

# Fatigue and fatigability

## - semantic and etiologic perspectives

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## INTRODUCTION

Fatigue and increased fatigability occur as symptoms in almost every medical and psychiatric condition, as well as being common reactions to non-pathological physical and psychological strain and stress. We will attempt to clarify the semantics of the terms "fatigue" and "fatigability", and we will put forward the hypothesis that the special kind of mental fatigability which characterises many cases of mild to moderate dysfunction of the brain is

functional in a sense that it represents an overload of pathological information (from the injured area) to higher cognitive mechanisms which may themselves be anatomically and physiologically intact.

The history of psychiatry shows many attempts to find the aetiology behind the fatigue symptoms (see e.g., Berrios 1990). It is clear that fatigue and fatigability can have an organic, as well as a psychological genesis and that mental fatigue and fatigability occur as reactions to injuries at many different locations. Therefore, it is reasonable to assume that these states do not share a common aetiology.

Fatigue and increased fatigability figure prominently in some specific insufficiency syndromes such as neurasthenia, first described by Beard (1869), the Chronic Fatigue Syndrome (CFS) (Holmes et. al. 1988), "mild neurocognitive disorder" (DSM-IV, 1994) the Astheno-Emotional Disorder (AED, described by Lindqvist and Malmgren 1990) and the Somnolens-Sopor-Coma Disorder (SSCD, *ibid.*) They are also common in depressive and anxiety disorders. There are, however, typical phenomenological differences between e. g., the abnormal mental fatigability which can be observed in the AED patient, the persistent drowsiness in the somnolent condition, and the feeling of not being able to do anything from which the depressed patient suffers. For the purpose of differential diagnosis it is therefore important to be mindful of the different kinds of fatigue and fatigability and to pay attention to the patient's introspective reports.

Fatigue and increased fatigability reflect a deficient functioning of the nervous system only when they occur as symptoms of a pathological process. When they appear as responses to (normal) over-work these states should rather be regarded as well adapted responses to physical and psychological strain. Hence, finding a neural correlate to tiredness as such would not, in itself, clarify the processes which lead to pathological fatigue. The latter processes may in turn be of many different kinds.

## **THE SEMANTICS OF FATIGUE COMPLAINTS**

Fatigue and fatigability are in themselves no pathological states. "Fatigue" simply refers to a state of being very tired or not being able to maintain expected force. "Fatigability" is a measure on how fast someone gets tired. Normal fatigue and some degree of fatigability can be observed (and felt) on any prolonged and/

or intensive task.

The semantic situation gets more complicated if we consider all the different nuances of meaning which are attached to these terms. "Fatigue" may be a description of a lot of experiences, from the exhaustion a person feels after running a marathon or the sleepiness a person experience after being awake for a long time, to the disabling, paralysing experience of not being able to even think about doing anything at all. We will do a small semantic exploration of the terms, indicating the underlying phenomenology and tentatively propose criteria for when these experiences should be considered pathological reactions.

## *SUBJECTIVE AND OBJECTIVE FATIGUE AND FATIGABILITY*

### *Objective fatigue*

Objective fatigue can affect the body as well as the mind. In the first case it is a reduction in the ability to exert muscle force or power which can be measured with objective methods and be observed in performance. Mental fatigue is, similarly, a reduction in the capacity to perform mental work, in general or of some specific kind (such as reading).

Not any performance reduction can be labelled "fatigue", however. A physical performance drop because of lack of recent training is not in itself fatigue (although it may lead to greater fatigability), and a visual reduction because of glaucoma is not visual fatigue. In typical cases of fatigue, the performance reduction should follow exercise of the function(s) which is (are) responsible for the performance, and it should grow in parallel to the amount of exercise. We will not try to delimit the concept of objective fatigue more exactly than that.

### *Subjective fatigue*

Normally subjective fatigue correlates fairly well with its objective relative. When we are objectively tired, we often feel tired too. However, there is no absolute relation between these two aspects. We often find that we actually had more physical strength than we felt like, or that we were able to go on reading even though we felt as if it was impossible. In some pathological cases the feeling of fatigue and the performance aspect do not correspond. Patients with "Chronic Fatigue Syndrome" (CFS) describe feelings of muscle weariness or

tiredness unrelated to objective measures of muscle fatigue (Wessely, 1993) and DeLuca et. al. (1995) found in their studies that the CFS group did not differ from the control subjects on tasks of higher order cognitive functioning (e.g., memory), even though they showed a high degree of subjective complaint on cognitive impairment. Conversely, Dechamps (1919) reported that in some diseases, such as tabes or chorea, "feeling of fatigue was not experienced even after severe work." The same phenomenon can be seen in, for instance, manic patients who feel as if they have a lot more strength than they actually have and in some substance induced states (amphetamines). A depressed patient, on the other hand, may not be able to embark on any physical or mental activity because the feelings of fatigue are so overwhelming. In other pathological conditions the objective and the subjective aspect of fatigue do correspond, but are abnormally severe. A patient with impaired wakefulness due to somnolence-sopor-coma disorder (SSCD) will suffer from a persistent feeling of drowsiness, but he or she will also appear drowsy to an observer and show a reduction in the capacity to perform cognitive work.

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*Fig. 1*  
*Subjective and objective fatigue*

## SUBJECTIVE

## OBJECTIVE

### PHYSICAL

Feelings of tiredness with a physical appearance, e.g.,

- heavy feeling in the body
- heavy feeling in the head
- tensed feeling in the body
- mild pain somewhere in the body

Any practice induced reduction in the ability to exert muscle power or force, attributable to

- impairment of muscle fibrers,
- or
- a decline in motoneuron input.

### MENTAL

Feelings of tiredness with a "mental flavour", e.g.,

- tired - mild sadness.
- tired - cannot think straight.
- tired - relaxed in a pleasant way.
- tired - tensed and irritable.
- heavy feeling in the head.

Any practice induced reduction in the ability to perform mental work, e.g.,

- inability to concentrate on a lecture.
- slowness in the course of thinking.
- learning and memory difficulties.
- lack of creative force in thinking.

### *Objective fatigability*

The phenomenon of fatigability depends on what it is that is being exercised. Any bodily or mental function is subject to fatigability. If we are doing push ups the muscles in the arms become increasingly fatigued, if we are staring with our eyes wide open, our eye muscles will eventually become more and more fatigued. In some cases, however, it is harder to distinguish *what it is* that is becoming fatigued. If we are requested to try to remember something and we try really hard without succeeding, there is a limit to this effort as well. After a while we will give up, maybe pleading fatigue. Is it the fatigability of memory that is in question here? Again, think about the case when we are reading a book. We will become more and more fatigued in a sense that will affect our reading, but is it correct to talk about fatigability of reading? We must keep in mind that if we have exhausted ourselves concentrating on reading a book this will not only inflict our near-future reading, but also other mental activities which we would want to engage in. Prolonged and/or intensive engagement in one activity will affect the ability to perform that activity *and* will moderately affect almost any other mental performance. This is apparent with typical mental activities as

reading, listening, etc. After an extended time of head calculating it will be difficult to concentrate on anything but especially hard to do head calculating.

### *Subjective fatigability*

In a strict phenomenological sense there is no such thing as a feeling of fatigability, only feelings of fatigue. At a first glance "to feel fatigable" can seem to mean the accompanying feeling to any (intensive or prolonged) task, but on closer examination that feeling is actually a feeling of fatigue, increasing in intensity. Fatigability, which simply means how long and with how much force a certain task can be carried out, has no direct experiential, phenomenological aspect. Another description of a feeling of fatigability would be: "to have a feeling of being easily fatigued" which is present in the absence of any actual work. Such a feeling can be accurate or not accurate. The depressed patient is sometimes the victim of such feelings, he or she feels like he or she would not be able to carry out any prolonged task. The feeling of fatigability in this "depressed" sense can be described as a feeling of knowing that you will not have any persistence if you would attempt to do anything.

To conclude, the subjective aspect of fatigability is either feelings of fatigue, or a subjective opinion of one's own (objective) fatigability.

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*Fig. 2*  
***Fatigability***

## SUBJECTIVE

## OBJECTIVE

PHYSICAL

The staying power of muscle contraction or motoneuron input.

MENTAL

The persistence in the ability to perform any cognitive work.

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### *SUBJECTIVE MENTAL AND PHYSICAL FATIGUE*

As already noted, fatigue may be felt in a number of different ways. The feeling can be characterised as relaxing or paralysing, it can be a tensed feeling of worry or anxiety. It can be unpleasant, discomforting and painful or a pleasant experience of satisfaction and well-being and it may have either a physical or a mental appearance. (Lindqvist&Malmgren 1990).

It may not always be easy to know by introspection whether fatigue is felt "in the body" or "in the mind". For instance, if I feel tired in the head, (like a slight dizziness) should this be characterised as mental or physical fatigue? The head is part of the body, but dizzy feelings in the head are often phenomenologically connected to e.g., concentration difficulties. As it may be hard to know *where* the feeling is located (in the head or in the mind), it may be equally hard to know *how* it feels. On closer examination it is not so easy to distinguish fatigue from e. g. mild pain.

At this point, it may be sufficient to note that the phenomenology of fatigue is obscure, as is the case with subjective experiences in general, and that further investigations in this area is needed. We want, however, to draw your attention to some phenomenological peculiarities which are interesting for diagnostic purposes. The feelings of fatigue occurring in SSCD are quite different from those colouring the clinical picture of AED and from those which are prominent

in depressions. While the SSCD patient feels drowsy and sleepy, the depressed patient's feelings are of hopelessness and heaviness. The AED patient, finally, often feels exhausted, tensed and irritable. These experiences are quite different from each other, yet they may all be described in terms of fatigue. An analysis of the nature of the patient's fatigue complaint can be decisive for the diagnosis in unclear cases.

When doing clinical work, we must also keep in mind that the descriptions of subjective experiences vary with language competence, personal taste, introspective practice and ability, as well as with the quality of the experience. For instance, complaints of fatigue can be employed by the patient to distinguish a single component in the symptom picture, but he or she may also use this simple term as a designation for a complex state which includes memory difficulties, indifference, depression, etc. (Lindqvist & Malmgren) L&M also highlight the fact that for some persons the term "fatigue" may only have a narrow meaning, synonymous to (objective) physical fatigue. He or she may not have the concept of "mental fatigue". These persons tend to deny "fatigue" as long as their motor persistence is unchanged, even though the mental condition is poor.

In the concluding section we will put forward a hypothesis concerning the neural correlates of (objective) mental fatigability.

## **THE AETIOLOGY OF MENTAL FATIGABILITY IN AED**

Since prolonged or/and intensive engagement in one mental activity will affect the ability not only to perform that activity, but will also moderately affect most other (mental) performances in the near future, mental fatigability can partly be described in terms of an activity-related decline of overall cognitive performance. The ability to concentrate is vitally involved in almost any cognitive performance. Hence in performing a cognitive task, the specific function(s) which is (are) used will be worn out and, at the same time, the ability to concentrate on any task will be reduced.

In the clinical picture of Astheno-Emotional Disorder, mental fatigability is a prominent feature. These patients have a diminished capacity for any mental work requiring concentration (e.g. reading, doing arithmetics, looking at TV) and easily become fatigued. Under normal circumstances, the time we are able to stay focused on one thing depends on how interested we are and how alert



(awake) we are. If we find, e.g., a lecture extremely boring we must typically enforce our attention with a voluntary act every five minutes or so. If we haven't slept for 48 hours and is having a conversation with a friend on a subject which interests us a lot, we cannot stay focused unless we force our attention on the discussion continuously, using our voluntary powers. The AED patient has to make these voluntary efforts to focus all the time, even when fully awake and with tasks for which he or she is fully motivated, and this leaves him or her with a feeling of fatigue already after a short while.

Since the fatigability in AED is so unspecific with regard to the cognitive task involved, it would seem that the cognitive deficiencies are secondary to a lowered general ability to concentrate. How does such a lowering of concentration power come about? If we define "to concentrate" as the act of staying focused on one thing under an extended period of time it (almost) follows that the best circumstances for concentration is when this one thing on which we concentrate is the only salient thing around. Then all mental effort can be put on the intensifying aspect of focusing, since none is needed for the selection. The more things happening around us the harder it is to stay concentrated on only one. This clearly has to do with the selective aspect of the mind, insofar as in order to focus on one thing we must "turn" other things "off". If we imagine that there is a selective mechanism which does this turning-off for us, it is reasonable to think that the more incoming information there is, the harder the mechanism has to work. Concentration difficulties could hence be a result of either a primary defect of the selective mechanism, or an overloaded selective mechanism.

AED with its characteristic mental fatigability occurs in connection to almost every mild to moderate dysfunction of the brain, regardless of the location of the lesion. Therefore we think that it is fairly reasonable to assume that in many cases, the concentration difficulties represent an overload of pathological information from the injured area on higher cognitive mechanisms which may themselves be physiologically intact. The selective functions themselves may be intact, but wear down quickly and finally break down under the burden of too much (and pathological) information. This will afflict the staying power of cognitive performance. To say the same in the words of the present conference: Although the neural correlates of AED are multifarious, a common denominator of many cases may be that the brain mechanisms underlying the most disturbed function are not in themselves afflicted.

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