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Benefit-risk assessment for sports and recreational facilities, activities and equipment

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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 83, *Sports and other recreational facilities and equipment*.

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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.

Introduction

A system is needed for identifying benefits and hazards and assessing risks related to sport and recreation for all ages and abilities. In many jurisdictions, there is a requirement for the designers, builders, owners/operators, including inspectors and maintainers of a sport and other recreational facilities and equipment, to carry out a risk assessment and, in some cases, to record it.

International Standards have been published on risk assessment and general risk management including ISO 31000^[1], IEC 31010^[2] and ISO 45001^[3] on occupational health and safety. These International Standards were written with the intention of providing methods for managing risk and preventing work-related injury and ill-health via the elimination of hazards and the minimization of occupational health and safety (OH&S) risks by taking effective preventive and protective measures. As the sport and recreation sectors have specific characteristics and face different challenges, there is a need for an additional International Standard. There is an expectation in sport and recreational activities that the user is making an implicit trade-off between the benefits and the inherent risks of the activity, including of the potential for harm.

Risks and benefits only have meaning in relation to the objectives pursued within the context of a project (i.e. the project scope). Regarding measuring the risks and benefits, any risk analysis should include at least the following objectives:

- injury and lethality (risk);
- improvement of health and wellbeing in a broad sense (benefit);
- compliance with legal requirements.

It is up to the user to determine the degree of acceptable risks and the minimum benefits to be achieved regarding the set objectives.

The terms “sports” and “recreation” describe diverse activities and the necessary equipment for all ages and abilities. For example, camping, hockey, high ropes and challenge course equipment, martial arts, games with rules such as football (soccer), kiteboarding, summer tobogganing, play spaces, etcetera all fall within “sports” and “recreation.”

It is recognized that sports and recreation involve numerous stakeholders including, but not limited to, designers, manufacturers, installers, owner/operators, maintainers, inspectors of sports and recreation equipment and facilities, and any park rangers, playworkers or activity leaders who may be present at these venues.

Due to the varied interests of the different stakeholders, a single system of hazard identification and risk assessment for the sport and recreation sector is not feasible. What can be achieved, however, is to identify principles and provide guidance on selecting appropriate techniques.

A key issue identified is the differentiation of sports and recreational activities from a work activity. Sports and recreational activities are designed for the public good; therefore public interests are paramount. The public good can include the social, physical, psychological health and welfare of the participant and society. Participation in sport and recreation involves exposure to risk which is not necessarily a bad thing and can be of benefit to the public good. Exposure to risk in daily life can reduce fear and improves the development of human competency.^{[4],[5],[6]} This is to be balanced with the exclusion of unforeseen or unrecognizable sources of harm. For example, in adventure sports, exposure to risk is what provides part of the enjoyment. Even in the case of children's play provision, it is now widely recognized that children seek risky situations. Graduated challenge provides opportunities for children to develop internal hazard references. Therefore, the age of participants should be a consideration when assessing benefits and risks.

It is common to conduct a benefit-risk analysis that explicitly brings together the consideration of benefits as well as the risks of sport and recreation to a single evaluation. This immediately separates sport and recreation from the world of occupational health and safety where the goal, as noted above, is generally seen as one of eliminating or minimizing risk.

Within sport and recreation, there are many different goals of which prevention of injury is but one. Using a benefit-risk approach recognizes the need for making trade-offs in achieving a balance that maximizes the overall social utility and public good. These are not the only considerations, though they are important ones. Whether provided on a commercial, not-for-profit, or charitable basis, sport and recreational activities involve an accepted, inherent element of risk and challenge. Taking risks brings rewards but also dangers.

The range of stakeholders involved in sport and recreation is so diverse, different types of benefit-risk assessment is needed. Generally, there are three types of assessments that can be used: the generic risk assessment, the site-specific risk assessment, and the dynamic risk assessment. This document helps providers of products, activities, and operators of facilities to better understand the risks associated with their products, activities, and facilities, and to evaluate, implement, and document a suitable benefit-risk analysis. For example, a generic risk assessment technique can be used to analyse the risks related to skis, while a site-specific risk assessment can be used by the owner/operator to evaluate the ski hill; and the skier and the ski instructor are dynamically assessing the risk during the skiing activity.

Those responsible for reviewing proposed research must ultimately weigh the risks and benefits to determine whether the relationship between them is acceptable. This process is complicated by the fact that risks and benefits often cannot be measured on a uniform scale. First, 'risks and benefits for subjects may affect different domains of health status', as when a risk of physical injury is incurred in an effort to achieve a potential psychological benefit. Second, 'risks and benefits may affect different people'; risks are typically borne by the participants in the research, but most of the benefits will be experienced by patients in the future^[7].

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Benefit-risk assessment for sports and recreational facilities, activities and equipment

1 Scope

This document specifies methods for a benefit and risk assessment for sports, for recreational and sports facilities including equipment. This document also provides guidance and requirements on benefit and risk assessment within this field. It includes examples for injury thresholds.

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 3864 (all parts), *Graphical symbols — Safety colours and safety signs*

3 Terms and definitions

For the purposes of this document, the following terms and definitions 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

activity

play, recreation or service that engages a *user* (3.23) and provides *benefit* (3.2) which can have an associated *risk* (3.11)

3.2

benefit

helpful or good effect, or something intended to help

3.3

benefit-risk

concept which acknowledges that in sports and recreation there is an inevitable and inherent trade-off between the *benefits* (3.2) of a sport or recreational *activity* (3.1) and some of the *risks* (3.11) which it can pose

Note 1 to entry: In some circumstances exposure to risk may in itself be considered to be a benefit, e.g. the benefits of risky play in childhood development.

3.4

benefit-risk assessment

BRA

form of risk assessment that considers both *risks* (3.11) and *benefits* (3.2) in parallel when making decisions

Note 1 to entry: Benefit-risk assessment is a balanced approach that involves judgment and is based on clear values and understandings. Where appropriate it takes account of local circumstances.

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Note 2 to entry: Benefit-risk assessment includes an evaluation of the social, physical, and developmental considerations of a given *activity* (3.1).

Note 3 to entry: There can be instances where regulators or governing bodies set thresholds that do not have a rationale with the BRA but are arbitrary and must be adhered to.

Note 4 to entry: The risk is not always apparent to the *user* (3.23) and should focus on the *harm* (3.13) that cannot be evaluated or determined by the user during an activity.

3.5

competence

ability to apply knowledge and skills to achieve expected results

[SOURCE: ISO/IEC 17024:2012, 3.6]

3.6

external context

external environment in which the organization seeks to achieve its objectives

Note 1 to entry: External context can include:

- the cultural, social, political, legal, regulatory, financial, technological, economic, natural and competitive environment, whether international, national, regional or local;
- key drivers and trends having impact on the objectives of the organization; and
- relationships with, and perceptions and values of external stakeholders.

[SOURCE: ISO Guide 73:2009, 3.3.1.1]

3.7

internal context

internal environment in which the organization seeks to achieve its objectives

Note 1 to entry: Internal context can include: [standards/sist/f1998ddb-b0aa-4aa6-ba7f-3fca3f9a725b/iso-4980-2023](https://www.iso.org/standards/sist/f1998ddb-b0aa-4aa6-ba7f-3fca3f9a725b/iso-4980-2023)

- governance, organizational structure, roles and accountabilities;
- policies, objectives, and the strategies that are in place to achieve them;
- the capabilities, understood in terms of resources and knowledge (e.g. capital, time, people, processes, systems and technologies);
- information systems, information flows and decision-making processes (both formal and informal);
- relationships with, and perceptions and values of internal stakeholders;
- the organization's culture;
- standards, guidelines and models adopted by the organization; and
- form and extent of contractual relationships.

[SOURCE: ISO Guide 73:2009, 3.3.1.2]

3.8

leader

competent person who takes responsibility for people, and is able to lead, guide and supervise an assigned *activity* (3.1)

[SOURCE: ISO 21102:2020, 3.8, modified — Note 1 to entry has been removed.]

3.9 safe

state of being protected from recognized *hazards* (3.14) that are likely to cause *harm* (3.13)

[SOURCE: ISO/TR 20183:2015, 2.1]

3.10 safety

freedom from unacceptable *risk* (3.11), but not *safe* (3.8)

Note 1 to entry: Safety is achieved by reducing risk to a tolerable level.

Note 2 to entry: There is no complete absence of risk. In turn, there is no product or system that is without some risk which shall be reduced to a tolerable risk.

[SOURCE: ISO/TR 20183:2015, 2.2]

3.11 risk

combination of the probability of occurrence of *harm* (3.13) and the severity of that harm

Note 1 to entry: The probability of occurrence includes the exposure to a *hazardous situation* (3.16), the occurrence of a *hazardous event* (3.15) and the possibility to avoid or limit the harm.

Note 2 to entry: The person or team performing the risk assessment should be able to quantify or define the harm

[SOURCE: ISO/IEC Guide 51:2014, 3.9, modified — Note 2 to entry has been added.]

3.12 risk criteria

terms of reference against which the significance of *risk* (3.11) is evaluated

Note 1 to entry: Risk criteria are based on organizational objectives, and *external context* (3.6) and *internal context* (3.7).

Note 2 to entry: Risk criteria can be derived from standards, laws, policies and other requirements.

[SOURCE: ISO Guide 73:2009, 3.3.1.3]

3.13 harm

injury or damage to the health of people, or damage to property or the environment

[SOURCE: ISO/IEC Guide 51:2014, 3.1]

3.14 hazard

potential source of *harm* (3.13)

[SOURCE: ISO/IEC Guide 51:2014, 3.2]

3.15 hazardous event

event that can cause *harm* (3.13)

[SOURCE: ISO/IEC Guide 51:2014, 3.3]

3.16 hazardous situation

circumstance in which people, property or the environment is/are exposed to one or more *hazards* (3.14)

[SOURCE: ISO/IEC Guide 51:2014, 3.4]

3.17

residual risk

risk (3.11) remaining after *risk reduction measures (protective measures)* (3.36) have been taken

Note 1 to entry: Following risk reduction measures, the residual risk should be less than tolerable risk, thus providing *safety* (3.10).

[SOURCE: ISO/IEC Guide 51:2014, 3.8, modified — "(protective measures)" has been added; note 1 to entry has been added.]

3.18

risk analysis

systematic use of available information to identify *hazards* (3.14) and to estimate *risk* (3.11)

3.19

risk evaluation

procedure based on the *risk analysis* (3.18) to determine whether a tolerable *risk* (3.11) has been achieved

3.20

risk assessment

overall process comprising a *risk analysis* (3.18) and *risk evaluation* (3.19)

Note 1 to entry: The degree of exposure to *risk* (3.11) is comprised of the potential severity of the *harm* (3.13) and the probability of that harm occurring. In determining the probability of occurrence of harm, the exposure of a *user* (3.23) to a *hazardous situation* (3.16), the possibility of a *hazardous event* (3.15), and the potential means of limiting the harm should all be considered.

3.21

intended use

use of a product or system in accordance with the information provided by the supplier

3.22

reasonably foreseeable misuse

foreseeable misuse

use of a product or system in a manner not intended by the supplier, where that manner of misuse can be anticipated based on predictable human behaviour

Note 1 to entry: In evaluating readily predictable human behaviours, all relevant demographics should be considered, including, but not limited to, elderly, children, and persons with disabilities.

Note 2 to entry: In the context of consumer *safety* (3.10), "reasonably foreseeable use" is often used to encompass both *intended use* (3.21) and reasonably foreseeable misuse.

3.23

user

ultimate organization or person engaged in the use of a product, facility or an *activity* (3.1)

Note 1 to entry: The user can be a parent, legal guardian, qualified caregiver, or another decision-maker where consent is required.

3.24

inspection

act of careful examination or scrutiny to identify *hazards* (3.14), and *hazardous situations* (3.16) and to evaluate compliance with regulations, codes, and standards

Note 1 to entry: Inspection should include, but not be limited to, consideration of hazards that can emerge during or as a result of intended operation, *reasonably foreseeable misuse* (3.22), vandalism, aging of the product/environment, and weather conditions.

3.25

manufacturer

party responsible for the design or fabrication of a portion or all of a product intended for a consumer

3.26 installer

party responsible for the assembly or installation, or both, of a product to its final configuration intended by the *manufacturer* (3.25) and destined for use by a consumer

Note 1 to entry: The installer makes the product ready to use, brings it into the market and has the same responsibility as the manufacturer; they may even combine several products to a system and act on behalf of the manufacturer.

3.27 operator

person(s) or organization(s) who allow a product to be used

Note 1 to entry: An operator may implement an active role as a designated supervisor during use.

3.28 protective device

apparatus, that blocks, shields, or otherwise prevents access to a *hazard* (3.14) or reduces the degree of *harm* (3.13) that can be caused by a hazard

EXAMPLE A guard.

Note 1 to entry: A protective device can be an element such as a railing.

3.29 graduated challenge

activity (3.1) that tests *users'* (3.23) physical, mental, emotional or social skills to achieve a given, intended outcome

Note 1 to entry: Based on the ability of the user, there can be circumstances where a user is presented with *hazards* (3.14) that shall be eliminated or reduced for the intended user group and unintended users should be warned away. The user group can be identified by age or ability within the appropriate standard.

3.30 user information

instructions, *warning* (3.31) labels, or other documentation provided by the *manufacturer* (3.25) regarding use and maintenance requirements for the product, as well as issues of potential *residual risk* (3.17) that can be related to aging of the product or skill of the *user* (3.23)

Note 1 to entry: This documentation can be provided by the manufacturer prior to purchase, installation, or acquisition of the product by the owner or *operator* (3.27), or both. The documentation should be available to the user prior to initial use.

Note 2 to entry: Information should be provided in a clear and understandable language. Where provided as graphical symbols or signage, this shall be clearly visible and understandable by the user.

3.31 warning

notice or communication to indicate a potentially *hazardous situation* (3.16) that if not avoided can result in *risk* (3.11)

Note 1 to entry: "Warning", along with "Danger", "Caution", and "Notice" are keywords whose meaning is defined in ANSI Z535.4. These keywords are used in *safety* (3.10) labels and follow specific requirements.

3.32 life-threatening injury

injury to any part of the human body which is severe or resulting in permanent impairment that would be categorized as abbreviated injury scale (AIS) of 4 or greater

[SOURCE: ISO/TR 20183:2015, 2.33, modified — "(severe with survival probable)" has been removed.]

3.33

debilitating injury

injury that diminishes or weakens the human body and has a legacy of greater than one month and that could be categorized as abbreviated injury scale (AIS) of 3

Note 1 to entry: Debilitating injuries would include requiring surgery concussions that require removal from play to medical attention.

[SOURCE: ISO/TR 20183:2015, 2.34 modified — "(serious, but not life-threatening)" has been removed.]

3.34

serious injury

acute physical injury requiring medical or surgical treatment or under the supervision of a qualified doctor or nurse provided in a hospital or clinic and includes injuries such as burns, fractures, lacerations, internal injury, injury to organ, concussion, internal bleeding, etc. that can be categorized as abbreviated injury scale (AIS) of 3

Note 1 to entry: All evaluations shall be considered in the light of the age of the *user* (3.23).

[SOURCE: ISO/TR 20183:2015, 2.35, modified — "that can be categorized as abbreviated injury scale (AIS) of 3" has been added; in note 1 to entry, "have to" has been changed to "shall".]

3.35

inherently safe design

measures taken to eliminate *hazards* (3.14) and/or to reduce *risks* (3.11) by changing the design or operating characteristics of the product or system

[SOURCE: ISO/IEC Guide 51:2014, 3.5]

3.36

risk reduction measure

protective measure

action or means to eliminate *hazards* (3.14) or reduce *risks* (3.11)

EXAMPLE *Inherently safe design* (3.35); *protective devices* (3.28); personal protective equipment; information for use and installation; organization of work; training; application of equipment; supervision.

[SOURCE: ISO/IEC Guide 51:2014, 3.13]

3.37

risk source

element which alone or in combination has the intrinsic potential to give rise to *risk* (3.11)

Note 1 to entry: A risk source can be tangible or intangible.

[SOURCE: ISO 31000:2018, 3.4, modified — "intrinsic" has been added; note 1 to entry has been added.]

3.38

surface

point of contact between the *user* (3.23) and an element in an *activity* (3.1) whose properties that can create a *hazardous situation* (3.16)

Note 1 to entry: A surface can be one that the user is in regular contact and be the potential for a hazardous situation such as contain sharp points or edges; alternatively, the user can lose contact with the surface unexpectedly due to lack of friction.

Note 2 to entry: A surface can be a point of contact that a user can fall onto and resulting in an injury. This can also be a point of contact within the play, sport and recreation facility or environment.

3.39**activity leader**

person assigned by a group or organization to lead an *activity* (3.1)

EXAMPLE Games leader, orienteering leader, canoe trip leader.

Note 1 to entry: Specific levels of training or competency in leadership and skills may be required by the group or organization before an individual is permitted to lead an activity.

4 Benefit-risk assessment — Process overview**4.1 Assessment team**

Benefit-risk assessments should be conducted by a team of at least three members with relevant expertise in an activity, facility, or product. Teams should be kept to the minimum number of participants necessary to include all relevant expertise.

Team membership should be maintained for at least the duration of the first review cycle; see 8.2 to help ensure the continuity of team wisdom.

The person designated as the team leader should have training and experience according to the requirements of [Clause 9](#) and have experience facilitating effective committee work, including the development of consensus.

The team leader should determine the types of expertise needed in the team.

Team members are typically drawn from one of the following three groups:

- product and facility designers;
- site managers;
- activity leaders.

4.2 Project scope**4.2.1 General****4.2.1.1 Overview**

The benefit-risk assessment shall be a total package, consisting of three distinct processes:

- a) definition of context;
- b) identification of user (parallel process);
- c) evaluation of the risk and benefit.

[Figure 1](#) illustrates the flow of the procedures specified in this document.

4.2.1.2 Establishing the context

The establishment of the context shall be the first task performed when conducting a benefit-risk analysis. Developing context involves communication between stakeholders.

The context is related to the requirement to assess a product, facility/location, or activity during its conduct.

The purpose of establishing the context is to define which of the assessment approaches (see [4.2.1](#)) is most appropriate to the circumstances, enabling effective risk assessment and appropriate management