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Envy and Positional Bias in the Evolutionary Psychology of Management

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We propose that humans have evolved at least two specialized cognitive adaptations shaped by selection to solve problems associated with resource competition: (1) a *positional bias* by which individuals judge success in domains that affect fitness in terms of standing relative to their reference group; and (2) *envy*, an emotion that functions to alert individuals to fitness-relevant advantages enjoyed by rivals and to motivate individuals to acquire those same advantages. We present new data supporting the existence of design features of these hypothesized psychological adaptations and discuss implications for economists, organizations, marketers, and managers. Copyright © 2006 John Wiley & Sons, Ltd.

INTRODUCTION

Over the past 15 years, evolutionary psychology has emerged as a major theoretical movement within psychology specifically and the social sciences more generally (Buss, 1995, 2005a, b; Pinker, 1997; Tooby and Cosmides, 1992). Evolutionary psychology provides new theories of entire domains of human functioning, such as mating, kinship, morality, and social exchange (Buss, 2005a, b; Pinker, 2002). At a minimum, it has guided researchers to discover empirical phenomena previously unknown. In its grandest aspirations, it offers the promise of a unifying meta-theoretical framework for the study of all human cognition, emotion, and behavior. Since human reasoning, motivation, and behavior are all tasks critical to the development of ecologically valid economic models, evolutionary psychology has the potential to provide important insights into phenomena that affect research within these disciplines (Browne, 2002; Colarelli, 2003; Gintis *et al.*, 2005; Saad, 2005).

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Evolutionary psychologists have recently begun to apply evolutionary psychological thinking to traditional economic theories, questioning some of the core assumptions on which many of these theories rest (see Aktipis and Kurzban, in press; Todd, 2001; Wang, 2001). For instance, Wang (2002) examined how framing decision-making tasks in terms of kinship problems affects how people make use of risk distributions in ways not predicted by rational actor models. Applying the logic of sexual selection theory (Darwin, 1871; Trivers, 1972) to explore one contextual effect on the degree to which imminent goods are valued over future goods (i.e. hyperbolic discounting), Wilson and Daly (2003) demonstrated that men's discount functions increase significantly when they are primed with attractive, but not unattractive, female faces. Economists, organizational psychologists, and other scientists have also begun to explore the utility of evolutionary theory in illuminating human investing behavior (Burnham, 2005), human resource management (Colarelli, 2003), and behavior in the workplace (Browne, 2002). Such applications of evolutionary psychology to traditional economic research questions have begun to inform economic thinking by providing a conceptual framework through which

to examine human rationality and deviations from rationality.

In this article, we explore two evolutionary psychological hypotheses that are of potential importance to economists, managers, and others involved in organizational decision making. We first address the nature of psychological satisfaction. We propose that satisfaction for goods in some domains is not judged according to the absolute amount one has of that resource, but rather on how much one has compared to others—a *positional bias*. Predictions follow for how this bias affects our preferences for certain types of resources. Although marketers have long understood and capitalized on the fact that individuals are typically less concerned with how much they have in an absolute sense than they are with how much *more* they have than their neighbors (the so-called hedonic treadmill), the evolutionary significance of this bias offers fresh insights that will be detailed below. We will then address one of the human motivational systems likely involved in facilitating behavior that is consistent with the positional bias: envy. Finally, we explore potential implications that these psychological processes might have for managers and businesses.

ENVY AND THE POSITIONAL BIAS: COGNITIVE ADAPTATIONS THAT FACILITATE SOCIAL COMPETITION

Individuals differ in their abilities to succeed in resource competition. Throughout human evolutionary history, individuals possessing characteristics that granted them preferential access to fitness-augmenting resources would have outcompeted individuals less able to secure such resources. Outperforming rivals in fitness-relevant resource competitions delineates an important domain of adaptive problems that humans have had to solve throughout our evolutionary history. We hypothesize that individuals who judged their success in resource competition based on their position *relative to their competitors* would have continued to strive for a better, more desirable position, regardless of their standing in an absolute sense. Such individuals would have left their more complacent competitors—those not concerned with their relative standing—in the evolutionary dust. Rather than being due to particular political systems such as capitalism or psychological pathology as some have argued (Bhugra, 1993), we propose that the motivation that many men and women express with outperforming their rivals, neighbors, friends, and relatives reflects evolved psychological design for resource competition.

This general proposition is supported by existing research and likely also resonates with individuals' intuitions about the nature of well-being and satisfaction for certain types of goods. People who earn $40 000 a year may be happy or sad. But they are far more likely to be satisfied with their income if their co-workers earn $35 000 than if they earned $60 000 a year (Frank, 1999). Individuals appear to be satisfied with their incomes only if they are better off than those with whom they compare themselves. So pervasive is this effect that economists have given it its own name. *Relative poverty* describes individuals who are not objectively poor, but feel poor compared to everyone else. Households with an income below 50% of the median in the country studied are considered to be living in relative poverty. In the United States, the median household income in 2000 was $41 994 (US Census, 2000). Although this income is substantially larger than the amount of income needed to provide the basic needs for survival, the feelings of deprivation experienced by individuals living in relative poverty are very real. This suggests that relative deprivation and the negative feelings associated with it are psychological states that require explanation.

Existing empirical research appears to support a link between positional income and happiness. Economists have found that subjective well-being is affected by relative, rather than absolute income levels (Clark and Oswald, 1996; Duncan, 1975–1976; Easterlin, 1973, 1995; Frank, 1999): at any point in time, the rich tend to be happier than the poor. But over time, the proportion of people reporting that they are happy or satisfied with their income does not increase with corresponding increases in a society's average income (Diener *et al.*, 1985; Myers and Diener, 1995). In a recent study designed to identify what types of things individuals judge based on concerns about relative position, Solnick and Hemenway (1998) created a list of items—of which income was a part—and had subjects choose between two alternatives. One

described a greater absolute amount and the other described a greater positional amount. They found that individuals are most concerned with where they stand relative to others in the domains of physical attractiveness, income, years of education, and intelligence. They also found that individuals are least concerned with where they stand relative to others in the amount of vacation time they have each year.

The researchers explained these findings in terms of positional concerns looming larger for 'goods that are crucial in attaining other objectives than for goods that are desirable primarily for themselves' (Solnick and Hemenway, 1998, p. 379). Although this provides an accurate summary or re-description of the findings, it does not provide a principled theory that explains *why* positional concerns exist in some domains and not others. Similarly, it does not generate novel predictions about as yet unknown aspects of this phenomenon that can only be derived from a larger theoretical framework, such as from an evolution-based theory, as we describe below. The application of evolutionary psychology to this domain of research provides a framework from which to derive predictions about differences between men's and women's positional concerns in addition to the *domains* in which individuals are likely to express them and those in which they are not. It also allows us to derive predictions about the cognitive processes that may guide behavior in resource competition situations.

We hypothesize that feeling dissatisfied with one's position in specific domains of life is the outcome of at least two adaptations: a 'positional bias' adaptation and a cognitive/motivational mechanism captured by the term 'envy.' We propose that these complementary cognitive processes are motivational systems designed by selection to propel individuals to acquire fitness-augmenting resources or positions that are possessed by one's social competitors. We hypothesize that judgments of success in those domains where *larger quantities* or *more desirable* resources have historically augmented fitness are intensely socially mediated, based on social comparative processes. We will provide supporting evidence from some of the data thus far collected that bears on these hypotheses and will then discuss the possible implications for the business and management world.

HYPOTHESIS I: THE POSITIONAL BIAS

The process of natural selection is a process in which individual phenotypes—and the genes that code for them—are selected based on their ability to outperform existing alternate forms in domains that affect fitness. For example, in the domain of mate competition, there are a limited number of men and women who embody the characteristics that men and women most desire in their mates (Buss, 1994/2003). Since there are fewer 'high-mate-value' mates than there are individuals who desire them, those individuals lucky enough to win the hearts of those deemed most desirable necessarily do so at the expense of their competition. From an evolutionary perspective, the qualities possessed by those individuals able to gain preferential access to desirable mates, over evolutionary time, have out-reproduced their mating competition. Success for scarce resources that affect fitness, such as mates, money, or game from a hunt, is not based on absolute amounts of success in these domains. Rather, success in an evolutionary sense depends on how much better one is doing than the average performance of one's rivals. The outcome of selection is thus inherently competitive. As Gore Vidal noted, 'It is not enough to succeed, others must fail.'

Based on this logic, we propose that the human mind has been shaped by selection to posses a *positional bias* in judging success in resource competition games. That is, we expect that humans attend to the positional rather than absolute value of (1) resources that are known to affect survival or reproduction and (2) personal attributes that affect individuals' abilities to acquire such resources. Conversely, we do not expect to see the positional bias in judgments of the desirability of unlimited resources or resources whose amount or desirability does not have an impact on survival or reproduction. This selective attention to relative standing in some domains but not others is proposed to be a design feature of cognitive structures favored by selection due to their ability to judge success in social competitions in a manner that has historically augmented fitness. We expect that the positional bias will be sex differentiated in those domains where the fitness payoffs from competition have been qualitatively different for each sex throughout human evolutionary history. In sum, we do not expect to see a 'general' positional bias, but rather

one that is specific to delimited domains of reasoning.

Specific Predictions about Positional Bias

Prediction 1: *The positional bias will be present when choosing between two potential incomes* (i.e. individuals will prefer a larger relative income to an absolutely larger, but relatively smaller income). Since gaining access to resources that augment survival and reproductive success has been an adaptive problem that humans have been solving throughout the course our evolutionary history, the mind has been shaped by selection to judge success in the pursuit of such resources in terms of relative position. Although cash economies were not present throughout most our evolutionary history, money is the ultimate fungible resource and, as such, can be converted into resources that augment fitness. Thus, we predict the positional bias to be present when individuals are reasoning about incomes.

Prediction 2: *The positional bias will be absent when choosing between two different lengths of time being happily married* (i.e. individuals will prefer an absolutely longer length of happy marriage to one that is absolutely shorter, but longer than their peers'). Although mate choice is a domain in which individuals compete for access to scarce resources (i.e. mates), one person's increment in marital happiness does not logically entail a decrement in another's marital happiness.

Prediction 3: *Women*, *more than men*, *will demonstrate the positional bias when choosing between* (a) *possessing a greater amount of absolute attractiveness and* (b) *being absolutely less attractive*, *but more than their same-sexed peers*. Since men have been shaped by selection to preferentially desire attractive women (attractiveness provides a cue to youth and fertility), attractiveness is a central feature of female–female mate competition (Buss, 1988, 1994/2003; Symons, 1979). Furthermore, since a man's optimal mating strategy depends not only on the attractiveness of a woman with whom he would like to mate, but also on the desirability of her same-sexed peers (Hill and Reeve, 2004), women's success at attracting a long-term mate is dependent on the attractiveness of both herself and her same-sexed mating competition. Therefore, we predict that women will exhibit the positional bias more than men when choosing between greater absolute or relative attractiveness.

Prediction 4: *When choosing between two potential income losses*, *individuals will prefer an absolutely smaller*, *but positionally larger income loss to an absolutely larger*, *but positionally smaller income loss* (i.e. the positional bias will be absent).

Since natural selection selects phenotypes based on their ability to outperform the average performance of one's competitors, it is evolutionarily beneficial for one to do better than the average performance of others. However, imposing costs on one's neighbors at a long-term net cost to oneself (i.e. there is no immediate *nor* future benefit) is both detrimental to one's own resource acquisition goals and unlikely to have any impact on the *mean* performance of all of one's competitors. Indiscriminate spite of this nature (i.e. imposing costs on another at a long-term net loss to oneself) is thus unlikely to have been selected for over evolutionary time (Hamilton, 1970; Knowlton and Parker, 1979). It is important to point out that indiscriminate spite is different than spiteful interactions in which the individuals inflicting the costs benefit from doing so either immediately or in the long term.[1] Spiteful behaviors of this nature are expected to be selected for and are readily observable in the form of murder, warfare, mate poaching, stealing, and numerous other cost-inflicting activities that are abundant in human social life (Buss, 2005b). Thus, in framing dilemmas about income loss for empirical testing, we required the loss to have two important properties: (1) it was imposed by a third party (i.e. not imposed by the same-sexed peers one uses as a comparison group in the question) and, as such, (2) there would be no long-term reputational or signaling benefit to be gained from 'punishing' the same-sexed peers. In such loss situations, choosing a greater loss for oneself to punish one's peers comes at a net cost to oneself, making it unlikely that selection would have shaped a positional bias when judging the desirability of two such losses.

Study 1. Methods and Materials

Materials: Participants ($N = 205$) were given a 37-item instrument similar to that used by Solnick and Hemenway (1998), of which the four prediction items were a part. For each item subjects were shown two states of the world, State A and State B.

For each item, in one state of the world the subject would possess a greater absolute amount of a resource (e.g. attractiveness, money, etc.), but they would have less than their same-sexed peers. In the other state, they would have a lesser absolute amount of the same resource, but more than their same-sexed peers. For each item, subjects were asked to choose which state of the world they would prefer. The exact instructional set read as follows.

In the questions below, there are two states of the world, State A and State B. *You are asked to circle the letter* (*A or B*) *corresponding to the world you would prefer to live in*. Treat each question *independently* from the others (i.e. State A in question 1 is different from State A in question 2, which is different from State A in question 3, and so on). There are no 'correct' answers, so please be completely honest when choosing which of the two worlds you prefer.

Below is a sample problem presented to participants when testing for the existence of the positional bias in the domain of physical attractiveness:

> 1. Assume physical attractiveness can be measured on a scale from 1 (lowest) to 10 (highest).
> A: Your physical attractiveness is 5; your same-sexed peers average 3.
> B: Your physical attractiveness is 7; your same-sexed peers average 9.

Participants: A total of 87 male and 118 female undergraduates who completed the instrument to partially fulfill an experiment requirement for course credit.

Results

Tests of predictions: As predicted by the positional bias hypothesis, both men (84%) and women (88%) preferred the positional answer with regard to their preferred monthly income ($\chi^2 = 110.15$, df = 1, $p < 0.001$). No significant sex differences were found for this item. Conversely, confirming predictions 2 and 4, both men (83%) and women (77%) preferred the non-positional answer with regard to their preference for length of time being happily married ($\chi^2 = 70.73$, df = 1, $p < 0.001$). With regard to their preference for a potential pay cut, 67% of men and 78% of women chose the absolute rather than the positional answer ($\chi^2 = 45.45$, df = 1, $p < 0.001$). No significant sex differences were found for either item. Prediction 3 was also confirmed. Women (65%) were more likely than men (41%) to choose the positional answer with regard to their physical attractiveness ($\chi^2 = 10.50$, df = 1, $p = 0.001$) (see Figure 1).

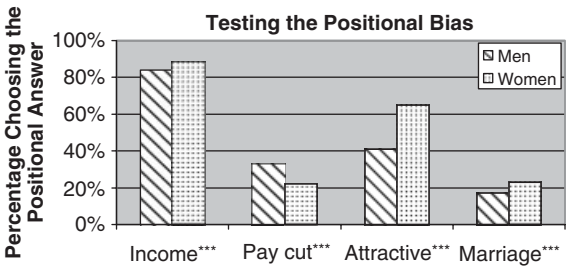

Figure 1. *Note*: N (men) = 87; N (women) = 118; p values: $^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$.

Discussion

The positional bias hypothesis states that men and women will attend to positional rather than the absolute values of limited resources that are known to affect survival and reproduction and that this preference should occur for gains but not for losses. Replicating a finding that was first demonstrated by Solnick and Hemenway (1998), men and women in our study exhibited the positional bias when choosing between two potential salaries. When asked to choose between having an absolutely larger income or an income that was absolutely less, but greater than one's rivals, both men and women preferentially chose the greater positional income.

The three novel predictions introduced in this paper were also supported. The prediction that women will exhibit the positional bias in the domain of physical attractiveness more so than men was supported. This finding suggests that the positional bias may be sex differentiated in at least one area where the fitness benefits available for men and women have differed throughout human evolutionary history. Neither current theories within economics nor any non-evolutionary theories within psychology have generated specific sex-delimited predictions of the positional bias phenomenon. Research is currently underway examining additional domains in which men and women are expected to exhibit the positional bias, those in which they are not, and those in which sex differences are expected.

The predictions regarding the absence of the positional bias when choosing between two lengths of time spent happily married or when choosing between two salary cuts were also supported. Additional research is underway to further explore the nature of the positional bias in gains as opposed to losses, the impact that this logic might have on traditional psychological and economic theories of loss-aversion and risk-taking, and whether this asymmetry exists across adaptive domains. Studies are underway to test whether the absence of the positional bias in loss situations holds in domains where the impact of the loss is not potentially life-threatening, as could be the case with income. Demonstrating the absence of the positional bias in situations that cannot be interpreted as potentially life-threatening—such as decreases in attractiveness or time available to accomplish a task—are necessary to further our understanding of the nature of the positional bias.

We are also testing for the positional bias in loss situations where the individual or individuals that one uses a comparison group are instrumental in one's loss. We expect the positional bias to be present in such cases, as the benefit of punishing one's rivals will likely exceed the greater immediate loss of resources. As with the sex-differentiated prediction above, it is important to note than no other existing economic or psychological theories have predicted such contextually linked predictions of this phenomenon. Future research will explore additional contextually sensitive features of the positional bias adaptation in hopes of a more in-depth understanding of the phenomenon.

HYPOTHESIS II: ENVY

Successfully outcompeting rivals in resource competition requires extensive social comparisons and, more specifically, (a) taking note when rivals possess a fitness advantage not enjoyed by oneself and (b) feeling motivated to acquire those same fitness advantages. Strategic interference theory (Buss, 1989b) posits that negative emotions have been shaped by selection to signal someone or something impeding one's preferred behavioral strategy. Strategic interference has been hypothesized to function by (1) focusing attention on the source of strategic interference, temporarily screening out information that is less relevant to the adaptive problem being faced, (2) prompting storage of the relevant information in memory (3) motivating action to reduce the strategic interference, and (4) motivating action to prevent future such interference. We propose that *envy* has been shaped by natural selection to signal competitive disadvantage, making individuals experience a strong resentful awareness of a fitness-augmenting advantage enjoyed by others with whom they are in direct competition combined with a desire to possess the same advantage (Gilbert, 1990, 2000). We propose that the emotion of envy will cause a person to focus on the source of their envy and serve as a motivational mechanism, prompting action designed to acquire the fitness-enhancing resources that rivals have that one lacks, as well as taking away the fitness-enhancing resources that rivals enjoy in as much as doing so benefits oneself. Evolutionary theory and, more specifically, the theory of strategic interference, give us a framework from which to derive predictions about the targets of men's and women's enviousness and the existence of sex differences in the content of men's and women's envy.

Evolutionary logic and strategic interference theory predict that the focus of men's and women's envy feelings will differ in domains where each has faced qualitatively different adaptive problems throughout human evolutionary history. One such domain is in the arena of mate competition. Throughout human evolutionary history, the primary way by which men have been able to directly increase the fitness benefits available to them from mate choice has been by gaining sexual access to young, healthy, and fertile women (Buss, 1994/2003; Symons, 1979; Williams, 1975). Conversely, a primary avenue by which women have been able to increase the fitness benefits available to them from mate choice has been by securing a partner who is able and willing to invest in herself and her offspring (Buss, 1994/2003; Symons, 1979; Trivers, 1972). Accordingly, researchers have demonstrated that women place greater a premium than do men on their potential mates' financial prospects and economic resources. Men's mate preferences, in contrast, reflect a preference for those cues most reliably correlated with fertility or reproductive value, such as a woman's youth, attractiveness, and relatively low waist-to-hip ratio (Buss, 1989a, 1994/2003; Kenrick and Keefe, 1992; Singh, 1993; Symons, 1979;

Sugiyama, 2005). Consistent with this evolutionary logic, researchers have also demonstrated that men prefer sexual access sooner than women (Byers and Lewis, 1988), that men desire a higher number of partners throughout their lifetime than women (Buss and Schmitt, 1993; Schmitt *et al*., 2004), and that men are more likely than women to consent to sex with someone who they have just met (Clarke and Hatfield, 1989). We hypothesize that one domain in which men's and women's envy feelings will likely differ is in the domain of sexual competition, reflecting the differences in the qualities with which each competes for mates.

Specific Predictions about Design Features of Envy

Prediction 1: *The target of men's and women's envy feelings will most often be their same-sexed peers or individuals with whom they are in direct resource competition* (*e.g. friends*, *siblings*, *co-workers*) *rather than celebrities or people outside of their immediate social group*. Since humans have spent the majority of their evolutionary history in small groups where same-sexed peers were the most direct reproductive competitors, envy should be designed to focus most intensely on their primary reproductive competitors: (1) same-sex peers with whom they most closely compete for access to mates and status and, and secondarily on (2) their same-sexed siblings with whom they compete most closely for access to parental resources. Although same-sex siblings often compete over parental resources, envy should be mitigated, compared to that over same-sex peers, due to their genetic relatedness.

Prediction 2: *Women will feel more envious than men when one of their same-sexed peers becomes noticeably more physically attractive*. Men's mate preferences have been shaped by selection to place a premium on a woman's attractiveness when choosing a mate, as physical appearance provides a wealth of cues to health and fertility status of a woman (Buss, 1989a, 1994/2003; Singh, 1993; Symons, 1979; Sugiyama, 2005). Physical attractiveness has thus been an evolutionarily recurrent domain in which women have had to compete more than men (Buss, 1988, 1994/2003). Women are thus predicted to feel more envious than men when one of their same-sexed peers becomes noticeably more physically attractive, making them take note of the advantage possessed by their rival so that they can adjust their competitive strategy as necessary.

Prediction 3: *Women will feel more envious than men when one of their same-sexed peers' romantic partners buys them expensive gifts*. The magnitude of resources invested in a woman by a man reflects both her mate value and the intensity of her partner's commitment to her—both domains central to female–female competition. Since women's mate preferences have been shaped by selection to place a premium on traits indicative of a man's ability and willingness to invest resources in herself and her offspring (Buss, 1989a), feeling envious of a same-sexed rival whose mate buys her expensive gifts would call attention to her rival's fitness advantage, motivating the woman to acquire the same advantage for herself.

Prediction 4: *Men will feel more envious than women when one of their same-sexed peers has more sexual experience than themselves*. Sexual access to multiple mates has been one critical path by which men, more than women, have been able to increase their reproductive success over the course of evolutionary time (Buss, 1994/2003; Symons, 1979). Thus, men should feel more envious when one of their same-sexed peers outcompetes them in this evolutionarily critical domain.

Prediction 5: *Men will feel more envious than women when one of their same-sexed peers acquires an attractive mate*. Female attractiveness provides a powerful cue to a woman's fertility, and occupationally successful men are better able than their less successful peers to acquire physically attractive partners (Buss, 1994/2003). The physical attractiveness of a mate, therefore, provides an honest signal of a man's success. Men should feel more envious in this domain, calling attention to their rival's success so that they can adjust their competitive strategy accordingly.

Study 2. Methods and Materials

Materials: Participants were asked to describe 7 instances when they had felt envious of another individual. They were asked to specify who they were envious of and why they felt envious. Participants were then given a 19-item instrument in which the four prediction items were embedded. They were asked to rank the 19 items in the order of the degree to which each would cause him/her to feel envious. They were asked to give a '1' to the

item that would make them feel the most envious...all the way down to '19' which is the item that would cause them the least amount of envy. For the first part of this study, individuals were asked to describe instances that they envied others, and their responses were coded for content by two research assistants blind to the purpose of the research. If the researchers disagreed on how any of the items should be coded, a third person was asked to resolve the discrepancy and designate the category in which the item is best fit.

Participants: A total of 116 male and 99 female undergraduates completed the questionnaire to partially fulfill an experiment requirement for course credit. None of the undergraduates who participated in this experiment had participated in Study 1.

Results

Tests of predictions: Consistent with prediction 1, the target of both men's and women's envy feelings were most often individuals with whom they were in direct competition (see Table 1). Same-sexed friends overshadowed all other objects of envy for both men and women, as predicted. Same-sexed siblings came in second as objects of envy for both sexes, as predicted, although this was a distant second.

In confirmation of prediction 2, women ranked their same-sexed peer becoming noticeably more attractive ($M = 9.45$, SD = 6.06) as more envy-inducing than did men ($M = 14.04$, SD = 5.04) $t = 6.08$, df = 214, $p < 0.001$. Women also ranked their same-sexed peer's romantic partner buying them expensive gifts ($M = 13.17$, SD = 4.92) as more envy-inducing than did men ($M = 14.48$, SD = 4.70) $t = 2.00$, df = 213, $p = 0.05$, confirming prediction 3. In confirmation of prediction 4, men ranked their same-sexed peer's having more sexual experience than themselves as significantly more envy-inducing than did women (Men: $M = 11.89$, SD = 5.9; Women: $M = 16.07$, SD = 5.27; $t = 5.43$, df = 213, $p < 0.001$). Men also ranked their same-sexed peer acquiring an attractive romantic partner as more envy-inducing than did women. Men's rankings ($M = 8.49$, SD = 5.19) exceeding women's rankings ($M = 10.58$, SD = 5.56) $t = 2.84$, df = 213, $p = 0.005$, confirming prediction 5 (see Figure 2).

Table 1. Who do men and women envy?

Who do we envy?	Women (%)	Men (%)
Same-sexed friend	59	53
Same-sexed sibling	8	7
Opposite-sexed sibling	4	6
Classmate	5	6
Family members (non-sibling)	6	6
Opposite-sexed friend	2	4
Celebrities	4	4
Athletic competitors	1	4
Mate	4	3
Co-worker	1	3
Neighbor	2	2
Stranger	2	2
Other	3	1
Total	100	100

Note: Based on self-reported episodes of envy feelings. N (men) = 116; N (women) = 99.

Discussion

When men and women were asked to write free-form about seven instances in which they felt envious of others, individuals were most likely to describe their same-sexed friends as being the targets of their envy feelings. The second-most frequently cited targets of envy, although a distant second, were individuals' same-sexed siblings. These findings are consistent with the hypothesis that envy has been shaped by selection to facilitate social competition and that the target of our envy feelings should most frequently be these individuals with whom we are in the closest social competition for access to scarce resources. Although celebrities, millionaires, and rulers may be in the most enviable positions, individuals appear to reserve most of their envious feelings for those individuals with whom they directly compete in day-to-day transactions. It is important to note

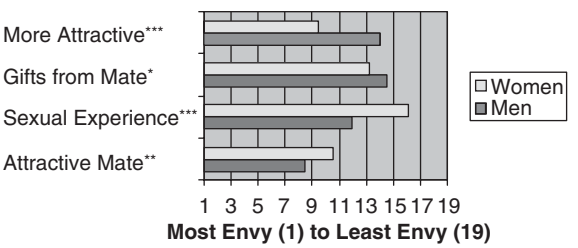

Figure 2. *Note*: N (men) = 116; N (women) = 99; p values: $^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$. Based on ranking items from 1 to 19 in order of likelihood to cause envy.

that the participants in this study were university students, many of whom are still heavily dependent on their parents' financial resources. It is likely that as financial and emotional dependence on parents decreases—which corresponds to lower levels of competition for parental resources—the degree to which siblings are cited as targets of envy will also decrease.

The situations that are most likely to invoke feelings of enviousness are sex specific, stemming from the different adaptive problems that men and women have had to solve throughout human evolutionary history. Since, historically, men have had to compete for sexual access to mates more than women (Trivers, 1972), men are more likely to experience envy when their same-sexed peers acquire sexual access to mates. Additionally, since selection has designed men to have a heightened preference for youth and attractiveness in their mates (Symons, 1979; Buss, 1989a; Kenrick and Keefe, 1992), men are more likely to feel envious of their same-sexed friends when they have mates that are more attractive than their own.

Since physical attractiveness plays such an important role in men's mate choice, women have had to be more competitive with their same-sexed peers regarding their own physical attractiveness (Buss, 1988). Women, more than men, ranked both their same-sexed peers becoming noticeably more attractive and their same-sexed peer's mate buying them expensive gifts as significantly more envy-inducing. Since women's mate preferences have been shaped by selection to place a greater premium on a potential mate's access to resources than have men's (Buss, 1989a, 1994/2003), it follows that men's and women's envy feelings should reflect this sex difference. Additional research is currently underway to explore the behaviors that envy motivates and how they relate to the adaptive problems that humans have faced throughout our evolutionary history.

GENERAL DISCUSSION

The process of evolution by natural selection selects phenotypes—and the genes that code for them—based on their ability to outperform existing alternate forms. Thus, success from an evolutionary perspective is typically not based on 'absolute' amounts of success in domains that affect fitness. Rather, success in reproductive resource competition depends on how much better one is doing than one's rivals. Although humans spent the majority of their evolutionary history in the social context of small hunter-gatherer groups, not in the modern world of business, cash economies, and large organizations, selection has shaped a psychology rich with psychological adaptations that get played out in this context. The current research explored two cognitive/emotional adaptations proposed to have been designed by natural selection to facilitate success in resource competition: the positional bias adaptation and the emotion of envy.

The findings provide a starting point from which to begin to understand how consumer-driven economies like the ones in the US and Western Europe operate on the individual level. Individuals are motivated not by absolute amounts of status or resources, but rather by the desire to be better off than their reference group. This has potentially important implications for business. One is that it verifies the importance of innovation in consumer products, particularly those that signal status. Expensive products that are owned only by those who can afford them are honest signals of possessing the financial resources necessary to invest in pursuits beyond rudimentary survival problems. The value of such products as signals depends on their rarity. As soon as one's social competitors all own the same BMW or Chanel suit, it no longer signal relative advantage to one's peers. Consumers look to the marketplace to provide them with the next generation of expensive products to signal their advantage and it is up to marketplace to anticipate and meet these signaling demands.

A second implication is that men's and women's marketplace motivations inevitably differ from one-another in delimited domains. From the findings presented and other data currently being analyzed, men appear to be more likely to be motivated by envy to purchase resources that showcase the amount of financial resources that they have and items that demonstrate status and sexual prowess. Conversely, women are more likely to be motivated by envy to purchase items that enhance their sexually selected traits (e.g. makeup and clothes). These findings are potentially relevant to advertisers who seek innovative ways to tap into men's and women's marketplace motivations to better market existing products and

make new products more appealing to the product's target gender.

This research also has potential implications for the design of retirement plans for employees. Fitness payoffs from signaling resource holdings by way of accumulating of consumer products (or attractiveness augmentations via fashion or surgery) necessarily depend on how one's spending compares to a rival's spending. An individuals' arsenal of products or beautification techniques only signal superior relative position when these items are not possessed, or are possessed to lesser degrees, by others. Thus, by virtue of mate competition, consumers can find themselves caught in perpetual spending arms races with real or perceived competitors to demonstrate advantage over their peers.

Since the fitness benefits associated with such costly resource displays in one's reproductive prime are necessarily greater than the benefits available from the same resources spent during retirement (when the effects of selection are most diluted), individuals who decide to invest monetary resources into savings rather than resource display will be penalized in domains such as mate competition. Thus, it is not surprising that consumers in the United States and elsewhere are plagued by credit card debt, with many finding themselves without sufficient savings for retirement. When setting up retirement programs for employees, if the goal is to induce employees to save more for retirement, employers may benefit from recognizing that individuals possess evolved psychologies that steeply *discount the future* in order to compete successfully during prime reproductive years (Daly and Wilson, 2005), and design programs that counteract those evolved future-discounting tendencies.

On the other hand, marketers of products pegged at enhancing perceived positional success in mate competition may wish to do precisely the opposite and exacerbate positional concerns. This can be accomplished by exploiting evolved future-discounting adaptations to induce current spending. Exhortations to 'go for the gusto' or 'just do it' or 'you only go around once in life' may attain their success by explicitly exploiting positional biases and future discounting to induce current spending by rendering saving for the future seem foolish.

An additional implication of this research is that managers might harness these psychological structures for achieving organizational goals. One method might be to shift the psychological frame of individuals within the organization to direct envy and positional bias toward rival organizations rather than rival individuals within the organization. This frame-shift could reduce the undermining effects of competition within an organization and align individual interests so that they have a 'shared fate' vis-à-vis competing organizations. Furthermore, that envy and positional bias have been found to contain many sex-differentiated design features implies that men and women are motivated by somewhat different incentives. The presence of a physically attractive same-sex individual, for example, is more likely to trigger envy in women than in men. Managers could become sensitive to the sex-differentiated activation of these potentially damaging adaptations in the work environment, and take steps to pre-empt conflict before it erupts in the workplace.

More generally, the existing research sheds light on the nature of satisfaction both within and outside the workplace. Psychological processes such as the positional bias and envy guarantee that long-term constant satisfaction with one's income, position in the status hierarchy, or job will be difficult to achieve. Indeed, satisfaction is problematic as a long-term psychological state. Individuals who are satisfied for a long term with the amount or desirability of their existing resources are less motivated to pursue additional resource acquisition opportunities. This works to the advantage of their less-satisfied peers, who continue to strive for additional fitness-augmenting resources at the expense of their satisfied counterparts. Thus, from the standpoint of resource competition, permanent states of psychological satisfaction unlikely to be achieved. Future research is needed to explore how this negative side-effect of the positional bias and envy can be attenuated both inside and outside the workplace.

For the findings presented in this paper to be directly applicable to economists, future research could fruitfully explore whether the positional bias and envy serves a motivational function (i.e. should we know what our co-workers make?) and if so, does this outweigh the costs of possible employee resentment? Within-organization envy can undermine organizational goals. Managers, for example, might undermine the efforts of workers to prevent them from out-shining her or him. Workers might also undermine the efforts of

co-workers to prevent them from excelling in performance (Buss, 1999/2004). The behavioral expression of these adaptations can potentially weaken the efforts of management to achieve organizational goals. While envy might motivate some individuals to perform at superior levels, thus enhancing organizational success, envy also motivates efforts to undermine the work of peers and management at the expense of organizational success.

We presented research bearing on two hypothesized adaptations that are likely to play a role in individuals' behavior in a business context: envy and the positional bias. These are just two adaptations among what are likely to be dozens that affect the business world. The human mind likely consists of a great number of specialized adaptations that have been specially selected for their ability to facilitate competitive success. Historically, men and women had somewhat separate 'occupations,' with men concentrating on hunting and women on gathering (Browne, 2002; Tooby and DeVore, 1987). Men's primary competitors were other men and women's primary competitors were other women. Essential to men's success at reproductive competition was access to social status and material resources needed to attract and retain women. In the modern world of work, both sexes compete for these resources.

How these adaptations play out in modern organizations remains a critical question that calls for additional research. Do men experience equivalent envy when a woman, as compared with a man, attains a position that he covets? Can women suppress their envy at workplace peers who attain greater attention merely because they are physically attractive? Can men suppress their envy at workplace peers who exceed them in non-work related domains such as sexual experience and the attractiveness of their romantic partners? The current findings raise, but cannot answer, these questions. But the lens of evolutionary psychology brings these new questions into focus, and may ultimately lead to more effective management strategies for dealing with an ancient evolved psychology played out in the modern world.

NOTES

1. For instance, spite can evolve if it deters subsequent attack or exploitation (i.e. it has reputation value) (Johnstone, 2001; Johnstone and Bshary, 2004). In this way, it plays a role in reputation formation and maintenance (called 'image scoring' in the literature, e.g. Nowak and Sigmund, 1998a, b; Lotem *et al*., 1999, 2003; Leimer and Hammerstein, 2001). In such models, individuals improve their reputation by acting spitefully toward others, decreasing the probability that they will be taken advantage of in the future. Most recently, Lotem *et al*. (2003) have linked this type of indirect reciprocity to Zahavi's handicap principle (1975) demonstrating that behavior that comes at an immediate cost to oneself may have reputation cultivating value precisely because it is costly. Since spiteful behavior comes at an immediate cost to oneself, it serves as an honest signal of the spiteful individual's quality, which may prove attractive to potential mates as well as discouraging others from taking advantage of one in the future (Johnstone, 2001).

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