FACULTY OF TEXTILE ENGINEERING TUL

DEPARTMENT OF CLOTHING TECHNOLOGY

INPUT PARAMETERS FOR SPORTSWEAR DESIGN.

Calculation of a dynamic effect of body dimension

INPUT PARAMETERS FOR SPORTSWEAR DESIGN

Garment fit and pressure comfort play an important role in clothing comfort, especially in the case of tight - fit sportswear.

Photo: www.sport-invest.cz

There are three factors, which influence the pressure exerted by garments**:**

- <u>Shape of the body parts</u>

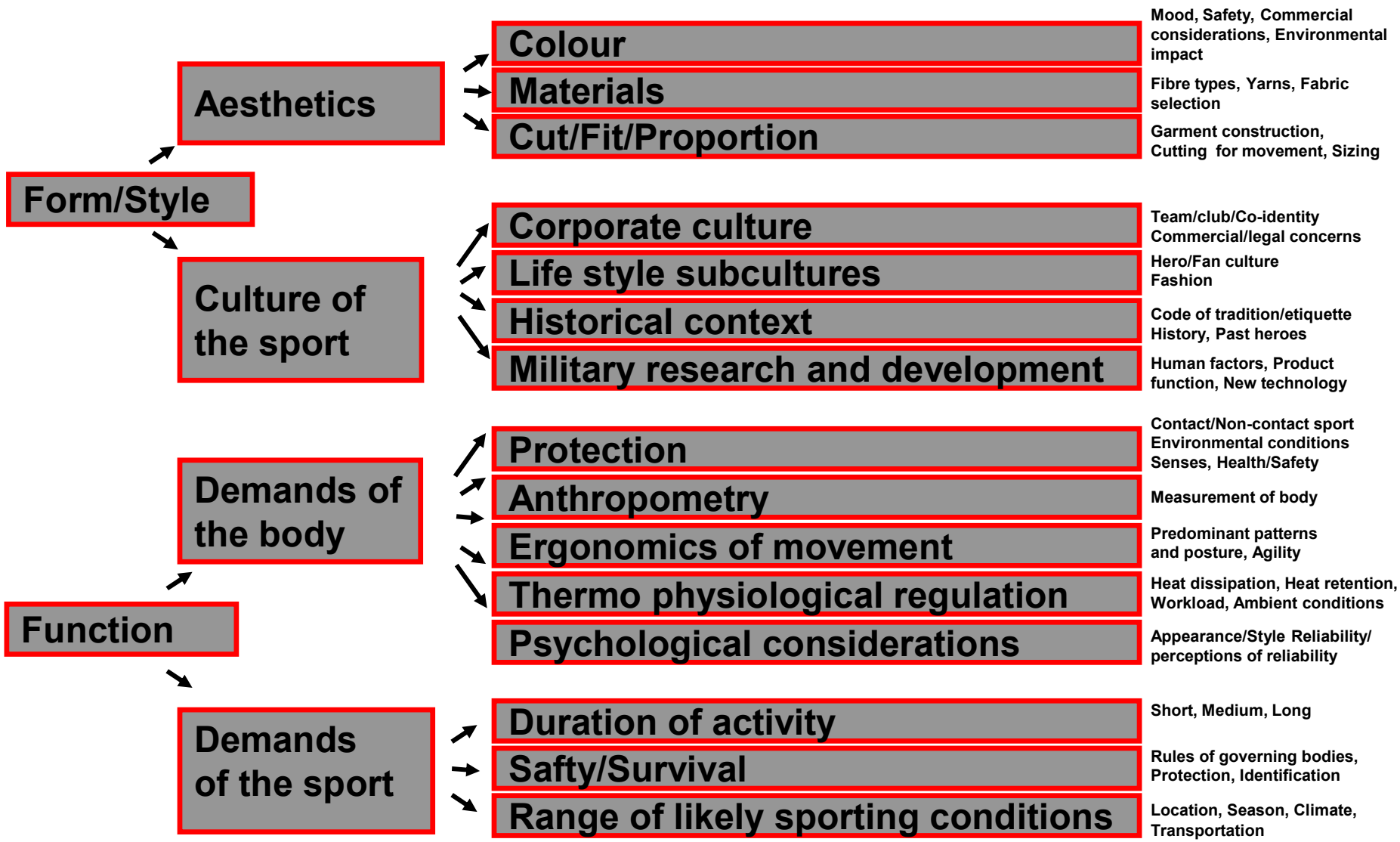
  Body shape is an important influential factor towards clothing pressure as greater the degree of curvature, the greater the pressure exerted.

- <u>Type of the fabric used</u>

  The amount of pressure, which measured in [mmHg] (*millimetres of mercury column)* has been found to vary in body locations when garments were made of different types of fabrics.

- <u>Design and fit of the garment</u>

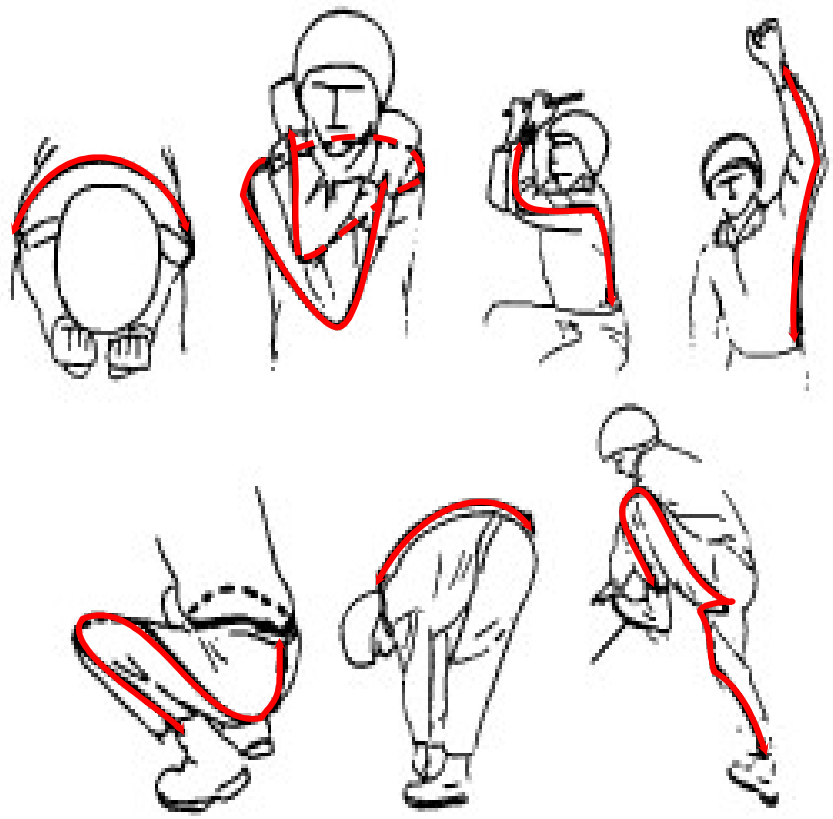
Information tree to guide the design research process for performance sportswear designers



Dynamic Body Dimensions

Humans have to function and move unrestricted in clothing systems.

- *Static Dimensions* - measurements of the body at rest.
- *Dynamic Dimensions* - measurements of body parts in motion.



Seven extreme body postures causing changes of 18 cm, 24 cm, 21 cm, 22 cm, 27 cm, 16 cm and 22 cm respectively, relative to a neutral position (Lotens, 1989)

An Example

In addition. It is important to note that an athlete will stretch in various ways depending on body movement. Which is highlighted in figure.

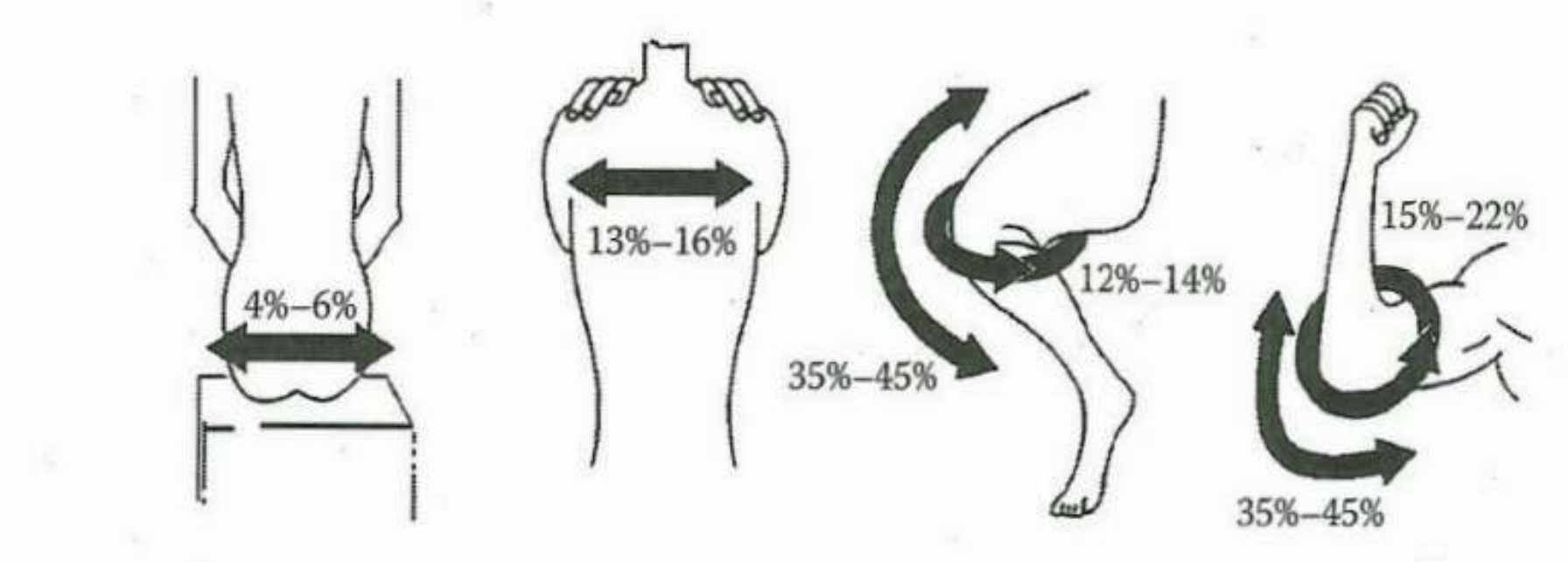
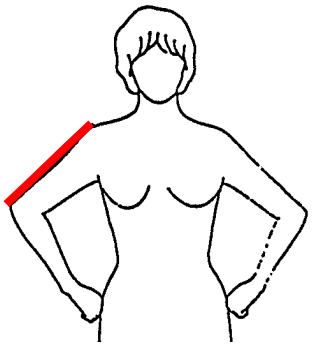


Figure
Key areas of stretch. (Courtesy of Elsevier, 2005)

Examples of Dynamic Body Dimension Measurement

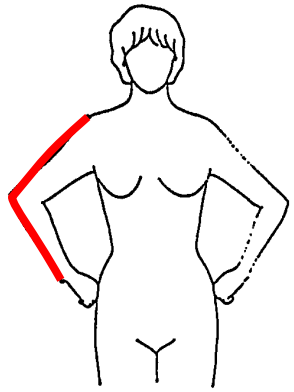
Length of bent arm

The dimension is taken from the shoulder point to the elbow. The measured person rests the clenched fist of the right hand on the hip, the upper limb is bent at a right angle.



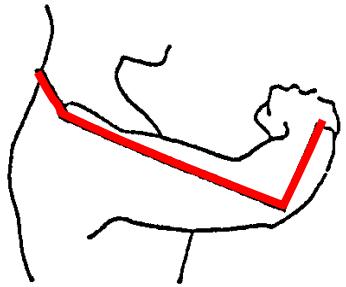
Length of bent arm and forearm

The dimension is taken from the shoulder point through the elbow to the wrist point on the little finger side. The measured person rests the clenched fist of the right hand on the hip, the upper limb is bent at a right angle.



Length from the nape to the wrist (bent arm and forearm)

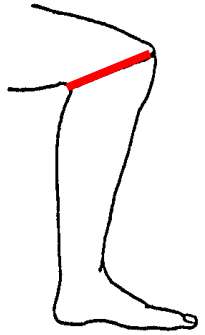
The dimension is taken from the nape to just pass the shoulder point on the outside of the upper limb to the elbow and further to the wrist bone on the pinch side.
The upper limb is forearm in a horizontal position and is bent at a right angle in the elbow joint.



Examples of Dynamic Body Dimension Measurement

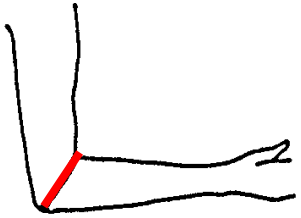
Circumference of bent knee

The dimension is taken obliquely below the knee to just pass knee prominent point in the middle of the patella. The lower limb is bent at the knee joint at a right angle.



Circumference of bent an elbow

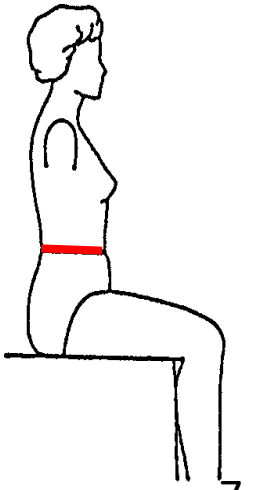
The dimension is taken just pass prominent bones of bent an elbow. The upper limb is bent at the right angle at the elbow bone.



Waist circumference of a sit person

The dimension is taken transversely around the body (torso) at the level of the waist points.

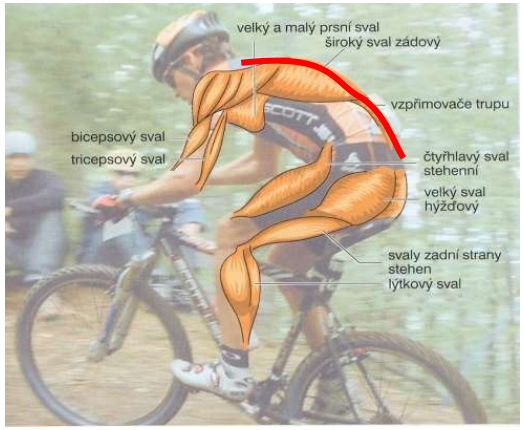
The figure sits upright and breathes normally.



Ergonomics of movement

human engineering

- *Static Dimensions -* measurements of the body at rest.
- *Dynamic Dimensions -* measurements of body parts in motion.

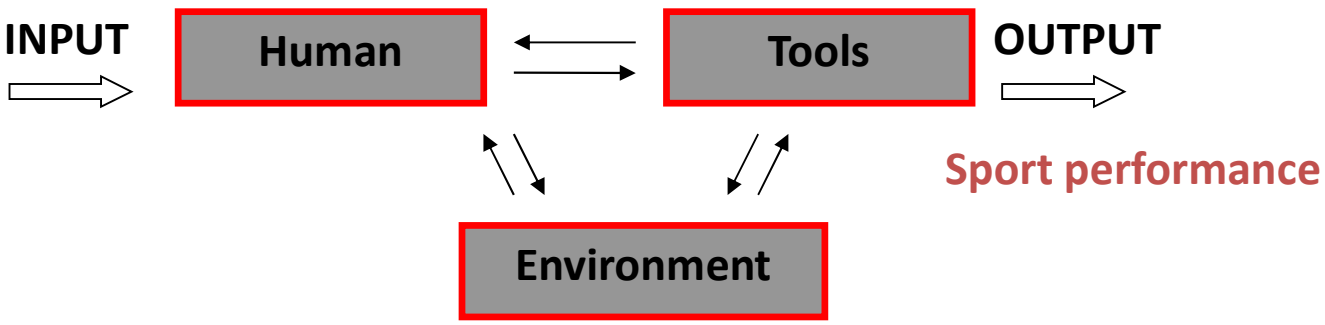


$d = x^{(d)} - x^{(s)}$ - *Dynamic factor*

$x^{(s)}$ - Measurement of body at rest

$x^{(d)}$ - Measurement of body parts in motion

$x[\%]$ $x = \frac{\bar{d}}{\bar{x}^{(s)}} \cdot 100[\%]$ - *Dynamic factor in percentage*



Information derived from the studies contributes to the design and evaluation of tasks, products, environments and systems in order to make them compatible with the needs, abilities and limitations of people.

Influence of the fabric

The type of fabric has a great influence on the amount of ease allowances e_i for:

- body movement,
- expansion
- comfort.

The dimensional stability of the fabric is an important factor.
The more stable the fabric, the greater the ease allowance.

This depends on whether it is:

- woven,
- knitted,
- or non-woven.

Constructional abscissa (general format)

$Ab_i = k_i * B_i + a_i + e_i$

AB_i	constructional abscissa
k_i	coefficient
B_i	body dimension
$\boldsymbol{a_i}$	absolute term
$\boldsymbol{e_i}$	easy allowance

E.g. for woven fabric:
Basic formula for front width:
fw (front width)= 0.24*wg + (-1,5 cm) + 2,5

E.g. for knitted fabric:
Basic formula for front width:
fw (front width)= 0.24*wg + (-1,5cm) - 2,5

Reference

- Prepared on the basis of documents by Ing. Blažena Musilová, Ph.D.
- Hayes SG, Venkatraman P, editors. Materials and Technology for Sportswear and Performance Apparel. 1st edition. CRC Press; 2015.