

# INTERNATIONAL STANDARD

ISO  
**10075**

First edition  
1991-10-01

## **Ergonomic principles related to mental work-load — General terms and definitions**

*Principes ergonomiques concernant la charge de travail mental —  
Termes généraux et leurs définitions*

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Reference number  
ISO 10075:1991(E)

## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 10075 was prepared by Technical Committee ISO/TC 159, *Ergonomics*, Sub-Committee SC 1, *Ergonomic guiding principles*.

Annex A forms an integral part of this International Standard.

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International Organization for Standardization  
Case Postale 56 • CH-1211 Genève 20 • Switzerland

Printed in Switzerland

## Introduction

This International Standard represents an extension of ISO 6385:1981, *Ergonomic principles of the design of work systems*, 3.7 to 3.9 — with special respect to mental work-load, describing terms and concepts in more detail because of the specific consequences that have to be taken into account in this domain.

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# Ergonomic principles related to mental work-load — General terms and definitions

## 1 Scope

This International Standard defines terms in the field of mental work-load, covering mental stress and mental strain, and specifies the relations between the concepts involved.

It applies to the design of working conditions with respect to mental work-load and is intended to promote a common usage of terminology between experts and practitioners in the field of ergonomics as well as in general.

It does not address methods of measurement and principles of task design, which are or will be dealt with in other International Standards.

## 2 General concepts

Any activity — even a predominantly physical one — can impose mental stress<sup>1)</sup>. "Mental stress" in this case is a term employed to designate any external influence impinging upon human beings and affecting them mentally. Mental stress induces processes of increasing or decreasing mental strain within human beings. The immediate consequences of mental strain are facilitating effects on the one hand, and mental fatigue and/or fatigue-like states on the other. As an indirect consequence of mental strain there may be practice and training effects. The consequences of mental strain mentioned here may differ in form and intensity, depending on individual and situational preconditions.

In this International Standard the expression "mental" is used wherever processes of human experience and behaviour are referred to. "Mental" in this sense refers to cognitive, informational, and emotional processes in the human being. The term mental is used because these aspects occur interrelatedly and can and should not be dealt with separately in practice.

## 3 Definitions

**3.1 mental stress:** The total of all assessable influences impinging upon a human being from external sources and affecting it mentally<sup>2)</sup>.

**3.2 mental strain:** The immediate effect of mental stress within the individual (not the long-term effect) depending on his/her individual habitual and actual preconditions<sup>2)</sup>, including individual coping styles.

**3.3 consequences of mental strain<sup>3)</sup>**

### 3.3.1 facilitating effects

**3.3.1.1 warming-up effect:** A frequent consequence of mental strain which soon after the activity has started results in a reduction of the effort required to perform that activity relative to the effort required initially.

1) See annex A, clause A.4.

2) See annex A.

3) The order of defining the following terms does not imply any functional relationship.

**3.3.1.2 activation:** An internal state with differential degrees of mental and physical functional efficiency.

NOTE 1 Mental strain can lead to different degrees of activation, depending on its duration and intensity. There is a domain in which activation is optimal, e.g. neither too low nor too high, ensuring best functional efficiency. It should be borne in mind that a too sudden increase in strain can lead to undesirable overactivation.

**3.3.2 impairing effects:** Impairing effects should be distinguished by their temporal pattern of recovery and the means to achieve this. They may also differ by their symptoms. Impairing effects can be more general or more specific, taking time for recuperation or variation in activity for recovery.

**3.3.2.1 mental fatigue:** A temporary impairment of mental and physical functional efficiency, depending on the intensity, duration, and temporal pattern of the preceding mental strain. Recovery from mental fatigue is achieved by recuperation rather than changes in activity.

NOTE 2 This reduced functional efficiency becomes apparent, for example, in feelings of tiredness, less favourable relationships between performance and effort, type and frequency of errors, etc. The extent of this impairment is also determined by individual preconditions.

**3.3.2.2 fatigue-like states:** States within the individual as effects of mental strain resulting from situations offering little variety. They quickly disappear after changes in the task and/or the environment/situation have been introduced. These states include monotony, reduced vigilance, and mental satiation.

NOTE 3 As a rule, in common with mental fatigue, feelings of tiredness also occur in fatigue-like states.

However, they differ from mental fatigue by their transitoriness. Particularly marked interindividual differences can be found with these fatigue-like states.

**3.3.2.2.1 monotony:** A slowly developing state of reduced activation which may occur during long, uniform, repetitive tasks or activities, and which is mainly associated with drowsiness, tiredness, decrease and fluctuations in performance, reductions in adaptability and responsiveness, as well as an increase in variability of heart rate.

**3.3.2.2.2 reduced vigilance:** A slowly developing state with reduced detection performance (e.g. when monitoring radar screens or instrument panels) in monitoring tasks offering little variation.

NOTE 4 Monotony and reduced vigilance can be differentiated with respect to the circumstances of their causal conditions, not with respect to their effects.

**3.3.2.2.3 mental satiation:** A state of nervously unsettled, strongly emotional rejection of a repetitive task or situation in which the experience is of "marking time" or "not getting anywhere".

NOTE 5 Additional symptoms of mental satiation are anger, decreased performance, and/or feelings of tiredness and a tendency to withdraw. Mental satiation in contrast to monotony and reduced vigilance is characterized by an unchanged or even increased activation level, coupled with a negative emotional quality.

**3.3.3 Other effect**

**3.3.3.1 practice effect:** An enduring change in individual performance, associated with learning processes, following from repeatedly coping with mental strain.

## Annex A

(normative)

### Additional explanations of terms and concepts

**A.1** Figure A.1 is intended to illustrate the relations between mental stress, individual factors, and actual mental strain and its immediate effects. The representation is a simplified one, ignoring potential reciprocal effects, and grouping together different conditions producing mental stress as well as different individual factors. For each group, only examples are listed; the listings are thus not exhaustive. The sequential order of the examples listed does not imply any rank order.

**A.2** Besides the consequences of strain mentioned in this International Standard, there are other consequences of mental strain, e.g. boredom, feelings of being overloaded, which are not dealt with in this International Standard, due to large interindividual variation, or to as yet inconclusive results of research. The same applies to possibly unfavourable long-term effects of repeated exposure to mental strain being either too high or too low.

**A.3** Depending on the preceding activity or the initial conditions in the individual, the same situation may lead to mental stress with either increased or decreased mental strain. For example, reading a book imposes mental stress leading to increased mental strain; however, reading the same information as a change from prolonged intense discussions may impose mental stress leading to a decrease in mental strain.

**A.4** Linguistic difficulties may arise from a difference in meaning between the technical language used by specialists and colloquial language. Whereas in colloquial language stress has a slightly negative connotation, in this International Standard stress is quite neutrally regarded as including all assessable factors impinging upon an individual from outside and which influence this individual mentally. As a consequence "Mental stress" within its meaning as a technical term also includes external influences which in colloquial usage would be described as a "relief from strain".

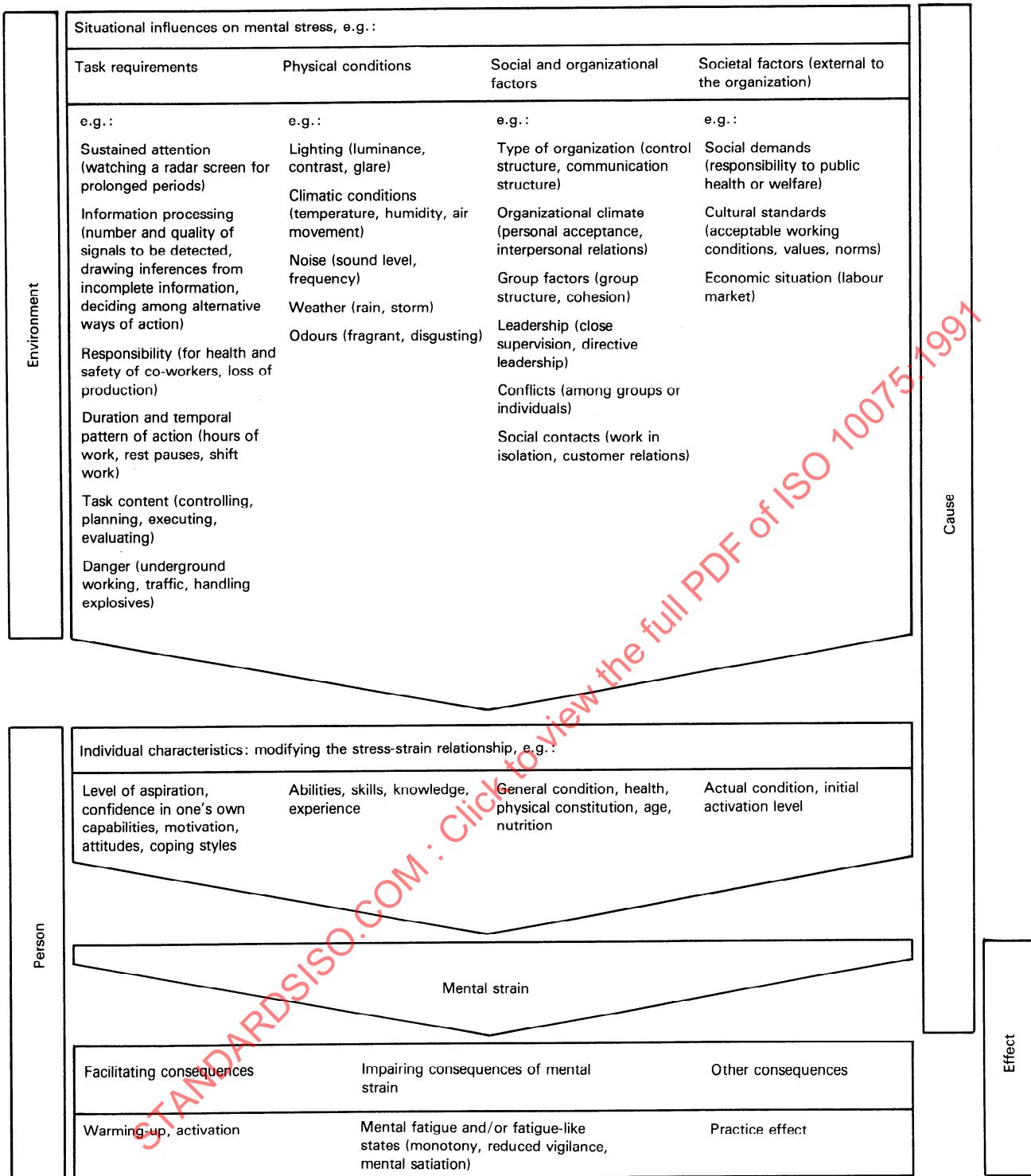


Figure A.1 — Stress-strain relationship in mental work-load

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