

Original Article

## The Matthew Effect: Evolutionary Implications

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**Abstract:** This article suggests that, in prehistoric man, the results of competition magnified the effect of small genetic differences between competing individuals, thereby increasing the differential in their relative reproductive success (difference amplification). This had the effect of accelerating the evolution of early man. The differential effect of success and failure on competing individuals led to “difference amplification”. These mechanisms can still be observed today. This model is relevant to psychotherapy with depressed clients.

**Keywords:** difference amplification, cycle of success, maladaptive cycle, assortative mating, phylogenetic adaptation.

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### Introduction

Difference amplification is the process whereby baseline differences between two competing members of the same group are magnified by the outcome of the competition through its effect on relative status, mood, self-confidence and attractiveness. Success tends to increase the winner’s self-confidence, elevate mood and breed success, while repeated failure can undermine the loser’s self-confidence and initiative, lower mood and reduce attractiveness, rendering the individual prone to further failure. This leads to a cycle of success for the winner and a possible maladaptive cycle for the loser. To the extent that one of two individuals engaged in conflict has a genetic advantage over the other during their encounters, the initial advantage might be compounded by difference amplification.

Natural selection is the differential contribution of offspring to the next generation by individuals of different genotypes but belonging to the same population (Wilson. 1975, p.589). According to Charles Darwin, this mechanism was the main guiding force in evolution. This paper will describe how difference amplification may have accentuated the impact of natural selection by accelerating the rate of human

evolution.

Meichenbaum and Biemiller (1998) refer to difference amplification in the school system as the “Matthew Effect” and it manifests as increasing difference between more and less proficient students. The apostle Matthew (Matthew, 13;12) said “For unto everyone that has, shall be given and he shall have abundance; but for him that hath not shall be taken away even that which he has”. In the school system, this is evidenced by a widening gap over time between the better and poorer students. The better students are more able to ask for help, are more stimulating for the teachers and receive more stimulation from the teachers than the poorer students. “Difference amplification” is not confined to the school system, but can be observed in many competitive arenas.

In the hunter gatherer society, the period during which most of human evolution occurred, the effects of small genetic differences were amplified through competitive social interaction and these differences emerged as relative social status. Significant differences in social status can be obtained, even when individual differences in genetic make-up are slight. This results from two complementary processes. On the one hand, the depression or anxiety suffered by individuals, who lose an agonistic encounter, discourages them from further competition so that they no longer challenge those above them in the hierarchy. On the other hand, the exhilaration and pride enjoyed by those, who prevail, encourages them to further competitive encounters. Mechanisms exist that maintain difference amplification. For example, when escalation by a subordinate in both animal and human hierarchies could bring a reward (e.g. in male control of access to breeding females in lions, baboons, elephant seals), or in an effort to overthrow a political leader, dominance displays by a dominant are rewarded if they result in the subordinate being intimidated.

Anthropologists, who have been struck by the relative classlessness of hunter-gatherer peoples, have argued that the skilled hunter doesn't enjoy any special status. However, Robert Wright (1994) refers to the “deeply human hunger for status” and the “seemingly universal presence of hierarchy”. For example “The Ache, a hunter gatherer people in South America, seem at first to possess an idyllic equality. Their meat goes into a communal pool, so the best hunters routinely aid their less fortunate neighbors. However, during the 1980s, anthropologists took a closer look and found that the best hunters, though generous with meat, hoard a resource more fundamental. They have more extramarital affairs and more illegitimate children than the lesser hunters and their offspring have a better chance of surviving, apparently because they get special treatment” (pp. 238-9). One might expect the same principle to apply to those with other talents that are useful to the group.

Studies on twins that compete for parental resources provide data about the impact of genetic differences on difference amplification. Shields (1954, p. 241) found a close relationship between intelligence assessed mainly on performance at school and mental health. The twin, who was less intelligent than his twin partner, was in the majority of cases rated as more severely disturbed psychiatrically. This tendency was equally clearly in uniovular and binovular twins and Shields suggested two possible

mechanisms. One was that those who are less able to cope with intellectual problems were also less able to cope with emotional ones, and the other was that emotional maladjustment lowered the level of intellectual efficiency. Both mechanisms would have contributed to difference amplification between twins. Whereas Shields focused on possible maladaptive reactions to repetitive loss, one could also consider the likelihood that the winner might have experienced the cycle of success which compounded his initial advantage.

Chartrand (unpublished manuscript) explored the consequences of attaining and not attaining an automatically activated goal. In two studies, she found that success at a nonconscious goal improved people's moods and failure depressed people's moods. In two additional studies, individuals who had succeeded at a nonconscious achievement goal performed better on a subsequent achievement task than those who had failed. This study demonstrated significant downstream consequences of success and failure at nonconscious goal pursuit for mood and behavior. These individuals were not competing with each other, but their reactions to success and failure illustrate the mechanisms that contribute to difference amplification.

Difference amplification can also be observed in other species. For example, Ivan Chase (1974) proposed that the strength of the hierarchy in chickens resulted from a magnification process, in which combinations of ability and luck drive some animals downwards in rank while lifting others upwards. Those who succeed are likely to seek out further confrontations while those who fail are more likely to avoid confrontations. Warren and Maroney (1958) provided further support for Chase's hypothesis, when they found that, among rhesus monkeys, the differentiation between losers and winners in pair wise contests increased over time. The scores of the initially successful monkeys rose and the scores of the initial losers fell. This would have, over time, produced a much stronger hierarchy exactly as predicted by the Chase model (Wilson, 1975, p.295).

### **The cycle of success**

The adage "nothing succeeds like success" governs responses through the life span, a principle already well accepted in the field of special education. Success is usually pleasurable, and major successes, like winning an Olympic gold medal, overcoming a major obstacle, and making a new discovery are generally associated with euphoria and pride. We aim to succeed, because of our drive for mastery, and motivational systems such as social rank, attachment and care giving help determine how we handle success and failure. Success tends to be associated with positive mood; it raises self-confidence and encourages us to take on new challenges.

The ubiquity of the cycle of success raises the question of whether it has a specific function that has evolved over time. Nesse (1991) hypothesized that "feeling bad", when one fails, causes one to give up failing enterprises and focus instead on arenas where one can make more productive use of one's skills. On the other hand "feeling good" when one succeeds encourages one to further develop and utilize these talents.

For example, in the hunter-gatherer society, the skilled hunter is likely to enjoy a high status and the individual with a natural talent as a hunter experiences the pride and euphoria associated with rising status. His enjoyment of his rising status motivates him to exercise his hunting skills, which helps his status rise or remain high. His natural prowess and his motivation to develop his hunting skills enable him to provide food for his family and the larger group. Therefore, the presence of a natural talent, such as excellent hunting skills in a hunter-gatherer society, generates a cycle of success as agonistic victory leading to ascent in the hierarchy provides more privileged access to resources, and more desirable mates thus promoting the survival of his genes.

After the first few years of life, most success involves a form of competition. It may be competition for resources, for status, for power, or to be attractive. As Tooby and Cosmides (1996) suggest, there is an underlying competition in many forms of social relationship, such as eliciting parental investment, developing supportive peer relationships, and attracting desirable mates. Though those, who are conspicuously devoid of talent, will probably have a lower hierarchical position, they may enjoy a status that results from their contribution being useful to the other members of the group.

We believe this “cycle of success” is biologically programmed and can be adaptive both in the short-term for the individual and subsequently for the progeny. However, each time one takes on a new challenge, this provides a greater access to resources, but engenders a new risk of failure.

### **The Cycle of Success across the life span**

It has been well recognized through systematic research (Masten and Coatsworth, 1995) that the quality of the early child/parent relationship varies and shapes the child’s subsequent relationships across the lifespan. Recent developments in the area of resilience and competence suggest that high competence and self-efficacy engendered through successful early experiences can have a positive impact on the child’s future development. This notion, although long recognized, has been supported by extensive evidence derived from follow-up of individuals who had to overcome stresses in early development. Thus, early successful encounters in organism-environment transactions have been shown to have a much greater impact on later life than was originally thought (Felsman and Vaillant, 1987). When the mother is able to terminate her infant’s crying successfully it is likely to raise her confidence and, if she fails she feels ineffective (Leavitt, 1998). Continued failure leads to “learned helplessness” which leads to debilitated performance in subsequent efforts to stop the child’s crying (Donovan and Leavitt, 1985).

The child faces a series of challenges during growth and individuation, which vary with the developmental stage. Erikson’s (1968) theory of psychosocial development popularized the notion of developmental tasks. He described eight stages of psychosocial development as lying on a continuum of success and failure. A “sense

of mastery” is a more encompassing term relating to the successful negotiation of the challenges associated with all developmental stages. A basic premise of Erikson’s model is that success in one stage facilitates success in subsequent stages - the cycle of success.

Erikson’s developmental model has been widely employed as an explanatory construct in a number of studies, including one that assessed the prediction of competence in adulthood. “Boyhood competence”, a composite of overall functioning based on Erikson’s “industry versus inferiority” notion of development was assessed in early adolescence. The data were then employed to predict competence in adulthood. Results showed that boyhood competence was the best predictor of adult functioning on a variety of outcome measures (Felsman and Vaillant, 1987). Thus the notion of competence appears to have predictive value across development. Because the Eriksonian notion of competence depends upon the degree of success the individual has had in coping with developmental challenges, the concepts of success and competence are closely linked.

### **Social Rank Systems**

Among humans, there are many different hierarchies that people belong to, each of which relates to a different field of endeavor. People vary in terms of the relative importance they attach to advancement in any specific hierarchy. Some want to have stylish clothes or a fancy car; others want advance in their hierarchy at work, or in their social environments.

Because success in competition for power or attractiveness brings more access to food, territory or mates, dominance rank is heavily defended. Moreover, given the importance of social rank for reproduction, animals seem to have evolved to seek higher rank (Weisfeld and Wendorf, 2000).

### **The Cycle of Success and Motivational Systems**

It has been claimed (Liotti and Intreccialagli, 1998; Hilburn-Cobb, 1998) that the attachment system, through the interpersonal cycles coordinated by the internal working models modulates, organizes in part or shapes the operations of the other interpersonal motivational systems (ranking, sexual-mating, cooperation and affiliation) throughout socio-emotional development. Grusec and Lytton (1988) queried the assumption that attachment acts causally and speculated that attachment is an indicator of the child’s overall resilience and adjustment, which may have other sources. Nevertheless, it appears that for the care-giving system to function effectively it is important for the mother to have had a secure attachment to her mother, when she was young (van Ijzendoorn and Bakermans-Kranenburg, 1997). It is also probable that a secure attachment promotes the optimal functioning of the social rank systems (Sloman and Atkinson, 2000). In summary, a secure attachment in childhood appears to be linked to the cycles of success in later life and conversely

a disorganized attachment is associated with the subsequent development of psychopathology (Carlson, 1988).

### **The Maladaptive Cycle**

The converse of the cycle of success is a maladaptive cycle associated with the negative reaction to failure and loss. In battle, it is well-known that a losing army can be paralyzed by feelings of helplessness and hopelessness so that it ceases to be an effective fighting force. One observes this too in competitive sports where an individual or a team that feels defeated loses confidence and ceases to be a threat to the opposition. This is associated with negative mood and can culminate in clinical depression (Kendler et al, 2003; Sloman, Gilbert and Hasey, 2003).

The maladaptive cycle is triggered by failure and becomes more likely after repeated failure, but it is not a necessary consequence of failure. For example, when the individual perceives that defeat is inevitable, it is often in his/her best interests to disengage from the struggle expeditiously. True submission involves acceptance of the subordinate role and, in primitive times, this would have served the function of avoiding serious injury or even death. However, in some cases the individual's anger or resentment is so powerful, that he cannot submit, thus causing him to persist in a hopeless struggle. This leads, in turn, to a more powerful triggering of the individual's subordination strategy, which is associated with escalating negative feelings of helplessness, hopelessness and inadequacy. This may eventually culminate in a clinical depression (Price et al, 1994; Sloman, 2000). In other cases, the individual's inability to handle the negative affect associated with defeat causes the individual, whose subordination strategy has already been activated, to become preoccupied with avoiding the pain of further loss. This may lead to fruitless power struggles characterized by an inability to admit any weakness or error and by a tendency to put others down.

A secure attachment, effective functioning of the subordination strategy and agonistic victory all assist in the regulation of emotion. One can contrast these features of the cycle of success with the maladaptive cycle. In the latter, an insecure attachment, a series of defeats and ineffective functioning of the IDS may impair the individual's ability to regulate affect. The attachment and social rank systems have a complementary relationship in that a secure attachment is associated with an effective functioning of the dominance and subordination systems (Sloman, Atkinson, Milligan and Liotti, 2002; McGuire, Fawzy, Spar and Troisi, 2000). For example, a securely attached individual, who has just experienced, can benefit from support, or comfort from an attachment figure that lowers his level of arousal and thus makes it easier for him to accept defeat. Furthermore, insecurely attached children have more difficulty in assuaging anxiety and tension and are, as a result, more likely to become overly submissive or overly aggressive. This is borne out by the fact that insecurely attached children are more likely to become either victims or bullies (Troy and Sroufe, 1987), evidence of the ineffective functioning of their dominance and subordination systems.

Movement up this continuum is associated with success including success in establishing a secure attachment, while continued failure or losses can lead to movement down the continuum. The infant's development of a secure attachment to the mother depends in large part on the mother's ability to respond appropriately to the child's needs. Because the quality of the child's attachment has an important influence on the child's future development, it could be argued that the child's fitness depends to a large extent on the effective operation of the mother's motivational systems, which are in turn reflective of the mother's fitness (von Ijzendoorn and Bakermans-Kranenburg, 1997). This suggests that the cycle of adaptation in the parents can be transmitted to the children through child parent interaction thereby affecting the fitness of subsequent generations.

The ill effects of maternal deprivation are a good illustration of the consequences of failure to develop a normal attachment and also represent an extreme example of the operation of the maladaptive cycle. An early classic report on foundling homes stated that that in 9 out of 10 infant asylums in the United States, all children under the age of 2 years died (Chapin, 1915). A survey in Baltimore revealed that, despite adequate physical care, 90% of infants died within 1 year of admission (Knox, 1915). In 1945, Rene Spitz reported on the high mortality, high morbidity and severe psychopathology in young children who were receiving only minimal stimulation in an institution (Spitz, 1945). The effects of institutionalization and maternal deprivation on development led to heightened awareness that infants need mothering. These kinds of findings were the stimulus for Bowlby's (1951) classic World Health Organization monograph in which he stated that it was essential for mental health that the young child should experience a warm, intimate and continuous relationship with the mother, which is what all these children lacked. Healthy growth is associated with secure attachment, successful mastery including agonistic success and effective functioning of the subordination strategy, which allows one to accept defeat. These are characteristic features of the cycle of success.

### **The cycle of success and the maladaptive cycle are one behavioral system**

We previously hypothesized that negative patterns were triggered in the genetically disadvantaged in in-group competition, which generated a maladaptive cycle that led to their more rapid elimination from the gene pool (Sloman, 1976; Sloman, Konstantareas and Dunham, 1979). In this paper, we have extended our hypothesis to encompass both the maladaptive cycle and the cycle of success. Furthermore, rather than viewing the cycle of success and the maladaptive cycle as distinct phenomena, we see them as being at different ends of a single continuum. Thus, the maladaptive cycle can be viewed as the unraveling or failure of development of the "cycle of success". Healthy growth and development and a movement up the status hierarchy represent the cycle of success and the maladaptive cycle is associated with anxiety, depression and falling status.

Pride is associated with a feeling of accomplishment that raises one's status in the

hierarchy. With increasing success one's status rises and the continuity may be shown by nonverbal displays. Shame on the other hand, is associated with feeling that one has failed and that others will look down on one. Thus, a major defeat or setback can result in feelings of pride being replaced by shame and humiliation because one cannot simultaneously be dominant and subordinate. This has led to the argument that pride/ shame is a single behavioral system, the origin and expression of which is analogous to dominance behavior in other species (Weisfeld and Wendorf, 2000). Therefore, if Weisfeld and Wendorf are correct, the cycle of success associated with pride and the maladaptive cycle associated with shame are on the same continuum.

Further evidence for the cycle of adaptation and the maladaptive cycle being on the same continuum is that a number of the same variables are associated with both risk and resilience. For example, stressors, parenting qualities, intellectual functioning and socioeconomic variables have been broadly implicated as predictors, correlates and moderators of both competence and psychopathology (Masten and Coatsworth, 1995, p. 741).

Finally, the "cycle of success" and the "maladaptive cycle" have in common the fact that both the cumulative advantages that accrue to those who win and the cumulative disadvantages that result from loss in competitive encounters lead to difference amplification between competing individuals.

### **Assortative Mating and Polygamy**

There is a tendency for people to choose mates that resemble each other in some key domain such as intelligence, physical appearance or height (Sadalla, Kenrick and Vershure, 1987). This is called positive assortative mating. Since for any such quality there is usually a genetic basis, this mechanism results in the mating of genetically similar people. This facilitates the process of mate selection by providing information about status and, therefore good genes (Sloman and Sloman, 1988). As a result, those who were endowed with good genes were likely to choose partners who had good genes. Though this may not be applicable to modern western society, we believe it was operative during most of our evolutionary history in preliterate societies.

Assortative mating occurs for features of competence associated with the cycle of adaptation such as status, power and self-confidence, a pronounced musculature in males, speed and grace, self-confidence, freedom from physical, intellectual and emotional handicaps, etc (Buss, 1985, Symons, 1979). These same attributes assist individuals to obtain multiple partners in polygamous societies. McGraw (2002) has argued, on the basis of male preference data from females, that modern human mate choice is based on criteria like RHP (an estimate of fighting capacity including weapons, allies and other resources), emotional characteristics and personal interests, and that these co-vary with environmental variables such as population density, and degree of competition for resources. He concluded that criteria of physical attractiveness, on the other hand, varied with the female's perception of her own attractiveness.

In modern Western society, one cannot readily measure fitness by reproductive success, but in the hunter-gatherers optimal mate selection would have either secured a partner with good genes, who would have maximized the probability that the individual's genes would replicate more prolifically than those of others, or secured multiple partners thereby also leading to a greater replication of the individual's genes.

Through competitive social interaction, the effect of a small genetic difference was amplified when this difference emerged as relative social status. Thus, significant variability of status can obtain even when individual differences in genetic make-up are slight (Sloman, 1976; Sloman, Konstantareas and Dunham, 1979). Assortative mating in hunter-gatherers gave those who were well endowed access to partners, who were also well endowed and the offspring would have had a double genetic advantage (Sloman and Sloman, 1988). Similarly, in polygamous societies, the operation of sexual selection would have increased the differential advantage of the most viable in finding mates and having progeny.

We have argued that access to multiple females was the critical fitness benefit to superior hunters in at least some supposedly egalitarian hunting societies. That may have little to do with assortative mating, which could be seen as an alternative strategy, better adapted to monogamous societies. If that were true, the expression of 'good genes' at a progressively higher relative frequency could still come about, but presumably at a slower rate than under an assortative mating paradigm.

### **Phylogenetic Adaptation**

We see a link between the cycle of adaptation, which occurs within the context of the interaction between individuals and the environment, and evolution through adaptive mutations, which can occur, when proximal adaptation is, at least in part, heritable. We propose that the magnification of genetically transmitted advantages during competition accelerated the human evolution by favoring the fittest. The process of phylogenetic adaptation is set in motion by "selection" i.e. the change in relative frequency of genotypes due to differences in the ability of their phenotypes to obtain representation in the next generation. Phylogenetic adaptation therefore represents the production of superior replicator genes, whose phenotypes manifest in any or all of a variety of abilities. Through their combined effect, the cycle of success together with assortative mating, or sexual selection would have greatly accelerated the action of natural selection and the rate of human evolution. We wish to emphasize that we are speaking of early man rather than modern human society.

### **A Biopsychosocial approach**

Our model is an integrative one in that it encompasses biology, psychology and culture (Gardner, 1997). Firstly, the impact of success and failure on mood state is a universal phenomenon, which appears to be biologically based. Furthermore, the

attachment and social rank systems, which motivate people to seek relief, or to achieve are also biologically based. The psychological component of our model is exemplified by the mood changes and associated cognitions that accompany success and failure. The socio-cultural dimension is highlighted by the tendency of all human groups to develop hierarchies (Mazur, 1973). Possession of relevant attributes is required to rise in a hierarchy. The attributes vary, but in every primitive society those attributes that support the survival of the group are highly valued (Wright, 1994). For example, in a hunter/gatherer society excellent hunting and gathering skills give rise to high status. These cultural standards determine the criterion for success in negotiating hierarchies in that society. Culture thus defines success in a way that will promote the survival of those members of the group, who are best adapted. This ultimately favors the survival of the group as a whole. It should be noted that most of man's evolution occurred as a hunter/gatherer. Thus, we need to consider the evolutionary function of our biological mechanisms in the context of the hunter/gatherer society. In our complex modern western society, where there is a wide range of hierarchies centering on different areas of expertise, the link between the criteria of success and survival may be more tenuous.

### **Therapeutic Relevance**

Parents and professionals in the field of special education have long been aware that students need to experience success to counteract their habitual experience of failure and humiliation. The positive feelings associated with successful mastery motivate the child to take on new challenges which provides an impetus to further growth.

Because those, who are clinically depressed, often feel overwhelmed by repeated failure, the therapist can assign tasks that enable the client to experience success. For example, when the depressed client feels angry, hopeless and defeated, the therapist is often able to determine that the client has the wherewithal to succeed. One may also assist the patient, who feels hopeless and defeated, to work towards more realistic goals. One can build up their self-confidence by reminding them of their strengths and increase the likelihood of success by suggesting they take one small step at a time. Enabling patients to become truly self-assertive (as opposed to letting off steam) helps them regulate their affect and become more productive and successful.

One preliminary step in psychotherapy may be to disrupt a maladaptive cycle in a client, who has no chance of winning, but is unwilling to give up a fight. A 50 year old executive presented with a rapid onset depression. He had recently been fired, but was determined to fight his firing even though there was no possibility of his keeping his job. This had generated an increasingly powerful subordination strategy, which manifested as clinical depression. The therapist advised him to accept his firing and to focus energy on achieving a better settlement. The client accepted this advice and his depression cleared.

## **Conclusion**

The effective functioning of our behavioral systems can generate changes that promote adaptation and survival. Though we have focused particularly on the attachment and dominance/subordination systems, this is also applicable to other systems like parenting and affiliation. We have examined the positive impact of secure attachment and winning adversarial encounters. The therapist promotes a more secure attachment by being supportive and empathetic and a more effective functioning of the dominance system by encouraging healthy self-assertion and by helping the client to judge when to accept defeat and move on.

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