gained Increases Linearly with Increasing Status Difference

When B_c increases linearly with Δs, equations (7a) and (7b) apply, and equation (1) can be rewritten as:

$$E = \left[\frac{k}{k + k e^{\kappa \Delta s}} \right] \left[m \Delta s + b \right] - \left[1 - \frac{k}{k + k e^{\kappa \Delta s}} \right] \left[\frac{D}{m_1 + m_2 e^{-\mu \Delta s}} \right] - \left[\frac{T}{t_1 + t_2 e^{-\tau \Delta s}} \right]$$

if Δs is greater than -b/m, and

$$E = \left[\frac{k}{k + k e^{\kappa \Delta s}} \right] \left[\varepsilon \right] - \left[1 - \frac{k}{k + k e^{\kappa \Delta s}} \right] \left[\frac{D}{m_1 + m_2 e^{-\mu \Delta s}} \right] - \left[\frac{T}{t_1 + t_2 e^{-\tau \Delta s}} \right]$$

if Δs is less than -b/m.

When Δs is large and positive:

$$\lim_{\Delta s \to \infty} p_s = \lim_{\Delta s \to \infty} \left[\frac{k}{k + ke^{\kappa \Delta s}} \right] = 0$$

$$\lim_{\Delta s \to \infty} (1 - p_s) = 1$$

$$\lim_{\Delta s \to \infty} B_c = \lim_{\Delta s \to \infty} m\Delta s + b = \infty$$

$$\lim_{\Delta s \to \infty} C_c = \lim_{\Delta s \to \infty} \left[\frac{D}{m_1 + m_2 e^{-\mu \Delta s}} \right] = \frac{D}{m_1}$$

$$\lim_{\Delta s \to \infty} T_c = \lim_{\Delta s \to \infty} \left[\frac{T}{t_1 + t_2 e^{-\tau \Delta s}} \right] = \frac{T}{t_1}$$

$$\lim_{\Delta s \to \infty} E = \lim_{\Delta s \to \infty} p_s B_c - (1 - p_s) C_c - T_c = 0 \cdot \infty - 1 \cdot \frac{D}{m_1} - \frac{T}{t_1} = -\left[\frac{D}{m_1} + \frac{T}{t_1} \right]$$

As in Cases I and II, the expected value is negative. Competing with others much higher in status lowers one's inclusive fitness.

When Δs is large and negative:

$$\lim_{\Delta s \to -\infty} p_s = \lim_{\Delta s \to -\infty} \left[\frac{k}{k + ke^{\kappa \Delta s}} \right] = 1$$

$$\lim_{\Delta s \to -\infty} (1 - p_s) = 0$$

$$\lim_{\Delta s \to -\infty} B_c = \varepsilon$$

$$\lim_{\Delta s \to -\infty} C_c = \lim_{\Delta s \to -\infty} \left[\frac{D}{m_1 + m_2 e^{-\mu \Delta s}} \right] = 0$$

$$\lim_{\Delta s \to -\infty} T_c = \lim_{\Delta s \to -\infty} \left[\frac{T}{t_1 + t_2 e^{-\tau \Delta s}} \right] = 0$$

$$\lim_{\Delta s \to -\infty} E = \lim_{\Delta s \to -\infty} p_s B_c - (1 - p_s) C_c - T_c = 1 \cdot \varepsilon - 0 \cdot 0 - 0 = \varepsilon$$

Competing with others much lower in status has little effect on one's inclusive fitness.

When Δs is zero:

$$\lim_{\Delta s \to 0} p_s = \lim_{\Delta s \to 0} \left[\frac{k}{k + ke^{\kappa \Delta s}} \right] = \frac{k}{2k} = \frac{1}{2} \quad \text{(for equal status competitors)}$$

$$\lim_{\Delta s \to 0} (1 - p_s) = \frac{1}{2}$$

$$\lim_{\Delta s \to 0} B_c = \lim_{\Delta s \to 0} m\Delta s + b = b$$

$$\lim_{\Delta s \to 0} C_c = \lim_{\Delta s \to 0} \left[\frac{D}{m_1 + m_2 e^{-\mu \Delta s}} \right] = \frac{D}{m_1 + m_2}$$

$$\lim_{\Delta s \to 0} T_c = \lim_{\Delta s \to 0} \left[\frac{T}{t_1 + t_2 e^{-\tau \Delta s}} \right] = \frac{T}{t_1 + t_2}$$

$$\lim_{\Delta s \to \infty} E = \lim_{\Delta s \to \infty} p_s B_c - (1 - p_s) C_c - T_c = \frac{1}{2} \cdot b - \frac{1}{2} \left[\frac{D}{m_1 + m_2} \right] - \left[\frac{T}{t_1 + t_2} \right]$$

As in the previous two cases, whether or not competing with equal-status others will increase an actor's fitness will depend on the values of these constants. Competing with those close in status will in some cases increase an actor's fitness more than competing with others much lower in status, and in some cases will be more adaptive than competing with others much higher in status.

If T_C, the inherent cost of competing, is a constant, T, and does not vary with status difference, then the limit of any of the above expressions when Δs is large and negative will be -T. In that case, competing with others much lower in status will lead to a net decrease in inclusive fitness.

In conclusion, regardless of how the benefits to be gained vary with status difference between actor and competitor, it is more adaptive for the actor to compete consistently with others close to himself or herself in status than to compete consistently with others much higher or lower in status.

That it is not adaptive to compete consistently with others much higher in status is no surprise, and follows from the fact that the probability of winning such contests approaches zero. That it is not adaptive to compete consistently with others much lower in status is more surprising. If the cost of competing is relatively constant, then this conclusion follows from the fact that what can be gained from such contests approaches zero while there is still some cost to competing. If the cost of competing is not constant, but approaches zero as the competitor is much lower in status, then a more accurate way of stating the conclusion is that consistently engaging in contests with those of much lower status has no effect on fitness. Thus it is not adaptive because it does not provide an advantage.

Appendix B: Questionnaire Used to Select Nonverbal Cues

	cue of ignoring	cue of physical dominance	neither	how powerful a cue is it?
standing with hands on hips				1 2 3 4 5
interrupting				1 2 3 4 5
gesturing				1 2 3 4 5
turning slightly away from the other, not facing them directly				1 2 3 4 5
tilting one's head back while looking at the other				1 2 3 4 5
pushing one's chest out				1 2 3 4 5
approaching the other directly and swiftly				1 2 3 4 5
touching the other				1 2 3 4 5
speaking first in an exchange				1 2 3 4 5
turning one's back on the other				1 2 3 4 5
lowering one's brows				1 2 3 4 5
erect posture, standing to one's full height				1 2 3 4 5
staring				1 2 3 4 5
looking at the other while speaking, but looking away when they speak				1 2 3 4 5
moving in a relaxed manner				1 2 3 4 5
pointing at the other				1 2 3 4 5
moving close to the other				1 2 3 4 5
speaking loudly				1 2 3 4 5
looking away from the other while they do something				1 2 3 4 5
standing with a relaxed posture				1 2 3 4 5
speaking in an angry tone of voice				1 2 3 4 5
being the last to look away when both people look each other in the eye				1 2 3 4 5
holding one's shoulders out, not hunching them or slumping				1 2 3 4 5
occupying more space than the other				1 2 3 4 5
not smiling				1 2 3 4 5

would create a strong impression of dominance or status

would not create much of an impression of dominance or status

cues of physical dominance: These are anything symbolic of physical dominance, or intimidation, specifically, anything that signals aggression or that exaggerates the impression of a person's size or strength.

cues of ignoring: These involve failure to engage the other person in some way, ignoring, not attending to the other person.

Appendix C: Follow-up Questionnaire

(men/women)

The behavior in this scene:

	makes the person look like he or she is submitting, giving in to the other person	does not make the person look like he or she is submitting, giving in to the other person	makes the person look like he or she is unsure of what to do
scene 1:			
scene 2:			
scene 3:			
scene 4:			
scene 5:			
scene 6:			
scene 7:			
scene 8:			
scene 9:			