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HAPPINESS IN THE PERSPECTIVE OF EVOLUTIONARY PSYCHOLOGY

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ABSTRACT. The human capacity for positive and negative feelings is shaped by the forces of evolution, thus the evolutionary perspective should be relevant to the study of happiness. This paper attempts to identify the more pertinent innate qualities of the human brain, and discusses how the evolutionary perspective can be used to relate these qualities to the study of happiness. Two aspects of our evolutionary legacy appear to be particularly relevant: One, the consequences of discords between the present way of living and the environment of evolutionary adaptation; and two, the presence of feelings designed to influence behaviour. The purpose of the present paper is to both expand on these two aspects and thereby arrive at an evolutionary based description of happiness; and to discuss the relationship between this biological account and some current approached to the study of happiness.

KEY WORDS: evolutionary psychology, happiness, mismatches, discords, brain rewards, environment of evolutionary adaptation, biological perspective.

In recent years the evolutionary, or biological, perspective has become widely accepted as relevant input to the social sciences, as witnessed by the emerging fields of evolutionary psychology and evolutionary anthropology.[1] Whenever a feature, such as an emotion or a behavioural pattern, is influenced by genetic constitution – that is, when it involves innate tendencies – it is expected that an appreciation of human evolutionary history will contribute to our understanding of that feature. There are several lines of evidence backing the claim that happiness is influenced by human genetic inheritance, including the cross-cultural universality of concepts describing this state. In fact, the contention may seem obvious, as it is generally recognised that there is a genetic component to the human capacity for sensations and feelings, including those related to mood. Consequently the study of happiness should benefit from an understanding of the character of the relevant genetic influence.

In the present article 'happiness' will be used in the meaning of 'the subjective appreciation of ones life-as-a-whole'. In other words, as to Veenhoven's (2000) division of aspects relevant for the quality of life into a four-partite matrix, the present use of the term happiness covers the 'appreciation of life' quadrant. Happiness, in the present meaning, appears to be not so much a feature shaped explicitly by the evolutionary process, but rather an indirect consequence of human nature; and as

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such may be better referred to as a state of mind, rather than as a trait. Although happiness is a rather abstract quality, the various methods designed for measuring subjective well-being do presumably offer relevant assessments.

It should be mentioned that not all cultures necessarily hold happiness to be the main purpose of life, and certainly not the main measure of success. For example, in Asian collectivist cultures following the norms of society is apparently considered more important than are personal feelings (Suh et al., 1998). However, as far as the present model of happiness is concerned, it is not important whether the positive mood of the individual is a consequence of success in following the norms of society, or results from a more direct approach to the pursuit of happiness.

As pointed out elsewhere, the main contribution of the evolutionary perspective in understanding human emotions and behaviour is to help shape a broader view (Buss, 1998; Palmer and Palmer, 2001). Thus, evolutionary psychology may be of limited value in regard to practical advice on how to study happiness, but could offer a useful conceptual framework. Moreover, the evolutionary perspective is most suitable for elucidating the general impact of the genes, thus although there is a genetic component to the individual variation in the propensity to enjoy life (Diener and Lucas, 1999; Lykken, 2000), this will not be an issue in the present article.

There are actually two main links between the natural sciences and the study of happiness: The evolutionary perspective and the neurological approach. The discipline referred to as 'affective neuroscience' (Panksepp, 1998) covers pertinent knowledge regarding neurological correlates of emotions, including those that may affect happiness; and another recent book, edited by Kahneman et al. (1999), includes chapters that look specifically at physiological–neurological aspects of well-being. The present paper concentrates on the evolutionary perspective. Previous work in this field (Grinde, 1996; Barkow, 1997; Buss, 2000) points towards two lines of reasoning: The relevance of the environment, and the relevance of sensations. The following discussion will start by expanding on these two perspectives, followed by an attempt to formulate a biological description of happiness; and, finally, a discussion on how this description relates to current studies of happiness.

THE ENVIRONMENT

In biology, the concepts most closely related to quality of life are 'fitness' and 'success'. The key to obtaining reproductive success lies in a combination of fitness and an appropriate environment, where the term 'environment' embraces both physical and social aspects. The 'appropriateness' of the environment is a question of to what extent it caters to the genetic constitution of the organism.

Human genes are designed for particular conditions of living, as are the genes of any organism, but in the case of humans (and presumably other mammals) the advantage of a suitable environment is not solely a question of allowing for reproductive success: A proper environment, as will be argued, correlates with an improved mental state. The point is substantiated by research on animals, which indicates that living under unnatural conditions, whether in regard to physical or behavioural aspects, has detrimental effects on health, including mental constitution, and consequently a presumed negative effect on the quality of life in the sense referred to as happiness (Moberg, 1985; Lord, 2002). Thus, whereas happiness is relevant for biological success only to the extent that the state of mind influences fitness, the appropriateness of the environment is relevant for happiness.

It may seem obvious that happiness is affected by having conditions that cater to basic needs, but, as will be discussed below, the quality of the environment may also influence happiness in more subtle ways. In other words, it is conceivable that minor deviations from the conditions for which the genes have designed humans can have long-term detrimental effects on the psyche. Moreover, which environmental deviations that are likely to promote distress is not necessarily obvious.

Environment of Evolutionary Adaptation

The concept 'Environment of Evolutionary Adaptation', or EEA, has been coined to reflect the conditions to which the genes are adapted.[2] The human EEA is typically associated with the Middle or Upper Palaeolithic environment of our ancestors; or, to phrase it differently, the environment in the period following the emergence of modern humans, some two hundred thousand years ago. The first change towards a different environment – one less in tune with the genes – presumably came with the increase in group size and beginning of agriculture 10 000–15 000 years ago.

It should be noted that human genes were not shaped in one particular environment, but rather over millions of years of interaction with various conditions. Our basic emotions, for example, did not appear in the Stone Age, but entered the brains of our ancestral animals some hundred million years ago, as evidenced from the observation that related emotional structures are present in brains of animals that parted with our lineage that long ago (Panksepp, 1998). Subsequent evolution, all the way up to modern humans, modified the emotional dispositions, but the alterations had to comply with the rules governing the evolutionary process, and as such do not necessarily reflect perfect adaptations to the particular conditions of Palaeolithic tribes.

One may also point out that present humans are adapted to diverse environments: The Inuits of Greenland are adapted to a different climate than the African Bantus. However, these variations in climatic adaptation may not matter that much for the present discussion – the more pertinent features of human EEA are presumably not so much a matter of the physical environment, but rather a question of social environment. Although traditional societies are organised in a variety of ways, the genes that influence social inclinations have probably not diverged significantly. This contention is supported by the observation that, compared to other species for which there are relevant data, the human species is genetically homogenous (Kaessmann et al., 2001).

To conclude so far, with the above limitations in mind, it may still be convenient to consider the way of life of Palaeolithic tribes to be an approximation of a universal human EEA, at least as far as social and behavioural adaptations are concerned. However, we obviously only have scant indirect evidence as to the nature of the environment and way of life at that time.

The Concept of Discord

The disparities between how we live and what our genes are adapted to have been referred to as 'mismatches'.[3] The words 'strain' or 'stress' will here be used for the detrimental effects of living under suboptimal conditions; mismatches are presumably often associated with such strain, but not always. For example, to sleep on a modern mattress probably creates less strain on your body than sleeping on the ground, and having a door to lock reduces the stress associated with worrying about predators. I shall use the term 'discord' for the cases were mismatches have detrimental effects. Thus, while a mismatch may be beneficial,

a discord implies a situation that in some, if not most, people cause an element of strain in a negative sense.

Some of the strain caused by discords is presumably associated with the classical stress response. Excessive activation of this response has been linked to a long list of ailments: Stress compromises the immune system, it can induce complaints such as headaches and muscle pain, and it is implicated in emotional problems such as depression, nervousness, aggression, and social maladjustment.[4] As a 'discord' is defined as being a deleterious mismatch, those discords that do not cause problems related to the classical stress response, should nevertheless correlate with a reduction in happiness and health. As pointed out above, a link between discords and health is well documented in the case of animals.

Discord situations presumably troubled our Palaeolithic ancestors as well, for instance when a natural catastrophe ruined the local environment, or when a child was orphaned. A discord situation is therefore better defined as a deviation from appropriate, or optimal, conditions, rather than a deviation from a particular environment that occurred sometime in our evolutionary history. The main point is that happiness is expected to correlate inversely with the presence of discords; since they tend to disturb the delicately balanced human physiology. As to their effect on the brain, a reasonable description would be to say that they act like sand in the human emotional machinery. Although humans appear to be more versatile than most animals, and certainly sufficiently versatile to survive out of balance, we are not necessarily versatile enough to avoid the cost of discords.

It is important to note that we are not necessarily aware of to what extent the conditions we live in are permeated with discords, neither do we know what sort of detrimental consequences the discords may generate. An example from anatomy illustrates the point: Myopia is closely associated with life in industrialised societies (Curtin, 1988). The increased incidence of myopia is presumably due to environmental factors; both the tendency of infants to spend long periods focusing at something very close (e.g., reading books), as well as exposure to light during night-time early in life (keeping the lights on in the bedroom), have been suggested as possible culprits (Widdows, 1990; Quinn et al., 1999). The point is that the growth of eyeballs and lenses is affected by their interaction with the environment, which means the quality and timing of light, as well as the use of the muscles involved in focussing.

Human genes are adapted neither to books nor to electricity, and as a consequence the expansion of the eyeball may end up not matching the shape of the lens.

The genes have designed both physical features such as eyes, and mental functions such as emotional dispositions, to mature with age; but in both cases correct maturation relies on appropriate external stimuli. As in the example of myopia, the mind may be 'scarred' or 'burned' by a variety of discord conditions without any recognition that the conditions are actually harmful.[5]

It is generally agreed that gross discords, such as bringing up infants without proper parental care, or in obviously deprived environments, can cause problems that affect health (Lundberg, 1993; Shonkoff and Phillips, 2000). It seems likely that less obvious discords may have an impact as well, both in relation to the maturation of emotions, and in the context of the mental constitution of adults. Possible examples of more subtle discords include the amount of skin to skin contact, the large number of strangers we interact with, restrictions on play behaviour (particularly on 'rough-and-tumble' play), and sleep patterns associated with shift work.

As a rule of thumb, one would expect that discords are particularly problematic in relation to complex features, and in relation to features that carry intrinsic weaknesses of design. In such cases it presumably requires less of a discord to cause overt problems. The brain is certainly a highly complex feature; furthermore, some of the 'modules' of the brain may have a particularly fragile design.

Our innate stress-reaction is one possible example of a vulnerable feature. All mammals react in a particular way to stressors (such as a predator or an hostile opponent), however, humans are apparently particularly prone to turn this response into a harmful chronic stress state, presumably because our recently evolved cognitive capacity allows us to worry about all sorts of real or imagined 'dangers' (Sapolsky, 1999). Thus the human stress-response may exemplify a weakness of design, within the context of a highly complex organ. The prevalence of mental problems related to anxiety and worry may reflect the effect of discord conditions on this particular feature. The discord could, for example, be related to an observation made by Liu et al. (1997) in rats. If rat mothers lick their offspring often, the pups produce less corticotrophin-releasing hormone (CRH, the master hormone of the stress response); and, more importantly, the effect lasts: The amount of CRH produced

in the hypothalamus of the adult depends on the amount of licking received during the first 10 days of life. In other words, a reduction in the physical contact between parents and child can cause the child to become more vulnerable to stress later in life.

While the science of 'Darwinian medicine' (Nesse and Williams, 1996; Trevathan et al., 1999) addresses the medical consequences of discord situations, like the example of myopia, the present paper adopts a broader view: Rather than restricting the discussion to overt health problems, it includes the possible consequences of discord situations on happiness. The pertinent question is whether the environment is optimal for avoiding mental agony and fostering happy people; or whether happiness is reduced by minor, possibly unrecognised, discord situations.

POSITIVE AND NEGATIVE SENSATIONS

Evolutionary Stages Towards a Happiness Centred Species

In humans, evolution has created a species highly concerned with emotional well-being, and with a potential for considerable variations in mood, thus happiness possibly means more to our species than to any other animal. Below are listed the four main evolutionary stages related to the moulding of this property. The list is relevant because it puts the existence of feelings, and thereby the propensity for hedonistic pleasure, in a perspective.

1. *The emergence of a nervous system*
   All organisms respond to environmental stimuli, but only in those carrying nerves organised in ganglia (e.g., nematodes and arthropods) or a centralised brain (vertebrates) can the response include anything remotely resembling feelings. Flowers may thrive, but they lack the nerve circuits required to appreciate the difference between blooming and withering.
2. *The use of measures that can be referred to as 'rewards' and 'punishment' in order to influence behaviour*
   The neurotransmitters normally associated with brain rewards (such as opioids and dopamine) are present in all vertebrates, as well as in many invertebrates, but they may not have been involved in positive and negative sensations prior to the vertebrate stage (Stefano et al., 1998; Panksepp, 1998). Vertebrates, however, are

presumably equipped with sensations designed to induce them to behave – that is, to take actions – conducive to the propagation of their genes. Generally, the behaviour is either of the 'make-the-best-of-an-opportunity' type or 'avoid-something' type; which roughly corresponds to positive and negative sensations (Nesse and Williams, 1996).

3. *The awareness of pleasant and unpleasant sensations*
   Although all vertebrates presumably 'feel' the difference between positive and negative sensations, at least they respond accordingly, the lower vertebrates are not necessarily 'aware of' pleasure or displeasure. There are data suggesting that this awareness evolved between the amphibian and reptile stage of vertebrate evolution: A reptile *seeks* pleasurable stimuli, such as sunbathing; and it is actually possible to measure a physiological response in the sunbathing reptile akin to what can be measured in humans who engage in positive experiences (Cabanac, 1999). Fish and amphibians do not show the same physiological response, their behaviour is presumably more instinctive and less influenced by an appraisal of sensations.
4. *The evolution of self-consciousness and a concomitant increased emphasis on feelings*
   Apparently only a few species have an awareness of a 'self'. According to the 'mirror test', and related tests, the list includes humans, certain apes, and possibly some cetaceans (Gallup, 1997; Reiss and Marino, 2001). Although sensations referred to as pleasure or displeasure do not necessarily depend on self-awareness, this capacity presumably increases the importance of feelings. Humans probably have conscious access to a larger fraction of brain processes than other animals, and subsequently more capacity to reflect on personal experiences; as a consequence, we may be more tuned towards positive sensations.

It is tempting to speculate that positive and negative sensations have a greater impact on the adaptation of humans than they have on any other species. Not only has the capacity for self-awareness presumably evolved further in humans than in other animals, and, as a consequence, we have more conscious appraisal of how we are doing. Another effect of consciousness is a greater measure of 'free will', and, for the genes, free will is a two-edged sword: While an ant will always follow the 'will of the genes', a human may choose to take actions that are not

in the interest of his or her genes. Thus, in order to retain a genetic influence on behaviour, it seems likely that evolution would enhance the intensity of agreeable and punishing sensations.

Although the dichotomy of positive and negative sensations is a simplification, when studying happiness it seems useful to consider sensations as either rewarding or punishing. As noted above, the two represent contrasting evolutionary purposes: Reward circuits are presumably designed as incitement, while penalising feelings function as discouragement. The distinction is obvious in the case of the more overt experiences; for example, the pleasures associated with food and sex signal biological advantages, while the pain of burning a finger is there to teach avoidance. It may be pertinent, however, to protest against the notion that all sensations can be labelled as either positive or negative, but, at the least, it should be possible to categorise the aspects of human affective experiences that have the more obvious impact on well-being.

It should be emphasised that the term 'reward' is here used for any sensation considered to be agreeable, neurologists often use 'brain reward' (sometimes referred to as pleasure drives) in a more specific sense: The activation of particular nerve circuits involved in delivering the more distinctive pleasurable sensations (Panksepp, 1998; Spanagel and Weiss, 1999). The 'brain rewards' are presumably associated with two discrete modules of the brain; one, typically referred to as 'wanting', serves the purpose of wetting the appetite and to energise the mind and body towards exploiting a resource; while the other, termed 'liking' or consummation-associated pleasure, concerns the sensations associated with the actual consumption (Robinson and Berridge, 1993). There is considerable knowledge as to the neurochemistry and neuroanatomy of these two modules, and as to the neurology of pain, while less is known about the mechanisms of pleasant and unpleasant sensations associated with various less defined emotive states (for a review see Panksepp, 1998).

Refinement of the Reward/Punishment Concept

The pertinence of rewards and punishment to the happiness of an individual may seem obvious, but on closer examination it raises a number of issues that need to be considered. Three such issues are singled out below. For the following discussion, it should be kept in mind that evolution shaped the human brain as a tool for survival and procreation,

feelings are consequently designed to promote appropriate behaviour that sustains life, not to make life more pleasant.

The Relevance of Conscious Appraisal

In order to understand how feelings are perceived, it is important to look at the relationship between conscious and unconscious processes in the brain. Processes belonging to the unconscious part of the brain may influence mood; for example, anxiety can be induced as a response to stimuli the individual is not at all aware of receiving (Hallowell, 1998). In fact, most feelings presumably start out in the basal, or unconscious, parts of the brain, but to experience them requires an involvement of cognitive functions. Whether feelings such as hunger and fear are conceived as pleasant or unpleasant depends on the processing at this higher level, and the outcome of the processing depends on several factors such as past experiences, personality, and expectations. Thus, closely related situations may sometimes be considered rewarding, while at other times they may be experienced as punishing.

I shall exemplify this issue by taking a closer look at fear and hunger. A dangerous situation can rapidly switch from a positive thrill to a frightening encounter, as when a rock climber looses his grip. In other words, fear can turn out as either rewarding or punishing. This may seem like an inconsistency, but it makes evolutionary sense when analysed in more detail. A scare is typically perceived as pleasant if the individual retains control of the situation, while unpleasant if the situation gets out of control, because these two modes of experiencing fright serve different biological purposes: The brain is designed to induce us to take some chances, otherwise we would never have laid down a large prey or ventured into uncharted land; but it is also designed to stop us from causing harm to ourselves, that is, to avoid hazards. The 'adrenaline kick' associated with climbing a mountain or riding a roller coaster may feel good, presumably because it improves the chance of survival if voluntarily encountered dangerous situations induce a positive mood and a high self-esteem. At the moment one looses the grip on the mountain, the unpleasant sensations devoted to harm avoidance kicks in.

Similarly, slight hunger can be experienced as pleasant; it entails an anticipation of food-related rewards, and can intensify the pleasure of eating. Too much hunger, however, is unpleasant, particularly in a situation where no food is available. The displeasure of starving is there

to discourage the individual from ending up in the latter situation. In the case of both fear and hunger it is presumably the conscious appraisal of the situation that decides whether the deeper signals, of respectively danger and lack of nutrients, give rise to agreeable or disagreeable sensations.

Rewards Associated with Hapless Situations

Not only is the categorisation of sensations as either positive or negative a simplification, in many cases the appropriate category is not at all obvious. I propose that certain sensations that are intuitively classified as negative actually contain an element of reward. For example, most people will list sadness and grief as disapproving, yet they are often actively pursued, as witnessed by the popularity of movies that induce these emotions in the spectator.

As in the example of fear, in order to understand this apparent paradox it is important to look at the functional significance of sadness and grief. One must distinguish between a harmful event and the associated response; the former is something to be avoided, the latter is a natural reaction. The loss of a spouse may be tragic for the genes, but as misfortunes occasionally occur, the genes have prepared the brain to cope with the problem. The genes are best served by implementing a mechanism that helps the survivor master the situation, and the normal response includes sorrow. The response may elicit compassion and help; it may also improve mental recovery, and thus increase the chance of finding a new spouse. The pertinent point is that to the extent grief is adaptive, the brain should encourage this feeling; and the available encouragement is in the form of an agreeable sensation. A beneficial emotion should, at the least, not trigger disagreeable feelings.

The above example reflects the following rule of thumb: Engaging the mind and body in tasks for which they are designed is expected to promote happiness by instigating positive feelings. This principle obviously applies to life-supporting actions, such as consuming food or keeping warm, but it should also apply to situations of fear and bereavement.

A situation of grief thus typically involves both negative and positive elements, the negative ones are there to induce the individual to avoid the unfortunate situation, and the positive ones are there to help the individual make the best of the situation once it has occurred. When watching a film, it is possible to nurture the positive effect; the spectator

can identify with – or empathise with – the characters, and enjoy sorrow without personally having to go through the harmful event.

A similar argument can be made for physical pain: The sensation is there to signal that you are hurting yourself, however, if you should hurt yourself there is no reason to suppress the natural response, such as screaming. Again, the point is to distinguish between, on the one hand sensations (and concomitant behaviour) designed for aversion; and, on the other hand, emotions involved in coping. According to the present vocabulary, the former is a punishment, while the latter is something the individual is urged to engage in, and is thus potentially rewarding.

Long and Short-term Benefits

All mammals presumably have brains capable of experiencing pleasure, it is therefore not surprising to find that, when offered the opportunity, animals will indulge in stimuli that activate the relevant brain circuits (Panksepp, 1998). Humans, however, are unique in that we have the brainpower to understand and exploit the situation; not only can we procure large quantities of naturally occurring rewarding stimuli, we have also created a number of substitutes, such as narcotics, artificial sweeteners, and pornography.

Most of the commercial stimulants can have negative consequences. The health effects of excessive use of stimulants such as sweets, fat food, and narcotics are well known. There are three main obstacles to having the long-term effect of indulgence in stimulants ending up as an overall positive effect on happiness: One, the long-term consequences may jeopardise health, which will reduce the subjective enjoyment of life; two, the reward tends to diminish with habituation, in fact, even short-term stimulation typically leads to hedonic adaptation (Frederick and Loewenstein, 1999); and three, the life situation created is not natural and may therefore involve an element of strain in the present sense.

Reward mechanisms evolved under conditions where the possibility of abuse was negligible. If misuse had been a problem (that is, if the stimuli were so easily available that overindulgence commonly decreased fitness) one would expect the process of evolution to eventually change the brain in a way that counteracted abuse. Thus for animals living under natural conditions, reward mechanisms presumably function according to the purpose; while if a species suddenly finds itself

in a situation of abundance to which it is not adapted, such as humans in an affluent society, there are likely to be complications. In other words, when including rewarding sensations as a component of happiness, it is important to balance short-term benefits against long-term disadvantages.

THE BIOLOGY OF HAPPINESS

A Biological Description of Happiness

Based on the above discussion, it is possible to formulate a model for understanding happiness in an evolutionary perspective. This model suggests that happiness is linked to two key concepts: One, to avoid discord situations, and the concomitant strain, by adjusting the conditions of life to innate tendencies; and two, to utilise the brain's potential for rewarding sensations. Thus happiness (in a biological sense) should correlate with how successful the individual is in pursuing these principles. A related description has previously been referred to as 'Darwinian happiness' (Grinde, 1996).

Refining the Biological Description: A Default State of Positive Mood

The above description distinguishes between 'avoiding strain' and 'obtaining rewards'. There is no distinct line separating these two principles; as previously pointed out, positive feelings are expected to arise when a person engage the mind and the body in tasks for which the genes have designed them. In other words, behaviour and mental activity that are in tune with inherent tendencies will be supported by the brain, and are thus expected to be pleasant.

Another point to be made is that the brain is obviously not always in the course of harvesting an overt reward or enduring a punishment. Although it may be argued that the mind tends to incline towards either a positive or a negative mood, the more tangible feelings occupy the mind for only a fraction of the day. On the other hand, some moods can permeate the day; either in a negative sense such as anxiety, or a positive sense such as love. Yet, even in the absence of blatant rewards, and in the absence of a permeating mood, most people seem to sense life as being more or less good. Presumably this subjective assessment is to some extent a consequence of variations in innate qualities

(Diener and Lucas, 1999; Lykken, 2000), the present model argues that it is also a consequence of how the individual relates to the above biological description of happiness.

The concept of 'default positive mood' – that the human brain is apparently designed to offer a positive frame of mind as long as the situation does not dictate alternative moods – somehow blends the principles of 'strain avoidance' and 'reward harvesting'. In support of this concept, several studies infer that, when basic needs are met, most people enjoy life, and that people tend to be optimistic.[6] There is also an argument favouring this notion based on the evolutionary perspective: Evolution should prefer the basal state of mood to be agreeable as it is presumably in the genes' interest to reside within a content carrier; a good mood is more likely to spur the individual to participate in procreation and life-supporting functions, at least when compared to a depressed state.

Moreover, while health is obviously important for happiness, it is more difficult to evaluate to what extent a good mood can procure health, or if a drop in happiness is solely a secondary consequence of ailments. The idea that a positive mood can improve fitness, and thus offer a biological advantage, is substantiated by a reported correlation between positive emotions (as assessed by analysing autobiographic texts written by nuns in early life) and longevity (Danner et al., 2001). One investigation that might seem to contradict this study is the report by Friedman et al. (1993). In a long-term follow up of persons whose personalities were tested when they were children, they found that longevity correlated with conscientiousness rather than cheerfulness; but then the item referred to as cheerfulness in this study also correlated with risk taking. In another analysis of the same data, Peterson et al. (1998) found evidence for the expected inverse relationship between pessimism and longevity.

Pain and negative moods are there for particular purposes, and as long as the stimuli eliciting such feelings are avoided or dealt with the general mood should be agreeable. Unfortunately, losing the state of 'default positive mood' may be one of the more typical consequences of a discord life situation; and even the presence of ample reward-eliciting stimuli may be insufficient to compensate for this deprivation. A variety of techniques, such as various forms of meditation and yoga, are presumably aimed at returning the individual to the default positive mood, and at nurturing this state of mind.

HOW THE EVOLUTIONARY PERSPECTIVE RELATES TO HAPPINESS RESEARCH

It is common to distinguish between conditions required for happiness (alternatively referred to as opportunities for a good life), and the actual sensation of well-being. McCall (1975), for example, makes this distinction. In his view the feeling of happiness is linked to need-gratification, and the conditions for happiness to the prerequisites for this gratification to take place. It is relevant to note that, when making this bipartite division, the quality of the social or physical conditions are often added to the score of happiness. Thus, in the view of McCall, beneficial conditions are of value, even if the individual does not exploit the opportunities available.

Need-gratification is closely related to 'rewards' in the evolutionary perspective. In the present model, however, the term 'rewards' is probably used in a broader sense, as exemplified by the suggestion that even emotions such as grief can contain an element of reward. The 'conditions required' are related to the present emphasis on 'discords'. However, discord situations can occur even if all apparent needs are gratified, thus the concept of discord may cover more territory than what is intuitively included in a list of conditions required for happiness. For example, in the present model minor disturbances caused by discord conditions during infancy can have long-term effects on quality of life, even if these conditions are not recognised in the least as being adverse, and even if the adult environment is optimal. Moreover, in the present model, the environment itself is not part of the happiness score, only the impact it has on the actual well-being of the individual.

The relevance of the term 'biophilia' (Kellert and Wilson, 1993) to research on happiness (Gullone, 2000), is also related to the concept of discords. Work along this line suggests an increase in well-being upon exposure to natural features of the environment, as well as possible adverse outcomes related to life in environments that contrast our EEA. There are, for example, data indicating that humans thrive better, and improve in cognitive tasks, in the presence of plants.[7] The typical city environment, where concrete dominates, as opposed to an organic environment with ample vegetation, could exemplify the subtle discords that may exert a negative impact on the human mind.

The previously mentioned model proposed by Veenhoven (2000) expands on the above bipartite distinction by subdividing the

'conditions for happiness' into 'outer qualities' and 'inner qualities', and by adding an 'outer quality' entity to the gratification part. Veenhoven's four-partite model seems to cover most, if not all, aspects embraced by other models. The conditions required for happiness are divided into the 'livability of the environment' (the external part), and the 'life-ability of the person' (the internal part). The former appears to cover whatever aspects of the environment are relevant, and is thus closely related to the concept of discords.

In 'life-ability' of a person lies the individual propensity to enjoy life. Some people are more prone to suffer from anxiety and depression, others tend to have a more cheerful disposition. The concept of 'life-ability' is related to what Lykken (2000) describes as a 'set point for happiness', in the sense of more or less fixed individual differences in the propensity for experiencing positive and negative sensations. Life-ability reflects both innate and acquired attributes, where the acquired component presumably is equivalent to the impact of discords on the mind. In other words, the strain of discords adds a burden that pushes people below their initial set point.

Veenhoven also divides the more overt aspects of life quality into an external and an internal category; the former being referred to as 'utility of life' and the latter as 'appreciation of life'. The 'appreciation of life' category comes close to the general use of the term happiness, and is thus the category more closely related to the use of 'happiness' in the present evolutionary perspective. Discord conditions decrease the propensity for happiness; brain rewards – in the present sense – add to the measure of happiness.

The rationale for including 'utility of life', alternatively referred to as 'external worth' or 'functionality for the environment', in a description of happiness seems less obvious; and, as pointed out by Veenhoven, this aspect is absent from many of the proposed alternative descriptions. The utility of life aspect is presumably most relevant where attention focuses more on the quality of society, while the relevance seems less obvious when the emphasis is on the happiness of the individual. However, the importance for the individual of feeling useful, or finding a meaning in life, is a recurrent theme in both psychological and philosophical writings, and thus deserves an attempt at a biological explanation.

In the evolutionary perspective, the contribution to individual happiness of having a 'meaningful life' is definitely relevant, but this contribution is easily included in the present use of the word 'reward'.

The perceived importance of utility (and the concomitant rewarding sensations) is presumably related to two aspects of human biology: One, humans are designed for gregarious social interactions, and the propensity for positive sensations accompanying acts that benefit others is included in that design (Grinde, 2000). For example, there are rewards associated with the feeling of 'helping comrades', as well as with being appreciated by others. Two, adult humans probably have an internal drive mechanism towards utility, a propensity that may have been a consequence of the increase in 'free will' – an organism with a high level of free will requires more incentives towards actions that promote the future of the genes. Thus acts perceived as useful, whether for the benefit of others or oneself, should trigger positive sensations.[8]

A variety of approaches to measure the quality of life have been proposed. The bipartite distinction of the theoretical models is typically reflected in the suggested methods, most measures focus either on the question of subjective well-being, or on the degree to which the conditions for happiness are present, or on both of these qualities. The subjective feeling of happiness, based on self-reporting, is necessarily subjective, but to the extent that it can be trusted, of obvious relevance to the actual quality of life of an individual. Apparently the current approaches are sufficiently good to give meaningful results in terms of validity and reliability (honesty of answers, interpersonal/cross-cultural comparability, and interpretation of questions) (Veenhoven, 1996). I expect that the available subjective methods for assessing happiness do offer relevant estimates regarding the present meaning of the term as well.

The most important dispensers of rewards and punishment are presumably associated with the requirements for procreation and sustaining life: Sex, food, shelter, and health. If these basic needs are satisfied, the most significant external factor appears to be our social life. Consequently, typical inventories for assessing the conditions for happiness emphasise health and social affiliation.

Much of the research on happiness has been in the direction of finding factors in the society, and in the personality of individuals, that correlate with the score on happiness assessment scales. In a recent review, Myers and Diener (1996) suggest four aspects of personality that correlate rather consistently with happiness. For one, extroverts are happier, a finding that is presumably related to the strong correlates between

happiness and the quality of bonds with friends and family, where the marriage bond appear to be particularly important (Veenhoven, 2001). An alternative way of depicting the importance of affiliations is to look at measures such as 'social participation' and 'social support'. Humans have evolved to a rare combination of pair-bonding and highly social behaviour, and the biological 'glue' that sticks both the couples and the tribe (or society) together is based on emotions. It should therefore not be surprising to find that when the social aspects of life do not function satisfactorily, there will be an emotional burden and a concomitant reduction of happiness.

As to two of the other personality correlates of Myers and Diener (1996), liking oneself and optimism, it is tempting to suggest that these traits may to some extent be a question of whether the individual has been able to retain, or find, the default state of positive mood.

The fourth correlate reported by Myer and Diener (1996) is the sense of 'personal control of life', a factor that is presumably closely related to the importance for happiness of a 'freedom' (Veenhoven, 1996). It is interesting to note that people indeed tend to be happier in societies that treasure the freedom of the individual, compared to more collectivist or confining regimes (Veenhoven, 1999). The possibility of taking charge of ones life seems to be important, and societies that demand narrow rules of conduct, obviously leave less room for personal independence. In the tribal communities of our Stone Age ancestors, the social ties, and the concomitant social participation and feelings of responsibility, were probably strong, but they were adapted to our measure of innate gregariousness, and thus not felt to be confining or oppressive. With the advance of large scale societies, there came a need to install social obligations between people who did not have personal ties, the typical solution was to use some form of authority to enforce principles of behaviour. The point is that while being considerate to those you are emotionally attached to is natural and rewarding, and does not require coercion, the enforcement of rules of conduct does limit personal freedom, and thus reduce the feeling of control. A relevant question is whether it is possible to induce the right types of emotional bonds between individuals who do not grow up in the setting of a close-knit tribe. Theoretically it may be possible for a society to have the citizens retain a feeling of personal control, and at the same time behave in a manner conducive to the best of the society – the question is whether the innate gregarious emotions can be exploited to divert

people towards behaviour, that is, for the good of the community, and thus allow societies to rely less on authority.

The concept of *flow* – the optimal experience – as described by Csikszentmihalyi (1991) is presumably related to the notions of rewards and a positive default mood. To obtain the experience of 'flow' a person should engage himself, to the extent that he may be totally absorbed, in tasks that appear meaningful. In the evolutionary perspective this seems to be related to the previously made statement that behaviour and mental activity that are in tune with inherent tendencies will be supported by the brain, and are thus expected to be pleasant. Moreover, to keep the mind engaged in this way may also help the individual avoid discords.

CONCLUDING REMARKS

While it is relevant to consider the quality of life of any organism in the meaning of biological success, 'happiness' is a term that applies primarily or exclusively to higher vertebrates, and to man in particular. The purpose of the present exercise has been to offer a contribution to a discussion of what the biological correlates to happiness may be.

Applying an evolutionary perspective to the social sciences is somewhat controversial, one relevant concern is that this perspective suggests a too deterministic model, another is that the conclusions can be misused.[9] For example, regarding the present application of evolutionary thinking, the idea that stimulation of brain rewards adds to happiness could be taken to suggest that any means to obtain these sensations are warranted. Besides the concern for long-term negative consequences, there is the obvious fact that the pursuit of happiness for one person is sometimes in conflict with what is good for others. Both concerns are pertinent; the response should be to add necessary qualifiers.

The present evolutionary perspective suggests three approaches that are relevant in order to understand the nature of happiness: The first is the question of the quality of the environment, where the principle of 'discord avoidance' is not necessarily that far from Veenhoven's (2000) concept of 'livability of environment'. However, the line of reasoning is somewhat different, and, in the present description, the part of the 'life-ability' of a person that is not due to innate factors

may be included as consequences of the environment. The second is the emphasis on positive sensations, here referred to as 'rewards' in the brain. The content of this concept is presumably related to previous entities such as 'need gratification', but again the theoretical rationale is quite different. The third approach is to suggest that, in a healthy individual who has managed to avoid disabling discords, the expected frame of mind has a positive tone, here referred to as a 'default positive mood'. The latter idea is related to the observation that people tend to be optimistic and positive (Myers and Diener, 1996; Lykken, 2000).

Happiness should not be conceived as a distinct trait or 'unit of evolutionary strategy'. The observed variation in well-being, indeed the fact that the concept of 'happiness' is part of the human vocabulary, is presumably an indirect consequence of how humans are equipped with sensations that help direct behaviour towards what is evolutionary viable, as well as with our particular form of consciousness and the concomitant capacity for appraisal of feelings. Thus one should not expect to find a module for happiness in the brain, but accept that good feelings are a consequence of the aggregate of a large variety of brain activities. Discords cause a reduction in happiness presumably because they reduce the likelihood that this aggregate of activity yields positive sensations, either through immediate effects or long-term effects. In other words, discords probably tend to disrupt the default setting by corrupting emotional parts of the brain.

Leaving aside innate individual variations in propensities for happiness, according to the present model those who score best on happiness are those who avoid discord conditions, and thereby manage to retain their default positive mood, and who are as a consequence in the best position to delight in the rewarding sensations associated with handling the daily chores of life. One question that derive from the present model, and that may be approached in future research, is whether the national and cultural variations in happiness scores (Veenhoven, 1999; Diener and Suh, 1999) can be related to the extent of discords in the societies being compared.

NOTES

[1] The recent interest in the evolutionary perspective is reflected in several books, for example, Buss (1998), Cronk et al. (2000), and Palmer and Palmer (2001).

[2] Check Crawford and Krebs (1997), and references therein, for a discussion of EEA.

[3] The concept of 'mismatch' has been deliberated by Eaton et al. (1988), and Pani (2000).

[4] Several books review the effect of stress on mental and physical health problems; for example, Carroll (1992) and Sternberg (2000).

[5] For a treatise of how various conscious or unconscious events can leave 'burns' in the brain, see Hallowell (1998).

[6] The predominance of happiness is discussed by Veenhoven (1997). Myers and Diener (1996) include a discussion on optimism.

[7] Data presented at the International Society for Human Ethology (ISHE) meeting in Salamanca 2000 by E. Oberzaucher and K. Grammer (abstracts available at http://evolution.humb.univie.ac.at/events/salamanca-abs.html).

[8] For a discussion of leisure and the need to do something 'useful', see Parker (1976).

[9] See Segerstrale (2000) for a discussion on the pitfalls and advantages of 'sociobiology'.

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