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Respiratory protective devices — Human factors —

Part 6: Psycho-physiological effects

Appareils de protection respiratoire — Facteurs humains — Partie 6: Effets psycho-physiologiques

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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 94, Personal safety — Protective clothing and equipment, Subcommittee SC 15, Respiratory protective devices.

This first edition of ISO 16976-6 cancels and replaces the second edition of the Technical Specification ISO/TS 16976-6:2014, which has been technically revised.

The main changes are as follows:

— the document has been editorially revised.

A list of all parts in the ISO 16976 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user’s national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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Introduction

This document addresses the psychological factors that can trigger physiological effects (psycho-physiology effects) that contribute to user acceptance, or the ability to tolerate wearing respiratory protective devices (RPD) for the duration needed. This document takes the position that the psychological state has a physiological correlate (e.g. anxiety is accompanied by an increase in heart rate) and that the physiological responses to wearing an RPD have an impact on the psychology of the wearer (e.g. difficulty in breathing will result in anxiety). The following clauses focus on a separate psycho-physiological situation that can impact user acceptance or contribute to the likelihood of the wearer removing the RPD prematurely and, thus, being exposed to a respiratory hazard. The physiological responses to wearing an RPD is addressed first followed by a discussion on the psychological responses to wearing RPD. The discussion then turns to the methodologies used to measure the psycho-physiological responses and how these measurements are used to predict whether an individual will have difficulty wearing an RPD. Finally, this document addresses the selection criteria that can be used to determine who is best suited to engage in an occupation requiring the use of RPD.

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Respiratory protective devices — Human factors —

Part 6: Psycho-physiological effects

1 Scope

This document provides information on the psycho-physiological effects related to the wearing of respiratory protective devices (RPD) and it is intended for the preparation of standards for selection and use of RPD.

It specifies for the writers of RPD standards, principles relating to

— the interaction between RPD and the human physiological and psychological perception,

— the acceptance by the wearer, and

— the need for training to improve acceptance of the RPD by the wearer.

This document does not cover requirements related to the specific hazard for which the RPD is designed.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 16972, *Respiratory protective devices — Vocabulary and graphical symbols*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 16972 and the following apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
aetiopathology
cause of the pathological state or disorder, pathogenesis

3.2
anxiety
state of being uneasy, apprehensive, or worried about what might happen, misgiving

3.3
blood pressure
BP
pressure in the large arteries of the body, typically measured in the bracheal artery

3.4
cardiac arrhythmia
variation from the normal rhythm of the heart beat

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3.5
claustrophobia
abnormal fear or dread of being in an enclosed or confined space

3.6
dysphoria
sensation of disquiet, restlessness, or malaise

3.7
dyspnoea
sense of air hunger, difficult or laboured breathing, or a sense of breathlessness

3.8
heart rate
HR
number of times the heart beats in 1 min

3.9
hypercapnia
excess amount of CO_2 in the blood

3.10
hyperventilation
increase in overall respiration resulting from an increase in both the depth and frequency of breathing

Note 1 to entry: This can be voluntary or result from an increase in activity, fear, or breathing excess carbon dioxide (CO_2).

3.11
hypoxia
volume fraction or partial pressure of oxygen in the breathing atmosphere below that found in the atmosphere at sea level

3.12
metabolism
metabolic rate
energy produced in human cells by aerobic or anaerobic processes

3.13
minute ventilation
$\dot{V}_E$
total volume of air inspired (or expired) in the lungs during 1 min, in $l \cdot min^{-1}$ (BTPS)

3.14
paresthesia
abnormal sensation without objective cause such as numbness, prickling, and tingling; heightened sensitivity

3.15
psycho-physiological effect
psychological trait(s) and responses to a given situation which can provoke a physiological response and the physiological responses to a given situation which can provoke a psychological reaction

3.16
respiratory rate
RR
number of breaths taken in 1 min

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3.17
SaO_2
degree of saturation of haemoglobin with oxygen in arterial blood

Note 1 to entry: Expressed as a percentage of total saturation.

3.18
stereoacuity
visual clarity in three dimensions

3.19
tachycardia
increased heart rate due to exercise, pain, *anxiety* (3.2), or pathophysiological state

3.20
$tcCO_2$
measured transcutaneous carbon dioxide

Note 1 to entry: The level of carbon dioxide in tissue vasculature, as measured by a transcutaneous CO_2 detector attached to the earlobe.

3.21
phobia
any persistent and irrational fear of a specific object, activity, or situation that results in a compelling desire to avoid the feared stimulus

3.22
state-trait anxiety inventory
STAI
psychological assessment tool used to determine the presence and type of *anxiety* (3.2) in an individual and is used to differentiate between situational *anxiety* (3.2) (state anxiety) and chronic feelings of *anxiety* (3.2) as part of the overall personality structure (trait anxiety)

4 Symbols and abbreviated terms

BP	blood pressure
FFR	filtering facepiece respirator
HR	heart rate
IDLH	immediately dangerous to life and health
Pa	Pascal
RPD	respiratory protective device
RR	respiratory rate
SA	state anxiety
SaO_2	arterial oxyhaemoglobin saturation
SARS	severe acute respiratory syndrome
SCBA	self-contained breathing apparatus
STAI	state-trait anxiety inventory
TA	trait anxiety

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