is achieved. Prior to stabilization, neural networks do not jump around between points in activation space. Stabilization is the process whereby a network first generates a determinate activation pattern, and thereby arrives at a point in activation space.

So a real neural network does not generate a pattern of activation, and thus a determinate representational content, until it achieves some measure of stability. Consequently, there is no distinction between “stable” and “transient” activation patterns. Stable activation patterns are physical objects, objects moreover that are structurally distinct from a neural network’s configuration of connection weights. And it is this distinction, between activation pattern representation and connection weight representation, that according to our vehicle theory marks the boundary between the conscious and the unconscious.

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**Abstract of the original article:** Females’ tendency to place a high value on protecting their own lives enhanced their reproductive success in the environment of evolutionary adaptation because infant survival depended more upon maternal than on paternal care and defence. The evolved mechanism by which the costs of aggression (and other forms of risk taking) are weighted more heavily for females may be a lower threshold for fear in situations which pose a direct threat of bodily injury. Females’ concern with personal survival also has implications for sex differences in dominance hierarchies because the risks associated with hierarchy formation in non-bonded exogamous females are not off-set by increased reproductive success. Hence among females, disputes do not carry implications for status with them as they do among males, but are chiefly connected with the acquisition and defence of scarce resources. Consequently, female competition is more likely to take the form of indirect aggression or low-level direct combat than among males. Under patriarchy, men have held the power to propagate images and attributions which are favourable to the continuance of their control. Women’s aggression has been viewed as a gender-incongruent aberration or dismissed as evidence of irrationality. These cultural interpretations have “enhanced” evolutionarily based sex differences by a process of imposition which stigmatises the expression of aggression by females and causes women to offer exculpatory (rather than justificatory) accounts of their own aggression.

**Hierarchy disruption: Women and men**

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**Abstract:** The application of evolutionary perspectives to analyzing sex differences in aggressive behavior and dominance hierarchies has been found useful in multiple areas. We draw attention to the parallel of gender differences in the worsening health status of restructuring societies. Drastic socio-economic changes are interpreted as examples of hierarchy disruption, having differential psychological and behavioral impact on women and men, and leading to different changes in health status.

Campbell’s (1999) target article about gender differences in aggression and status-seeking behavior describes a convincing body of evidence and presents a plausible evolutionary explanation. The target article and the commentaries raise a number of questions concerning the consequences and practical implementations of an evolutionary theory. We propose that several new findings in the areas of epidemiology and health psychology yield parallel results that fit well with Campbell’s model. The phenomenon of health status deterioration in restructuring societies, primarily those of Central and Eastern Europe, and the untill-now not convincingly explained gender differences in health deterioration are results that could serve as a bridge between a behaviorally oriented evolutionary model and large-scale epidemiological findings. Reading the article and the following debate was a profound intellectual experience; the recognition of parallel results between different fields was even more exciting.

Socio-economic changes following political transition in the countries of Central and Eastern Europe have influenced people’s lives in a variety of ways. Among these phenomena, one of the most striking is the declining health status of these societies (Feachem 1994). The dynamics of the process show different characteristics in different countries according to the chronological nature of the political changes. In Hungary deterioration began in the early 1970s at a constant slow grade, and male life expectancy decreased by 3 years between 1970 and 1995, parallel with political softening and the beginning of economic polarization (Bobak & Marmot 1996; Kopp 2000). As a more severe example, male life expectancy in Russia fell by six years between...
1990 and 1994 (Notzon et al. 1998). Paradoxically, women have not been affected as severely as men by these processes of deterioration, giving rise to a higher gender gap in life expectancy (12.1 years in Russia) and mortality. Gender ratios in mortality of the middle aged have risen threefold in several Eastern European countries (Hungarian Central Statistical Office 1999). According to these epidemiological results, women are better at staying alive. One must ask, what were the toxic effects that induced the last deterioration of health status and the greater impact on men than on women?

The link between dominance and resource holding in humans can be described in several ways: by means of social status, education, income, occupation, and political influence. These are exactly the factors which the political and socio-economic changes turned upside-down, giving rise to a general loss of control and predictability. Hence, we consider our hypothetical model of hierarchy disruption useful for analyzing the epidemiological phenomena registered recently.

A large body of evidence supports the inverse association between socio-economic status, and morbidity and mortality (Marmot et al. 1991). Worsening health status and rising mortality in connection with socio-economic changes have been studied thorough and thoroughly, as has the gender-relatedness of these phenomena (Kopp et al. 1995; Weidner 1998; Mackenbach et al. 1999). In accordance with the literature, our own results from 1988 and 1995 – two turning points during the socio-economic changes – indicate that income showed a strengthening connection to self-reported morbidity in men, measured as the number of sick days per annum, but only to a much lesser degree in women (Kopp et al. 2000; Réthelyi et al. 2002). Men seem to be more susceptible to hierarchy disruption and the loss of hierarchy status.

Parallel findings in primatology are meaningful. From a biological point of view, the political and socio-economic changes may have similarities to patterns referred to analogously as hierarchy disruption, which have been observed in baboons living in patriarchal dominance hierarchies (Sapolsky 1990a; 1990b). Observations among the male baboons indicate that higher rank position goes together with protective physiological profiles for stress-related illnesses connected with lower levels of basal cortisol and faster cortisol normalization. However, not rank itself but the sense of control and predictability are the factors that determine physiological reactions. Dominant males at the time of newly formed hierarchies do not enjoy the beneficial effect of high rank until the new order is settled. Studies regarding female dominance hierarchies in Cynomolgus macaques in connection with coronary artery atherosclerosis found that social subordination increases the development of atherosclerosis in experimental settings. Social isolation, however, had an even greater atherogenic effect on female macaques in similar experimental settings (Shively et al. 1995).

Returning to our original question, we must consider possible psychological mediators of hierarchy disruption. According to our results mentioned earlier, depression is an important mediator between income and self-reported morbidity in men, but not in women. This association might seem paradoxical because women report generally more depression. However, they also report more adaptive coping strategies, and are able to recognize depression and more willingly take effective steps to counter depression, anxiety, and pain of any kind, in forms of health-care utilization (Unruh 1996), a fact cited by Campbell as well. Social support and cohesiveness are other protective factors which women make more use of (Knox et al. 1998). Besides their important role in health psychology, the evolutionary importance of social support and cohesion in connection with child rearing and human socialization seems plausible, fitting well in Campbell’s model. Such a framework is comparable with the results of modern epidemiology. Growing evidence supports the hypothesis that the worsening health status and the evident gender gap in health decline can be explained only by a combination of traditional risk factors and psychosocial factors. Standard risk factors for noncommunicable diseases such as smoking, diet, alcohol consumption, and obesity do not differ sufficiently in Eastern and Western countries to explain the striking differences in health status. However, there are striking differences in psychosocial risk factors such as depression, exhaustion, social support, hostility, and adaptive coping strategies (Kristenson et al. 1998).

In her response to the commentaries, Campbell addresses questions of dominance hierarchies in democracy and capitalism. From an epidemiological point of view, history is teaching us the lesson that neither an ideologically based egalitarianism (i.e., socialism), nor a change to a democratic system, reduced status seeking. In summary, we suggest an evolutionary mechanism of trade-offs between the possible costs and benefits of status-seeking behavior and those of social cohesion and integration, which are most apparent at times of hierarchy disruption (Kopp & Réthelyi 2004). Further research on socio-economic factors and health should bring a better understanding of causal relationships and even offer possibilities of social and medical intervention.

Editors’ Note: There is no Author’s Response to this commentary.

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Perceptual fluency and lexical access for function versus content words

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Abstract: By examining single-word reading times (in full sentences read for meaning), we show that (1) function words are accessed faster than content words, independent of perceptual characteristics; (2) previous failures to show this involved problems of frequency range and task used; and (3) these differences in lexical access are related to perceptual fluency. We relate these findings to issues in the literature on event-related potentials (ERPs) and neurolinguistics.

Pulvermüller (1999) posits that lexical access for function words involves the perisylvian region whereas lexical access for content words additionally involves other cortical areas related to the specific meanings. Function word cell assemblies should produce faster lexical access times, because they are more concise in the geographical sense and possibly because functions whose representations are restricted to this area are deemed to be more automatized (Whitaker 1983). However, the experimental literature on function word and content word lexical access times does not support this. Pulvermüller et al.’s (1995) own data show that lexical decisions are slower for function words than for content words. Two main sources of evidence are used to evaluate these proposals: (a) imaging studies focusing on localizing word processing in the brain, based on stimulus-triggered event-related potentials (ERPs), positron emission tomography (PET), and functional magnetic resonance imaging (fMRI), and (b) studies of the temporal dynamics of fast activity changes in the brain, as revealed by high-frequency responses recorded in the electroencephalogram (EEG) and magnetoencephalogram (MEG). These data provide evidence for processing differences between words and matched meaningless pseudowords, and between word classes, such as concrete content and abstract function words, and words evoking visual or motor associations. There is evidence for early word class-specific spreading of neuronal activity and for equally specific high-frequency responses occurring later. These results support a neurobiological model of language in the Hebbian tradition. Competing large-scale neuronal theories of language are discussed in light of the data summarized. Neurobiological perspectives on the problem of serial order of words in syntactic strings are considered in closing.