

# Cognitive Activation Theory of Stress (CATS), sensitisation and common health complaints

HOLGER URSIN<sup>a</sup> AND HEGE R ERIKSEN<sup>a, b</sup>

<sup>a</sup>*Unibob Health, University of Bergen, N-5015 Bergen, Norway;*

<sup>b</sup>*Department of Education and Health Promotion, University of Bergen, N-5015 Bergen, Norway*

**ABSTRACT:** According to the Cognitive Activation Theory of Stress (CATS), a formal system of systematic definitions, the term “stress” is used for stress stimuli, the stress experience, the non-specific, general stress response, and the experience of the stress response. The stress response is normal, healthy, and necessary alarm. If sustained there may be a risk of illness and disease. The level and duration of the alarm depends on the expectancy of the outcome of stimuli and the specific responses available for coping.

The most common health complaints are subjective health complaints like muscle pain, tiredness and mood changes. These are normal aches of short duration and low intensity for most people. For some the pains and complaints are substantial and long-lasting with serious implications for functioning. There are no sharp or obvious limits in the distribution of health complaints, separating ‘normal’ and endurable pain and complaints, and intolerable complaints that need professional help. These conditions are most often unspecific, and are the most common reason for encounters with health professionals, and the most frequent reason for sick leave and disability. There is a striking comorbidity for all these conditions. This may be explained by psychobiological sensitization within neural loops, maintained by sustained activation, which has been suggested as a mechanism for these conditions.

**KEYWORDS:** Cognitive Activation Theory of Stress; Subjective Health Complaints; Sensitisation

Address for correspondence: Corresponding Author, M.D., Ph.D., Department of Idle Sciences, University of All Knowledge, 100 Main Street, A-10000 Polar City, Antarctica. Phone: +23-1-345-6789; FAX: +23-1-345-6788  
e-mail: correspondent@allknowledge.edu

## STRESS

The Cognitive Activation Theory of Stress (CATS) <sup>1</sup> offers a formal system of systematic definitions, aiming at reducing the reliance on words with imprecise meanings and usage. This is particularly important in a field where there are so many conflicting terms and attributions, among experts, and among the general public. This is not only a matter of concern for experts and theoretical discussions. Erroneous attributions may be very costly, for the individual, and for society. When expensive and ambitious preventive and curative initiatives are built on superstition the net results may be negative, or even disastrous.

The term “stress” is used for stress stimuli, for the stress experience, for the non-specific, general stress response, and for the experience of the stress response <sup>2</sup>. For CATS the most basic assumption is that the stress response is a normal, healthy, and necessary alarm response. If this was not true, the stress response would not be present in all species, in all individuals, in all cultures. The stress response is a part of our biological inheritance, and it is by no means an outdated response. In principle, the response is simply an increase in arousal. However, if sustained it may contribute to illness and disease.

It seems to be a consensus that physical demands and psychological characteristics that produce the stress response have nothing in common. All stimuli are appraised<sup>3</sup> or filtered<sup>2</sup> before they gain access to the response system. The main “filters” are related to response outcome expectancy and stimulus expectancy<sup>4</sup>. It is the individual’s experience of the demands and the expectancies of the outcome, which determine whether the demands will cause stress responses, which- if sustained- may cause illness and disease in man and animals<sup>2</sup>. Within this cognitive tradition CATS define coping as positive response outcome expectancies<sup>1</sup>. This means that the individual expects that he or she will be able to handle the situation with a positive result. In these situations, there is a low level of subjective health complaints and low levels of psychophysiological, psychoendocrine, and psychoimmune arousal<sup>1</sup>.

When it is impossible for the individual to establish coping, other expectancies may develop. When the individual learns that there are no relationships between anything the individual can do and the outcome, we refer to this as helplessness in CATS. Two of R.L. Solomon’s students, Overmier and Seligman<sup>5</sup>, found that dogs with previous experience with inescapable shocks did not learn avoidance tasks. They found that this state of “helplessness” generalized to situations where control is possible. Translated to CATS, helplessness occurs when the perceived probability of avoiding the aversive stimulus with a response is the same as for no response. In other words, the response is without any perceived consequence for the occurrence of the aversive event. The organism has no control. This expectancy has been accepted as a model for anxiety and depression. Since

the CATS formulations are valid for animals as well, this is a useful theoretical basis for animal models for depression and anxiety<sup>6</sup>.

Hopelessness is even worse. In CATS, this term is used for an acquired expectancy that most or all responses lead to negative results. Hopelessness is more directly opposite of coping than helplessness, since it is a negative response outcome expectancy. There is control, responses have effects, but they are all negative. The negative outcome is his or her fault since the individual has control. This introduces the element of guilt, which may make hopelessness a better model for depression than helplessness<sup>7</sup>.

CATS is a general and comprehensive stress theory, compatible with other theoretical positions. In working life in humans, the most influential model is the demand/control model<sup>8</sup>. It is the combination of psychological demands, task control and skill use at work that predicts stress-related ill health and behavioural correlates of work. Jobs with high demands, low control, and low social support carry the highest risk of illness and disease. Low psychological demands and high levels of control carry the lowest risk. Jobs with high psychological demands and high control, and low psychological demands and low control, carry an average risk. The model predicts disease, especially related to cardiovascular disease, and it is particularly the control dimension that is the most robust predictor<sup>9</sup>. Newer tradition emphasizes individual stress management, coping abilities, and subjective feelings of being in control or being able to cope<sup>9</sup>. In CATS, it is the expectancy of being able to cope that is the essence<sup>10</sup>, not the objective possibility of having control. Also, CATS is applicable directly to animal experimentation, and has a developed pathophysiological model built into the theory.

The effort-reward imbalance model<sup>11</sup> has its focus on reward and contractual fairness in employment, and is a strict model for human work relations, without a pathophysiological basis.

### COMMON HEALTH COMPLAINTS

The most common health complaints are subjective health complaints like muscle pain, tiredness and mood changes. These are normal aches and complaints of short duration and low intensity for most people. For some the pains and complaints are substantial and long-lasting with serious implications for functioning. There are no sharp or obvious cut points between “normal” and “pathological” levels in subjective health complaints, separating ‘normal’ and endurable pain and complaints, and intolerable complaints that need professional help. These conditions are most often unspecific, and are the most common reasons for encounters with health professionals, and the most frequent reason for sick leave and disability.

A variety of subjective illnesses with few or no objective findings have appeared at regular intervals as epidemics in our society under different

labels. Examples are chronic fatigue syndrome, food intolerance, myalgic encephalitis, 'yuppie flu', whiplash, fibromyalgia, post-viral syndrome, and the Gulf War syndrome. Patients diagnosed with these illnesses complain of muscle pain, tiredness, depression, fatigue, headaches, sleep disturbances, concentration problems, memory lapses, flu-like symptoms and 'allergies'. There are, however, few or no objective findings that might explain the 'disease', or the complaints go beyond what is regarded as 'reasonable' by the physician.

The prevalence of subjective health complaints is very high in national surveys. In a recent study conducted in Norway 96% reported that they had experienced at least one type of complaint during the preceding 30 days<sup>12</sup>. However, the prevalence of substantial complaints was moderate: Only 13% reported substantial musculoskeletal complaints, 5% "Pseudoneurological" complaints (tiredness, mood changes), 4% gastrointestinal complaints, 2% allergy, and 18% flu-like complaints. The high prevalence makes the finding of such complaints "normal"; most people have them. It does not hinder them or make them seek medical advice or help from society; neither does it signal that they are in any inherent danger of developing dangerous and debilitating conditions. However, they may develop into conditions where complaints are so long lasting and intense that they require medical and social interventions, including sickness compensation. The transition from the "normal" complaint to the serious condition seems to be a continuous process, with no clear or objective thresholds to indicate a distinction. We suggest that this transition is due to a psychobiological sensitisation.

It appears reasonable to assume that humans in every culture and environment experience health complaints like pains, fatigue, itching, dizziness etc., ranging from minor and transient to disabling and permanent. The interpretation and the meaning of complaints and sensations may be determined by the culture in which we live and our idiosyncratic attitudes. A headache can be interpreted as a sign from the body that it needs rest, but can also be a cause of worry: is this the first sign of a brain tumour, harmful radiation from mobile phone or evil spirits released to harm me?

In media, as well as by professionals, it is often assumed that these complaints, as well as serious somatic disease, are a result of a misfit between our physiological constitution and the modern, civilized life<sup>13</sup>. Historical analyses argue against the idea that the subjective health complaints, or psychosomatic conditions, fatigue or hysteria really are new phenomena, typical for our time<sup>14</sup>.

Likewise, it does not appear as if these complaints are specific for industrialized societies. In a comparative study of 120 aborigine Mangyans living in the jungle of Mindoro Island in the Philippines, the frequency of subjective health complaints was found to be more frequent than a representative sample from the Norwegian population, indicating that these complaints are not specific for industrialized societies<sup>15</sup>. A similar

investigation of subjective health complaints in 320 Maasai people, living on the savannah in Eastern Africa, showed the same finding. These semi-nomadic people, living along the Great Rift Valley in southern Kenya and northern Tanzania, had significantly higher level of subjective health complaints than the standard Norwegian population. A life style very different from the “stressed” Nordic European population, with a diet of milk, meat and blood from the cattle, and living in a primitive, but highly organized society, does not imply a low level of subjective health complaints, or “psychosomatic” complaints<sup>16</sup>.

### **SENSITISATION: THE PATHOPHYSIOLOGY OF SUSTAINED ACTIVATION (“STRESS”)**

There is a striking comorbidity for subjective health complaints, or the unspecific conditions that constitute the main reasons for sickness absence and common health complaints. This may be explained by psychobiological sensitization within neural loops, which has been suggested as a mechanism for these conditions<sup>17</sup>.

Sensitization is an increased efficiency in a neural circuit, due to a change in the synapses from repeated use. This feed-forward mechanism increases the response to a stimulus. Sensitization is a typical feature of pain pathways, pain produce pain. Patients referred to a back pain clinic for low back pain do not have back pain only, they also complain about general pain, headaches, tiredness, anxiety and depressed thoughts<sup>18</sup>. Patients hospitalized for irritable bowel disease have similar comorbidity<sup>19</sup>. The level of comorbidity is also a significant prognostic factor for spinal pain<sup>20</sup>.

This basic neurobiological process may be assumed to have a cognitive analogue. Brosschot et al<sup>21</sup> have suggested that this cognitive correlate is an attentional bias, giving priority to thoughts and information related to fears and somatic complaints. They find that patients with subjective health complaints (unexplained medical complaints) show sensitization and extensive activation of cognitive networks related to illness and pain. Brosschot refers to this as the “night and day watch” of the sensitized organism.

We believe this is an acceptable theoretical basis for the design, and indeed for the effects, of cognitive behavioural treatment programs for low back pain<sup>22</sup>, as well as for other illnesses like fatigue<sup>23</sup>. Within CATS, this night and day watch is related to sustained activation, which is the motor sustaining the activation of specific pain and illness related cognitive networks. Employees in work situations with high risk of developing sickness leave and muscle pain complain about “stress”. The prevalence of subjective health complaints is high in populations that experience low job satisfaction<sup>24</sup> and low levels of coping<sup>17</sup>. These are all cases where CATS predicts high and sustained activation.

## CONCLUSION

Stress complaints are very prevalent, so are subjective health complaints. It appears to be important to realize that many of our common aches and bodily sensations are normal phenomena, there are movements in the guts that may be felt, muscles and joints do hurt occasionally. Actually, almost all of us have had such experiences the last 30 days. In spite of this, the plurality of us is happy, in good health, and satisfied with our working conditions.

Only when these sensations become very strong do we need attention and care. Sickness absence is a major problem for those that are involved, and it is also a major economic and social problem in the modern welfare society.

When we need care, it is reasonable to demand that the interventions are based on rational thinking and evidence based methods. There is far too much emphasis on interventions that do not have any proven effect. Very large interventions are being performed on a bogus theoretical basis, without the necessary research control to identify whether the intervention was effective, what part of the interventions that was effective, and for whom the effect was beneficial.

## REFERENCES

1. URSIN, H. & H.R. ERIKSEN. 2004. The Cognitive Activation Theory of Stress. *Psychoneuroendocrinology*. **29**: 567-592.
2. LEVINE, S. & H. URSIN. 1991. What is stress? *In*: Stress. Neurobiology and Neuroendocrinology. M.R. Brown, C. Rivier & G. Koob, Eds.: 3-21. Marcel Decker. New York.
3. FOLKMAN, S. & R.S. LAZARUS. 1990. Coping and emotion. *In*: Psychological and biological approaches to emotion. N.L. Stein, B. Leventhal & T. Trabasso, Eds.: 313-332. Lawrence Erlbaum, Hillsdale, New Jersey.
4. BOLLES, R.C. 1972. Reinforcement, expectancy and learning. *Psychol. Rev.* **79**: 394-409.
5. OVERMIER, J.B. & M.E.P. SELIGMAN. 1967. Effects of inescapable shock upon subsequent escape and avoidance responding. *J. Comp. Physiol. Psychol.* **63**: 28-33.

6. ERIKSEN, H.R., R. MURISON, A.M. PENSGAARD & H. URSIN. 2005. Cognitive activation theory of stress (CATS): From fish brains to the Olympics. *Psychoneuroendocrinology*. **30**: 933-938.
7. PROCIUK, T.J., L.J. BREEN & R.J. LUSSIER. 1976. Hopelessness, internal-external locus of control, and depression. *J. Clin. Psychol.* **32**: 299-300.
8. KARASEK, R.A. & T. THEORELL. 1990. Healthy work, stress, productivity, and the reconstruction of working life. Basic Books, New York.
9. THEORELL, T. & R. A. KARASEK. 1996. Current issues relating to psychosocial job strain and cardiovascular disease research. *J Occup Health Psychol.* **1**: 9-26.
10. ERIKSEN, H.R. & H. URSIN. 1999. Subjective health complaints: is coping more important than control? *Work and Stress*. **13**: 238-252.
11. SIEGRIST, J. & A. RODEL. 2006. Work stress and health risk behavior. *Scand J Work Environ Health*. **32**: 473-481.
12. IHLEBÆK, C., H.R. ERIKSEN & H. URSIN. 2002. Prevalence of subjective health complaints (SHC) in Norway. *Scand J Pub Health*. **30**: 20-29.
13. FOLKOW, B. 2000. Man's two environments and disorders of civilization: Aspects on prevention. *Blood Pressure*. **9**: 182-191.
14. SHORTER, E. 1992. From paralysis to fatigue. A history of psychosomatic illness in the modern era. The Free Press, New York.
15. ERIKSEN, H.R., B. HELLESNES, P. STAFF & H. URSIN. 2004. Are subjective health complaints a result of modern civilisation? *International Journal of Behavioral Medicine*, **11**: 122-125.
16. WILHELMSSEN, I., S. MULINDI, D. SANKOK, A.B. WILHELMSSEN, H.R. ERIKSEN & H. URSIN. 2007. Subjective health complaints are more prevalent in Maasais than in Norwegians. *Nordic Journal of Psychiatry*. In press.
17. ERIKSEN, H.R. & H. URSIN. 2002. Sensitization and subjective health complaints. *Scandinavian Journal of Psychology*. **43**: 189-196.

18. HAGEN, EM, E. SVENSEN, H.R. ERIKSEN, C.M. IHLEBÆK & H. URSIN. 2006. Comorbid Subjective Health Complaints in Low Back Pain. *Spine*. **31**: 1491-1495.
19. VANDVIK, P.O., I. WILHELMSEN, C. IHLEBÆK & P.G. FARUP. 2004. Comorbidity of irritable bowel syndrome in general practice: a striking feature with clinical implications. *Alimentary Pharmacology and Therapeutics*. **20**: 1195-1203.
20. VON KORFF, M., P. CRANE, M. LANE, D.L. MIGLIORETTI, G. SIMON, K. SAUNDERS, P. STANG, N. BRANDENBURG & R. KESSLER. 2005. Chronic spinal pain and physical-mental comorbidity in the United States: results from the national comorbidity survey replication. *Pain*. **113**: 331-339.
21. BROSSCHOT, J.F., W. GERIN & J.F. THAYER. 2006. The perseverative cognition hypothesis: a review of worry, prolonged stress-related physiological activation, and health. *J Psychosom Res*. **60**: 113-24.
22. AIRAKSINEN, O., J-I. BROX, C. CEDRASCHI, J. HILDEBRANDT, J. KLABER-MOFFETT, F. KOVACS, A.F. MANNION, S. REIS, J.B. STAAL, H. URSIN & G. ZANOLI. 2006. European guidelines for the management of chronic nonspecific low back pain. *European Spine Journal*. **15**: S192-S300.
23. DEALE, A, K. HUSAIN, T. CHALDER & S. WESSELY. 2001. Long-term outcome of cognitive behavior therapy versus relaxation therapy for chronic fatigue syndrome: A 5-year follow up study. *Am J Psychiat*. **158**: 2038-2042.
24. SVENSEN, E., B.B. ARNETZ, H. URSIN & H.R. ERIKSEN. 2007. Health complaints and satisfied with the job? A cross-sectional study on work environment, job satisfaction and subjective health complaints. *J Occup Environ Med*. **49**: 568-573.