

CONSUMER SAFETY UNIT

CHILDATA

The Handbook of Child Measurements and Capabilities

- Data for Design Safety

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Department of Trade and Industry

Beverley Norris and John R Wilson
Institute for Occupational Ergonomics
Department of Manufacturing Engineering and Operations Management
University of Nottingham
University Park
Nottingham
NG7 2RD

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Ashizawa et al (1987)
Branta et al (1984)
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Krogman (1971)
Sells (1951)

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Read these sections before using any of the data in the handbook

1 Introduction

The CHILDATA Handbook - a Databank of children's measurements and capabilities - has been produced to meet the needs of manufacturers, designers, standards bodies and research organisations for the ergonomics and performance data which are fundamental to the design of products and environments suitable for children. Without such data, design might be left to informed guesswork or will at least require an excessive process of expensive and time consuming testing, evaluation and redesign. However, the data have until now remained either inaccessible or difficult to select and apply. It is intended that CHILDATA will be usable in conjunction with existing safety standards by those concerned with the design or provision of products with which children may come into contact. These may be products intended for use: *by* children, such as toys, nursery products and playgrounds; *with* children, such as safety guards, pushchairs, cots and beds; or *around* children, such as playpens, architectural features (eg door and window handles, railings) and household consumer products (eg electrical goods).

The aim of the Handbook is to bring together all appropriate, available ergonomics data on children into one easy to use design resource. To ensure that CHILDATA is easy and quick to use, only the most useful measurements and reliable sources have been included. Some data have been excluded, usually those with limited applicability or very specialised data, for example, facial measurements. Sources of additional data not included are given in the bibliography at the end of the Handbook.

CHILDATA is a collection of the most up to date and reliable ergonomics and performance information on children. There are data on 187 measurements of children's characteristics and abilities for children from birth to 18 years old from the UK, USA, The Netherlands, Germany, Australia and many other countries. Included is information on children's body sizes (referred to as anthropometric data), children's strength, motor abilities (such as running and jumping), skills related to specific products (such as the height of barriers they can climb) and some psychological abilities (such as their understanding of safety symbols). These data can be applied to any product or environment with which a child may interact to ensure that the interaction is as safe, comfortable and effective as possible. They can be used in a classical ergonomics fashion, so that products 'fit' children and are usable and safe. Equally important, data may be used to help ensure that children are excluded or protected from a hazard. For example, data on hand and finger size can be used to prevent hands or fingers reaching around or through guards or to stop fingers becoming trapped in openings; hand strength

data can be used to ensure the controls on electrical goods cannot be operated and door handles cannot be opened.

The CHILDATA Handbook consists mainly of tables organised according to the type of measurement (eg anthropometry, strength etc) and each table lists data according to age and sex. Some background information is also listed, such as the country of origin, date of publication and the number of subjects measured and this information should be taken into account when using the data. For some measurements, more than one source is presented, usually because they relate to different age groups or, particularly in the case of the anthropometric data, different countries of origin are included for comparison.

Sections 2, 3 and 4 describe how to use and select the data and should be read before using any of the databank. They give an introduction to using ergonomics data in general (section 2), the special considerations that should be given to designing for children (section 3), and information specific to the sources used in CHILDATA, such as how to choose between them (section 4). Section 5 is a guide to the tables, including an hierarchical index of all measurements and illustrations of the anthropometric measurements. The data tables are followed by a list of references, a list of other sources of useful data that could not be included, a list of useful contacts and finally an alphabetical index to the measurements.

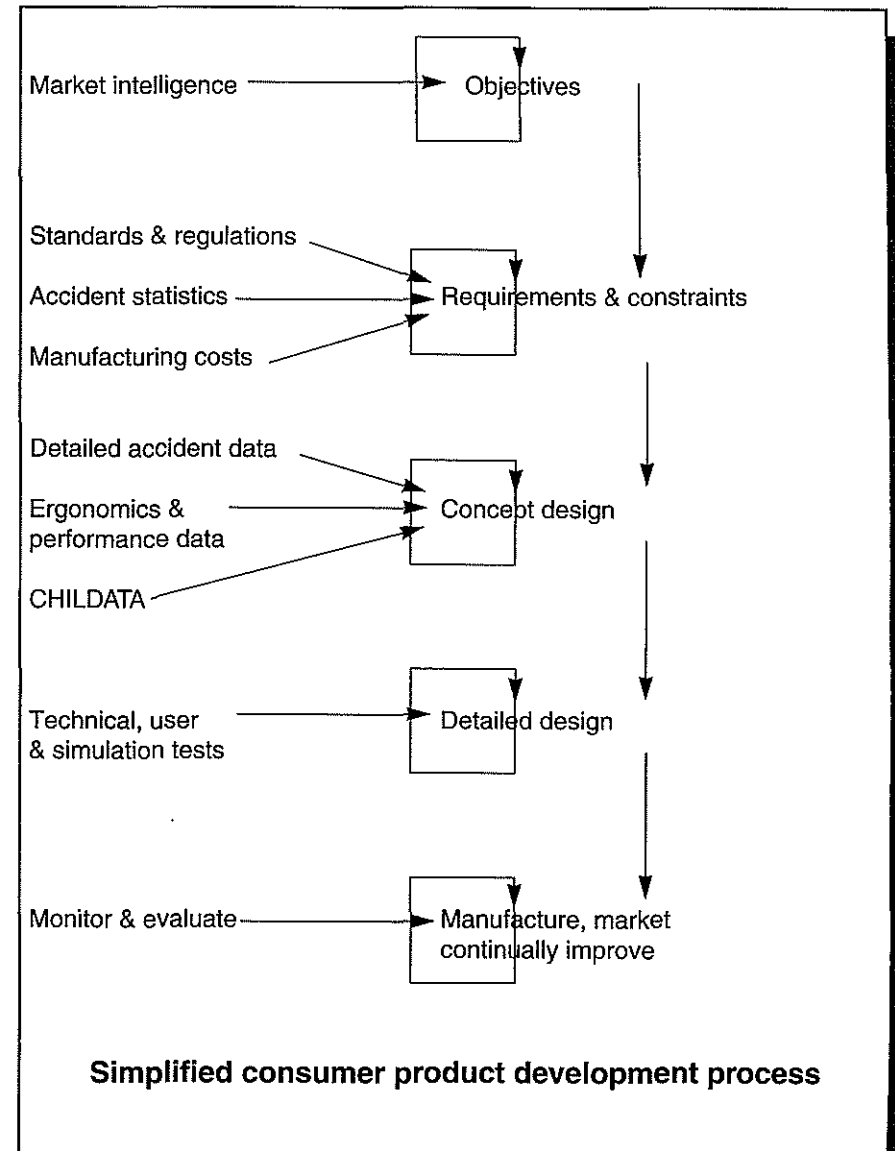
2 Using ergonomics data in design

Ergonomics involves the study of how people interact with their surroundings, the products and tools they use, the buildings they work and live in, the information they receive, and of how all of these activities are organised. The aim of ergonomics is to improve every level of this interaction, to enhance people's comfort, satisfaction and safety and the usability and effectiveness of their tools and products. Ergonomics begins with measurements of people and with studies of how people perform and interact with their environment; these studies produce information about human characteristics and abilities. Without this basic information, we cannot expect the products we produce to 'fit' their users. The ergonomics and performance data contained in this databank are the results of such measurements and studies and should be the starting point for developing products designed for use by or around children.

Use of the information in the CHILDATA Handbook is not an alternative to testing and evaluation, but should increase test efficiency and reduce the amount of testing. It will also shorten product development times and reduce the chance of marketing an unsafe, unsuitable or unusable product. This becomes clear when we look at a simplified description of the consumer product development process, especially when designing products to be used by, or to be safe for, children:

Once design objectives have been set, accident data such as that produced by the DTI's Consumer Safety Unit Home Accident Surveillance System [1] may be used to establish likely risks; in addition, standards and regulations will produce requirements and constraints on the design just as much as will market intelligence and manufacturing cost information. From an outline or concept design, ergonomics and performance data can be applied to enhance product usability, safety and design quality, and to help accelerate the iterative design process into a detailed design. Although a programme of testing and evaluation - involving technical, user and simulation tests - is always necessary, this can be a far more effective and speedy process if ergonomics and performance data have been applied from early in the development.

Use of information from CHILDATA, in conjunction with safety standards, will assist product design in terms of both safety and the effectiveness of the design process and will therefore improve product competitiveness. However, the data are by themselves not a guarantee of user or child safety; care must be taken in their interpretation and application. Testing, whilst it may be made more economical and effective by prior use of this handbook, will usually still be necessary for new designs or substantial redesigns.



2 Using ergonomics data in design

2.1 Types of data

CHILDATA contains data on all aspects of children's behaviour and these can be classified into three broad categories: anthropometry, physical abilities and psychological abilities.

2.1.1 Anthropometry

Anthropometry is the measurement of body dimensions:

Static anthropometry

Static anthropometry is the measurement of body dimensions with the body held in standardised, static postures. Measures include stature, weight, centre of gravity, body breadths, depths, circumferences, the height of body landmarks from the floor, seating dimensions, face, hand and foot dimensions. Static anthropometric data account for over half of the measurements in the Handbook and are the main type of data used to ensure the 'physical fit' of items to be used by or with children.

Functional anthropometry

Functional anthropometry, in contrast, is the measurement of the limits of movement of the human body such as the distance that can be reached overhead, in front of or to the side of the body and the maximum step height. Functional anthropometric data will often be used to ensure that equipment is made inoperable or inaccessible by children.

2.1.2 Physical abilities

Physical abilities data include measurements of any physical activity. Three main types of data are included in the Handbook:

Strength

Strength can be measured in a number of ways. It can be the isolated strength around a joint (eg the force exerted when bending the elbow and keeping the rest of the body still), the force exerted in a specific action (eg pushing) or when applied to a specific object (eg opening bottle caps). The last two may be measured in standardised postures or by allowing posture to be varied to produce maximum force. Data are included on the strength of the arms, hands, fingers, legs and

mouth and include pushing and pulling, lifting, twisting, pinching and biting forces.

Movement

These measurements refer to general movement skills and include data on running speeds and distances, jumping distances, swimming, walking across beams and ladders, and balance.

Specific performance

These are measurements of physical abilities related to specific activities or products, such as climbing fences, opening windows, throwing objects and swallowing.

2.1.3 Psychological abilities

Measurements of psychological abilities can include information on how we perceive the world and process information. Much of the information is often difficult to apply to design or may be too specific to include in a collection of data for general design use such as this. Although some psychological data have been included in CHILDATA, designers should also be aware of the more general guidance that is available regarding children's psychological development (Section 3) and the reader is referred to general texts on child development for more information. Psychological data included in CHILDATA fall into two categories:

Perceptual abilities

Perceptual abilities include measurements of children's visual and auditory perception, presented as reaction times to visual and auditory stimuli.

Cognitive abilities

Cognitive abilities include children's understanding of warning symbols, understanding and preference for colour and attention span.

2 Using ergonomics data in design

2.2 Types of interaction

Children interact with their environment in a number of ways and ergonomics data can be used for each type of interaction. Table 1 gives examples of the five types of interaction and how ergonomics data can be used ► and some of these are shown in figure 1.

2.3 How people vary

Ergonomics data are used to ensure that products and environments are designed to fit and suit as many people as possible. It is apparent that people vary in size, shape, strength, physical and psychological abilities and in personal preferences but it is important to determine exactly how people vary and how many people will be accommodated, or excluded, with a certain set of design parameters. It is therefore important to understand the reasons for, and to specify the extent of, human variability.

2.3.1 Calculating the limits of human variation

Providing information for designers means that we should be able to put limits on the range of peoples's physical and psychological functions. It is impossible to measure everyone, so the range of variability of an attribute is predicted by measuring a random selection of people representative of the group we intend to design for (the target population). Depending on the size of the sample and the size of the target population, the accuracy of the predictions can be specified. Most surveys of anthropometric measurements, including those presented in the CHILDATA Handbook, use sample sizes large enough to predict the variability of body dimensions with acceptable precision. Other measurements, such as strength, children's performance and psychological abilities, are often collected as part of smaller scale or ad hoc research, and sometimes use small sample sizes. While the non-anthropometric data in the Handbook represent the most reliable and applicable data available, the information provided on sample sizes should be used to give some indication of the reliability of the data. Methods to calculate confidence limits based on sample size are presented elsewhere [2].

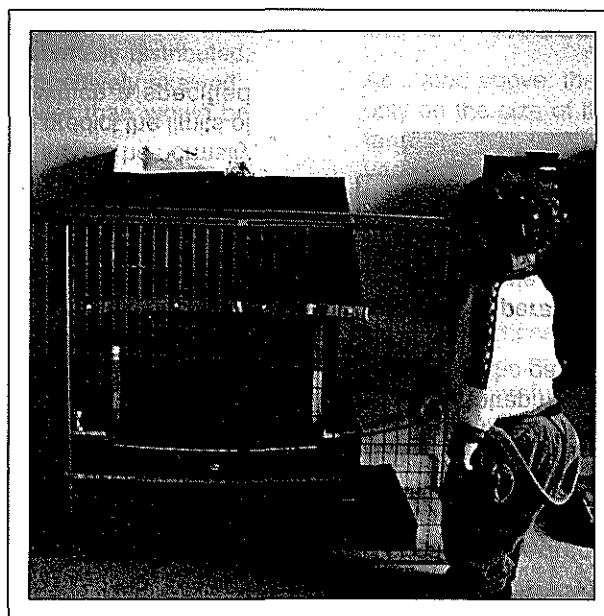
Table 1: Types of interaction and uses of ergonomics data

Child interacts with:	Examples of products or environments	Possible applications of ergonomics data	Data to be used include:
Product	medicines and their packaging	make child resistant - inoperable or unattractive	hand size, opening strength, attractiveness of colour, understanding of symbols
	dummy or pacifier	prevent swallowing	mouth size
	bicycle	reach to pedals and handlebars, size of handlebars	arm length, leg length, sitting height, hand size
	cooker controls	prevent operation	overhead reach height, wrist turning strength, hand size
Personal space	infant carriers	support and retention	body length, shoulder breadth, hip breadth, chest depth
	stair guards	prevent access over or through stair guard, prevent operation of locking device, stability	step height, ability to climb barriers, reach height, wrist turning strength, lifting strength, pushing strength, pulling strength
	fireguard	prevent access or entrapment, operation of locking device, stability	finger breadth, finger length, hand, strength, pushing strength, pulling strength
Physical environment	window and door handles	prevent operation	overhead reach height, height at which window handles can be operated
	railings and bannisters	prevent access over or through, prevent entrapment	step height, ability to climb fences, shoulder breadth, chest depth, head breadth, head length
Social environment	child resistant containers	operable by elderly and disabled but not by children	comparison of children's and adults cognitive and fine motor skills
Information	safety signs	recognition and comprehension by children	children's understanding of colour codes, understanding of symbols
	warning alarms	recognition and comprehension by children	auditory perception

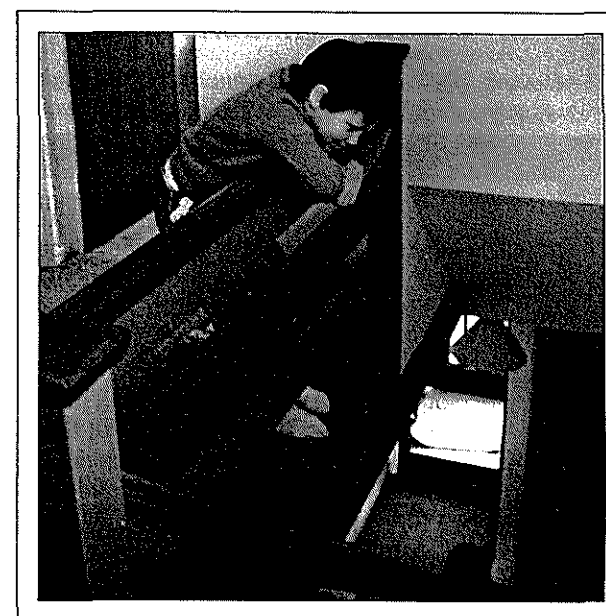
Figure 1: examples of ergonomics data used in design



Information and data on children's overhead reach, handsize, pulling strength and wrist twisting strength should be used to prevent children reaching to, and operating, the controls or doors on domestic products such as cookers.



Products used around children should also account for their inadvertent use; information on children's finger sizes should be used to prevent access through fireguards and the security and stability of such items should account for children's pushing and pulling strength.



To be effective, the design of barriers, railings and fences should be based on children's abilities to climb over such barriers; maximum step height and foot size should be used to prevent a child making a foothold on horizontal bars and spacing between bars should be based on head size to prevent the risk of head entrapment.

2 Using ergonomics data in design

Provided that the sample of people measured is a true representation of the target population, the results generated can be used to calculate the range of variability of an attribute and limits can be set within which we would expect any particular percentage of the population to fall. If we measured every member of a population to collect information on stature, for example, and plotted the frequency with which they occur, the results would look like figure 2.

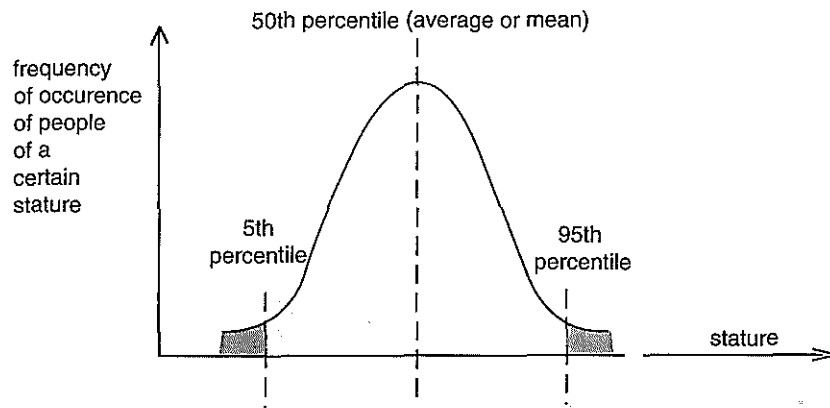


Figure 2: Distribution of stature (normal distribution)

The area under the graph represents the total population. The majority of people fall within the middle range with a low incidence of very tall or very short people. The graph is symmetrical around the midpoint and this point divides the area under the graph in half, such that 50% of the population is shorter than this value and 50% is taller. This is called the 50th percentile value. In the case of stature, the 50th percentile is also equivalent to the average or mean. When this is so, the graph is called a Normal or Gaussian distribution and stature is said to be normally distributed. When a variable is normally distributed, it is easy to predict the limits of the range of that variable, or to calculate a range within which a specified percentage of people will occur.

In design it is often difficult to accommodate every individual in a population, and a common design compromise is to design to accommodate the middle 90% (or 95%); that is, to exclude the smallest 5% (or 2.5%) and the largest 5% (or 2.5%) of the population. The majority of sources of anthropometric data present the fifth

and ninetyfifth percentile values and these are used as an acceptable range of the variable. These figures are used because, as figure 2 shows, the slope of the distribution decreases sharply towards the tails and accommodating an extra one percent of the population at each extreme of the distribution requires a relatively large increase in the value of the variable. However, more extreme percentiles should be used where critical design scenarios occur, and in situations where there is a known risk a safety margin might also be applied (this is discussed further in Section 2.4). Examples of designing to accommodate different ranges of the population are shown below:

Designing for an acceptable range of the population:

positioning and design of straps in an infant car seat

5th percentile female to 95th percentile male torso dimensions are required to specify the limits of adjustment of straps so that a specified group of infants can be accommodated

Designing for extremes of the population:

maximum space between vertical bars on a stair gate

minimum female foot breadth of children once crawling should be used to set maximum space between bars to prevent feet passing through the bars, to avoid entrapment and the use of the bottom crossbar as a foothold to climb over the gate

minimum operating torque of handle turned to open stair gate

maximum male wrist twisting strength of children once they are crawling and standing should be used to specify operating torques and reduce the risk of inadvertent operation of the handle by the child

2 Using ergonomics data in design

Percentile values of a variable can be easily calculated, provided the variable is normally distributed. The majority of anthropometric data are normally distributed, although weight is a notable exception. (Weight is usually 'positively skewed', indicating a disproportionate number of people who are heavier than would be expected).

Percentile values can be calculated using the following equation:

$$X_{(p)} = M + SD (Z)$$

where

$X_{(p)}$ is the percentile value to be calculated eg X_{99} is the 99th percentile value

M = mean

SD = standard deviation

Z = standard deviate score

Standard deviation is a parameter of the normal distribution used to indicate the amount of variance in an attribute. Approximately 68% of a population will lie within one standard deviation either side of the mean ($\pm 1 \times SD$) and approximately 95% lie within two standard deviations either side of the mean ($\pm 2 \times SD$). The standard deviation is calculated using the following equation:

$$SD = \left(\frac{\sum (X - M)^2}{n - 1} \right)^{1/2}$$

where X = each measured value
 M = mean
 n = number in sample

Standard deviate scores (or *Z scores*) can be found in the table in Appendix 1, giving *Z scores* for percentile values from 0.001% to 99.999 percentile.

Nearly all data tables present mean and standard deviation values so if the percentile values required are not presented they can be calculated using the above equation.

2.3.2 Reasons for human variability

As stated above, the accuracy of our predictions of human variability depends not only on the size of the sample we test but how well they represent the target population. It is therefore important to understand the reasons for human variability and how the group of children for whom we have data may differ from those we are trying to accommodate in our designs. The major sources of variability are as follows:

Gender

Body proportions can vary between the sexes during childhood. Therefore, when designing to accommodate the range of a mixed population, data should be examined carefully before automatically using the 5th percentile female value and 95th percentile male value to set design limits, as is often the accepted practice when designing for adults. There may be instances when these will not accommodate the range of children at a particular age, especially during adolescence. Step by step guidance on combining datasets (eg male and female) can be found elsewhere [2].

The majority of the data in the Handbook are presented separately for males and females. Data on infants however, usually up to two years of age, are presented by the sources as a combined population, as the differences between the sexes at this age are considered minimal.

Age groups

Children do not develop at a steady rate throughout childhood. It should not be assumed therefore that trends in data in one age group will apply to another; that is, that the proportional change in a particular body dimension over one age range will be the same over another range. The age groups of the data used should match the target age group exactly. This is particularly important with regard to infants and adolescents, when anthropometric measurements can change rapidly. Data on infants are sometimes presented in six monthly age bands, and mean data for that group should be used with caution. Also, the specification of ages of children used to collect data can vary between sources. Unless otherwise stated, the ages of children in the databank refer to birthday years, that is, age three includes all children aged from their third and up to their fourth birthdays; data are sometimes classified according to the six months prior to and after a birthday, that is, age three including children from age 2.5 to 3.5 years, but where this occurs it is clearly stated.

2 Using ergonomics data in design

Disability

Anthropometric and performance measurements are nearly always carried out on children without any form of physical or psychological impairments or difficulties. This is because the majority of behavioural research is carried out for medical applications and not for design, and the data are only intended to represent children without any sort of impairment. The data presented here will not therefore necessarily accommodate children with any sort of disability and designers must be aware of this. This is a serious inadequacy of much of ergonomics data and needs to be addressed. Very limited amounts of design data on children with specific disabilities have been published and may be accessed through specific searches.

Cultural differences

It is widely recognised that people around the world differ in size and shape; for instance, some racial or ethnic groups are taller than others. Worldwide variation in stature has been suggested as being nearly 40 centimetres, between the mean height of the tallest and shortest adults in the world [2]. It is therefore to be expected that these differences also exist in childhood, and the databank contains data from a number of countries in order to help assess these differences. Within multiracial/ethnic communities such as the UK there are also observed anthropometric differences between children of different ethnic groups[3]. Anthropometric differences are due not only to genetic differences, but to differences in socio-economic conditions even within the same country. This is particularly so in developing countries but even within the UK, small differences in the rate of growth have been observed recently between children in Scotland and England [4,5]. In order for any anthropometric data to be truly representative of a population they should account for all racial/ethnic, demographic and socio-economic variables within that population. Not all of the sources of data in this Handbook account for these factors and the sampling procedure of any data source should be studied. The samples of the major anthropometric sources are described in detail in Section 4. The sample details of the sources of all other data, where available, are summarised within the data tables.

Secular trend

Over varying time periods, indeed centuries, there has been a documented increase in stature [6]. Changes in body size over time are referred to as a secular trend and have been attributed to improvements in living conditions [7]. The overall increase in adult-attained stature has been linked to an earlier onset of the adolescent growth spurt [8] and this suggests that any secular increase in body dimensions may be more accentuated in children and perhaps less predictable than those observed in adults. It is unlikely that one figure representing secular trend in stature will be valid across all ages of children; for instance, the stature of 13 year old Japanese children increased by approximately 80mm from 1948 to 1978 but by less than 70mm in six year olds over the same period [9].

There is much debate as to whether or not the secular increase in stature has halted in developed countries such as the UK. From 1979 to 1986 there was no increase in the stature of 5 to 12 year old children in England and Scotland [10] but some increase has since been recorded from 1986 to 1990 [5]. A recent increase has also been recorded in Dutch children aged 6 to 18 years living in the north of the country [11]. Meanwhile data collected on children in the USA in the 1960s and 1970s are considered by some as still valid for use there in the 1990s [12]. It is therefore important to consider when anthropometric data were collected, whether there has been any secular trend in stature since then and, if so, how a secular trend in stature relates to other anthropometric measurements.

2.4 Applying the data

The caution concerning human data outlined above, such as changes in human characteristics over time, can be overcome, provided that the designer is aware of them and accommodates any uncertainty with appropriate tolerances. These tolerances depend upon how the data are being used and how critical the design scenario is.

2 Using ergonomics data in design

2.4.1 Design scenarios

There are five main scenarios which can be used to describe the ways in which data may be applied to design. These are presented in table 2.

design scenario	aim	examples	design should accommodate	critical design scenarios:
fit	design to ensure user-product match and appropriate and effective use	cots, pushchairs, bicycles, cycle helmets, car restraints	maximum range of the population eg 5th to 95th %ile	use both maximum and minimum expected values
reach	placement to ensure access and appropriate and effective use	position of handrails, step height	smallest of population eg 5th %ile	use minimum expected value
clearance	placement to avoid undesirable or unintentional contact	access hatches, desk-seat gap	largest of population eg 95th %ile	use maximum expected value
entrapment	avoid unintentional retention of the whole body or body parts	wholebody: railings, washing machines head: cot sides, ladders, bannisters hand/finger: doors, cupboards, folding pushchairs, fire guards	largest of population eg 95th %ile	use maximum expected value
exclusion	ensure inaccessibility and inoperability	barriers, railings, guards, inoperable controls, packaging	maximum range of the population eg 5th to 95th %ile	use maximum and minimum expected values

Table 2: Design scenarios and how ergonomics data should be applied

There are situations when it is unacceptable to design to accommodate only the majority of the population and exclude the extremes. These are critical situations in which there is a risk of injury. Here, safety margins should be used to ensure the entire population is accounted for. For example, if a fire guard is to be effective and safe there must be no design-related risk of any child being able to pass their fingers through or around the guard to reach the fire. By a combination of minimising gaps in the guard and increasing the distance between the guard and the fire, the risk of injury even for children with the smallest diameter fingers, hand and wrists and with the longest arms can be considerably reduced.

One method that has been suggested to derive acceptable safety margins is to calculate maximum or minimum values of anthropometric variables rather than use 5th and 95th percentiles [13]. These can be calculated using the equations in the box below.

$$\text{Maximum value of variable} = X_{95} + 0.7(\text{SD})$$

$$\text{Minimum value of variable} = X_5 - 0.7(\text{SD})$$

where

X_5 = fifth percentile value

X_{95} = ninetyfifth percentile value

SD = standard deviation

Whenever design situations involve a real risk of injury, additional safety tolerances should always be added to the design limits already indicated by anthropometric data or human performance data.

2 Using ergonomics data in design

2.4.2 Other considerations

The following issues should also be considered when applying ergonomics data.

- Clothing** All anthropometric data in the Handbook are measured with children barefoot and in underwear. Infants are measured naked and without nappies. If applying data such as stature and reach heights to situations where children may be clothed, an allowance for shoes should be made which may vary depending on current fashions. A correction of 25mm for children up to 12 years and boys over 12 years, and 45mm for girls and women over 12 years has been recommended [2]. Corrections for other clothing are likely to be negligible with the exceptions of outdoor wear, protective clothing (eg cycle helmets), gloves and babies' nappies.
- Strength** Strength measurements depend on the posture adopted to perform the task and the motivation of the subjects, especially children, during measurements. If strength is measured in a standardised posture the results may be lower than can be achieved in realistic settings. For instance, pushing strength measured with one arm with static posture will be far less than if two arms and body weight can be used. Also, it may be difficult to guarantee maximum effort in experiments from young children who may be unnerved by experimental conditions.
- Posture** Functional anthropometric measurements such as reach are usually taken in standardised postures and do not account for stretching or twisting to maximise the reach.

3 Designing for children of different ages

Childhood is a period of continual and sometimes rapid change in physical and psychological abilities. Also, there can be huge variations between children of the same age, particularly around adolescence. Designing for children can be more difficult than designing for adults because of this continual change and the wider variation within age groups. This section describes some key stages in child development and identifies how certain important developmental factors should be taken into account when designing for children.

3.1 Anthropometric measurements

The rate of growth varies during childhood; growth is rapid during the first few years of life then decreases after infancy until the 'adolescent growth spurt' when it increases again. The timing of the growth spurt varies between individuals and is different in boys and girls. A general guide would be anywhere between age 9 and 14 years for girls and 11 and 16 years for boys although there is some evidence that, along with a secular increase in stature, the adolescent growth spurt is also starting earlier [6].

While there is a general increase in body dimensions with age, the amount of variation within each age group also increases, demonstrated by an increase in the standard deviation of anthropometric measurements with age. Wide variation within age groups can lead to an overlap across age groups; for instance, a tall 7 year old boy may be taller than a short 10 year old (1320mm and 1290mm respectively [2]). This variation within age groups sometimes makes it more appropriate to design according to variables other than age; weight for instance is sometimes used to specify the suitability of baby carriers and nappies. Some anthropometric data (although none in this Handbook) are in fact classified according to weight rather than stature.

Anthropometric differences between the sexes start to appear slowly after birth and increase with age. Differences in the timing of the adolescent growth spurt mean that girls can overtake boys around adolescence. After about age 13 the anthropometric differences between the sexes become more pronounced; dimensions such as shoulder breadth in boys and hip breadth in girls increase and start to resemble adult proportions.

Body proportions are also changing throughout childhood. At birth, the ratios of head length and leg length to stature are greater than in older children or adults. Head length is around 25% of stature at birth but decreases to around 10% in adults.

3.2 Physical abilities

Motor abilities develop in the same sequence in all children but at different rates. Motor development starts with simple reflexes like grip, then postural movements such as moving the head, followed by locomotor skills such as sitting, crawling, standing and on to fine manipulative skills such as holding a pen. Motor control develops first in the head and works down the body to reach the feet last, and starts with the control of the middle of the body and works out to the extremities.

A general scheme of motor development in infants:

birth	grasp reflex .
1 month	holds head erect and steady for 15 seconds
2 months	sits with support
3 months	fingers oppose palm, thumb not used
5 months	sits alone momentarily
6 months	uses thumb in opposition
7 months	early stepping movements, poor pincer grip
9 months	walks with help
11 months	walks alone
14 months	walks up stairs with help

(Bayley Scales of Infant Development [14])

A general sequence of locomotor development:

↓
sit
crawl
creep
stand
walk
run
climb
balance
catch
throw

3 Designing for children of different ages

Again, there can be immense differences within age groups, and development in one variable does not necessarily mean equivalent development in all. For instance, a child with 95th percentile stature may have 5th percentile hand strength. Some differences in motor performance between the sexes can start in early childhood; girls are considered to perform better at tests of balance, hopping and flexibility while boys perform better at running and throwing. Male/female differences in strength and endurance become more measurable after adolescence. Performance in all such motor skills improves up to adolescence, when skills level off without further specific training.

3.3 Psychological abilities

The development of perceptual and cognitive abilities in children is particularly relevant to design, in terms of when and how children are able to understand and interact with their surroundings. However much of the information available concentrates on the first measurable emergence of perceptual abilities such as the ability to perceive depth or colour. The conditions of such experiments are often too specific and controlled to allow the results to be generalised for the purposes of design. For guidance on the general developmental milestones the reader is referred to development texts (see Section 8, Bibliography). However, the most important psychological design issues, such as whether a child will be able to understand written instructions, recognise and act upon a warning sign or work out how to operate a lock, are very dependent on factors such as motivation, previous exposure, peer support and curiosity rather than strict measures of reading skills, visual perception or reaction times. If designing for children involves such issues it may be necessary to carry out user evaluation and testing rather than relying on general developmental guidelines.

3.4 Stages of development related to safety

The following is a list of stages of child development with examples of how particular stages may relate to design, and particularly to design safety, adapted from the Child Accident Prevention Trust (with permission). The list is by no means intended to be exhaustive but highlights a selection of possible risks.

Age	Skills	Risks
3 months	wriggles, kicks	instability in baby bouncers
5 months	rolls over, reaches for objects, grasps, puts objects in mouth	rolling off surfaces, reaching for dangerous items, choking
8 months	crawls, sits alone	falling down steps or stairs, pulling hot items onto themselves
9 months	pincer grip, pulls to stand,	opening cupboards
10 months	walks holding furniture	climbing and falling
11 months	knows things when they are out of sight	looking for items placed out of sight, ingesting household products
13 months	walks unaided, crawls upstairs operates knobs & switches	opening windows, containers, falling from stairs
18 months	explores, imitates	playing with knives, operating controls on household products
2 years	screws beyond one turn, interested in smell/ taste/texture	operating locks & catches on safety gates, using lighters & matches
3 years	stops putting objects in mouth	operating child resistant containers, playground accidents
pre-school	climbs trees, operates bolts, competent on stairs	falling from bicycles & trees, operating electrical products

4 How to select data

4.1 Anthropometric data

4.1.1 Sources of anthropometric data

In order to provide some international comparison of anthropometric data, stature and weight data have been included from a number of countries. There may be differences between the sources in terms of sample sizes, sampling techniques, representativeness of the population, classification of age groups, measurement techniques or year of measurement. These should be noted when using the data to make international comparisons.

Country	Age range (years)	Source
UK	0-18 (weight from age 3 only)	Pheasant 1988
Ireland	newborn	Hayes 1983
Netherlands	0-12	Steenbekkers 1993
Spain	0-2	Ferrandez 1986
Belgium	12-18 (males only)	Ostyn 1980
Germany	3-17	DIN 1981
Norway	3-16	Waalder 1983
USA	newborn	Copper 1993
USA	0-19	Snyder 1977
Turkey	6-15	Dindar 1989
Saudi Arabia	newborn	Rasheed 1991
Saudi Arabia	6-16	Magbool 1993
India	6-12	Singh 1987
Japan	7-15	Ashizawa 1987
China	0-7	Zhang 1988
China	7-17	Yi-Ling 1982
New Zealand	0-9	Clymer 1988
Stature only:		
France	0-16	Joubert 1982
Hungary	6-14	Budavari 1982

(Note that stature in infants less than two years old is measured as crown to sole length.)

The remainder of the anthropometric measurements (over 140) are taken from a smaller selection of sources. These primary sources are listed and described below:

Country	Age range (years)	Source
UK	0-18	Pheasant 1986
UK	0-16	BSI 1990
Netherlands	0-12	Steenbekkers 1993
Netherlands	0-5.5	Steenbekkers 1989
Germany	3-17	DIN 1981
USA	0-19	Snyder 1977
USA	0-13	Snyder 1975
USA	2-10	Owings 1977
USA	0-4	Schneider 1986

Pheasant 1986 (UK)

The data were produced using a method of estimating anthropometric measurements from stature. Stature was measured in 1970/1971 [15] in a nationwide sample of 15,000 children representative of the UK school population aged three to eighteen years. The stature data were considered to be still valid in 1985 when the data were re-published [16]. The anthropometric measurements were calculated using body part/stature ratios from North American sources [17,18]. All data are calculated to the nearest 5mm. The majority of UK anthropometric data in the Handbook are taken from this source.

BSI 1990 (UK)

While this is the most recent large scale anthropometric survey of children in Britain, the data were collected for the clothing industry and many of the measurements have limited application to design, for instance bent arm length. Some of the measurements have been used in order to supplement the data from Pheasant, and these are mainly circumferential measurements. Data on 2000 infants (0-5 years) were collected in 1987; 4770 girls (5-16) were measured in 1986 and 3428 boys (5-16) were measured in 1978. The subjects were nationally representative (excluding Northern Ireland), from mainly urban areas and socio-economic factors were disregarded. Most importantly, the results represent Caucasian subjects only.

4 How to select data

Steenbekkers 1993 (The Netherlands)

This is the primary source of Dutch data. A sample of 2245 children aged 2 to 12 years were measured between February 1990 and February 1991. These are the most recent anthropometric data on European children available. The sample was geographically representative of the Netherlands and included children born both in the Netherlands and abroad and those born to non-Dutch parents; the sample was not considered sufficiently representative of socio-economic factors. A sample of 87 infants aged 0 to 14 months were also measured in one geographical area of the Netherlands a few years earlier. Monthly age groups in infants were classified as thirty days.

Steenbekkers 1989 (The Netherlands)

A few measurements are taken from this study that were not recorded in the subsequent 1993 study by Steenbekkers. A sample of 633 children aged 0 to 5.5 years were measured in one region of the Netherlands between 1987 and 1989.

DIN 1980 (Germany)

Deutsches Institut für Normung (DIN) is the German Standards organisation and the data are taken from the German Standard for body measurements of children. The data were collected between 1968 and 1977. It should be noted that at that time the data are stated as representative of 'the regional and social variation' of children from the Federal Republic of Germany.

Snyder 1977 (USA)

This is the most comprehensive collection of design-related child anthropometric data available. The data were collected between 1975 and 1977 on a sample of 4127 children aged between birth and 19 years and were nationally representative of ethnic, demographic and socio-economic variables.

Snyder 1975 (USA)

This is a prior report from the same US authors providing some additional measurements, recorded on a sample of 4027 children aged between birth and 13 years, again nationally representative and measured between 1972 and 1975. Monthly age groups in infants were rounded to the nearest month.

Owings 1977, Schneider 1986 (USA)

Owings provides dimensions on the hands of children aged 2 to 10 years (sample 350) collected as part of the Snyder survey. Some facial measurements are taken from Schneider, a nationally representative study of 300 children aged from birth to four years measured in the early to mid 1980's.

4.1.2 Validity of anthropometric data

The validity of the large data sources (Pheasant, BSI, Steenbekkers 1993, DIN 1980 and Snyder 1977) have been assessed for the purposes of the CHILDATA Handbook. This involves their validity as sources of nationally representative data (given any secular trend) and also for use with a target population of UK children, given that UK or even European data are not available for all of the measurements.

Stature and weight from each source were compared to the most recent UK data [19] in order to assess UK secular trend and international differences. The results are presented in terms of an adjustment figure for each source, where this has been considered necessary. The method of comparison and the current UK stature and weight data are described in Appendix 2.

Table 3 indicates the discrepancies in stature and weight between the sources and current UK data. The figures are the percentage adjustments required for each source (ie increase or decrease source data by the figure shown).

Country	Source	Age (years)	% difference from current UK data:			
			Stature male	female	Weight male	female
Britain	Pheasant 1986	2-18	-1.40%	-1.27	0.99	-0.31
	BSI 1990	5-16	-0.97	-0.37	-1.14	-2.49
USA	Snyder 1977	4-19	-0.31	-0.31	4.42	1.02
Germany	DIN 1980	3-17	1.44	1.79	n/a	n/a
NL	Steenbekkers 1993	2-12	3.17	3.16	8.07	7.1

-ve value indicates source data are lower than current UK data

+ve value indicates source data are greater than current UK data

Table 3: Comparison of mean percentage stature and weight data between major CHILDATA sources and current UK data (Freeman et al, 1995)

4 How to select data

Pheasant 1986 (UK)

Table 3 indicates that, according to Pheasant, UK children are approximately 1% to 1.5% shorter than current estimates for the same age group; males are around 1% heavier while females are around 0.3% lighter. Using differences in stature only and assuming that differences in stature are reflected proportionately throughout the body (see discussion in Appendix 2), this suggests that all data from Pheasant should be increased by the appropriate adjustment figure. Increasing male data by 1.5% would mean an increase of between 0.8mm and 1.3mm for hand breadth (50th percentile 2 and 18 year old boys respectively) and between 11mm and 21.7mm for shoulder height (same subjects). The decision as to whether these adjustments are warranted in any particular situation must be left to the user. The absolute adjustments might be considered negligible for small body dimensions such as hand measurements, given the confidence limits within which all anthropometric data are reported; for example, stature data is often only measured to within the nearest 5mm [12,22] and all of Pheasant's data are rounded to the nearest 5mm. For larger body dimensions such as shoulder height, the adjustment is still small compared to the amount of variation that is found within each age group (shoulder height varies by 180mm between 5th and 95th percentile 18 year old boys). The adjustment figures are provided to give some indication of possible changes in the population; adjustment factors based on stature are provided for use at the designer's discretion but should be considered in any design situation where there is concern over safety.

BSI (UK)

BSI data also indicate shorter stature than current estimates although the differences between BSI and current data are less than for Pheasant, which is to be expected since BSI data are more recent. Male stature from BSI (collected in 1978) is approximately 1% lower than current stature, and female stature (collected in 1986) is around 0.4% less; there is however a difference of 2.5% in female weight data. Possible adjustment of data should again be considered where there is any concern over design safety.

USA data

Data from Snyder (1977) were collected during the 1970's and it has been suggested that data collected then are still valid for US children (this was recently demonstrated for school age children in one area of the USA [12]). The difference between stature data from Snyder and the current UK estimates is very small, with Snyder's data around 0.3% lower than current UK childhood stature. It would therefore appear that Snyder's data from the United States, including that from

other sources (such as Owings and Schneider) are the most appropriate of the non-UK sources in the Handbook for use with a UK population. Possible adjustment of data should again be considered where there is any concern over design safety, especially given the greater differences in weight between US and UK data, particularly for males.

German data

The DIN standard has not been updated since the late 1970's. Also, data were collected on children in the Federal Republic only which means the appropriateness of these data for the current German childhood population should be assessed given the political changes in the country. German stature data are approximately 1.5% higher than current UK childhood stature and possible adjustment of data should again be considered where there is any concern over design safety.

Dutch data

Data from Steenbekkers are the most recent data available for Dutch children and as such are the most valid source available for that population. They are also the most recent source of data on any European childhood population. Dutch children are taller and heavier than current UK children, stature is approximately 3% greater than current UK childhood stature and there is approximately 8% difference in weight. This difference should be considered if using data from Steenbekkers for a UK target population and possible adjustment of data should again be considered where there is any concern over design safety.

If there are no UK data available for a particular measurement it is recommended that the most appropriate data to use, based on a comparison of stature only are, in descending order:

- 1 USA (Snyder, Schneider and Owings)
- 2 Germany (DIN)
- 3 Netherlands (Steenbekkers)

It should be remembered that the assessment of validity has been based on differences in stature and weight only and these differences may not be reflected proportionately in other anthropometric measurements. No assessment has been made of data on infants (see table 3 and Appendix 2).

Guidance regarding the application of all anthropometric data to design is given in section 3.

4 How to select data

4.2 Non-anthropometric data

A number of sources of data are sometimes presented for measurements other than anthropometry, eg for strength. This is often because the sources give data on different age groups, the data are from different countries or because they use different methods to collect data. For instance, grip strength may be measured with either one or two hands and this will obviously affect the results.

If more than one source is presented for any measurement, the details of how the data were collected should be used to decide which is most appropriate for the design application. The background information provided for each source such as the year of publication, the country of origin and the sample size and details should also be used to assess the validity of the data.

5 How to find the data you need

The datatables are organised into five sections, each section containing data on different types of measurements:

- 1 Static anthropometry
- 2 Functional anthropometry
- 3 Physical abilities
- 4 Psychological abilities
- 5 Cognitive abilities

Figure 3 shows how the data are organised and this is followed by a full list and classification of measurements. This is a hierarchical classification of measurements according to measurement type (eg static anthropometry, strength) and body part (eg head, torso). The classification is followed by a full set of anatomical diagrams showing all of the anthropometric measurements contained in the Handbook. The datatables for each measurement are then presented in numerical order.

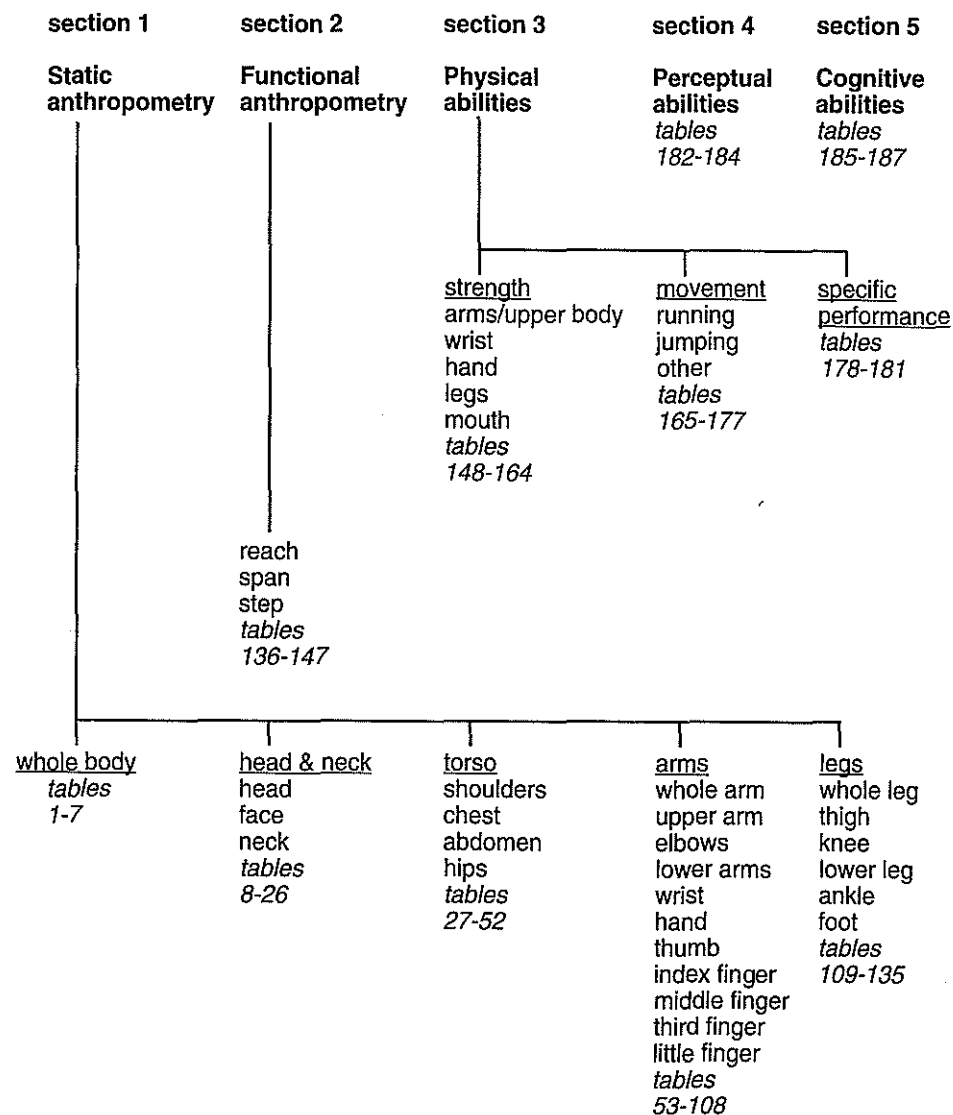


Figure 3: Classification of measurements

5.1 Classification

Section 1 Static Anthropometry

1.1 Whole body

- 1 Weight
- 2 Stature
- 3 Body length, crown to sole (supine)
- 4 Sitting height
- 5 Sitting height, crown to rump (supine)
- 6 Centre of gravity (standing)
- 7 Centre of gravity (seated)

1.2 Head and neck

Head

- 8 Head breadth
- 9 Head length
- 10 Head circumference
- 11 Head height
- 12 Maximum head diameter (chin to back of head)
- 13 Ear to ear (bitragion) breadth

Face

- 14 Face breadth(bizygomatic or cheekbones)
- 15 Face breadth (brow ridges)
- 16 Jaw breadth
- 17 Face height
- 18 Face height (bridge of nose - chin)
- 19 Eye height (from floor)
- 20 Eye height (seated)
- 21 Eye separation (interpupillar distance)
- 22 Mouth breadth
- 23 Mouth opening (between incisors)

- 24 Nose length

Neck

- 25 Neck breadth
- 26 Neck circumference

1.3 Torso

Shoulders

- 27 Shoulder height (from floor)
- 28 Shoulder height (supine)
- 29 Shoulder height (seated)
- 30 Shoulder breadth (bideltoid)
- 31 Shoulder breadth (biacromial)

Chest

- 32 Chest height at armpit
- 33 Chest breadth at armpit
- 34 Chest breadth at nipples
- 35 Chest depth
- 36 Chest circumference at armpit
- 37 Chest circumference at nipples

Abdomen

- 38 Waist height at navel
- 39 Waist breadth (in infants)
- 40 Waist breadth at navel
- 41 Abdominal depth
- 42 Waist circumference (maximum in infants)
- 43 Waist circumference (natural)
- 44 Waist circumference at navel

Hips

- 45 Hip height at trochanter
- 46 Hip breadth (maximum in infants)
- 47 Hip breadth at trochanter

- 48 Hip breadth (maximum when seated)
- 49 Hip depth
- 50 Hip circumference
- 51 Buttock height at maximum depth
- 52 Buttock height at gluteal furrow

1.4 Arms

- 53 Arm length to fingertip
- 54 Arm length to grip

Upper arms

- 55 Upper arm length (shoulder to elbow)
- 56 Upper arm depth
- 57 Upper arm circumference
- 58 Upper arm circumference at armpit

Elbows

- 59 Elbow height (from floor)
- 60 Elbow height (supine)
- 61 Elbow height (seated)
- 62 Elbow breadth

Lower arms

- 63 Lower arm length (elbow to fingertip)
- 64 Lower arm length (elbow to grip)
- 65 Lower arm breadth
- 66 Lower arm circumference

Wrist

- 67 Wrist breadth
- 68 Wrist depth
- 69 Wrist circumference

Hand

- 70 Knuckle height (from floor)
- 71 Hand length (to wrist)
- 72 Hand length (to thumb crotch)
- 73 Palm length
- 74 Hand breadth at palm
- 75 Hand breadth at thumb
- 76 Hand depth
- 77 Hand circumference at palm
- 78 Hand clearance (minimum aperture)
- 79 Maximum grip diameter (between thumb and index finger)
- 80 Maximum grip diameter (between thumb and middle finger)
- 81 Grip length (middle finger to thumb)
- 82 Fist breadth
- 83 Fist depth
- 84 Fist circumference
- Thumb
- 85 Thumb length
- 86 Thumb breadth at distal joint
- 87 Thumb diameter (minimum aperture)
- Index finger
- 88 Index finger length
- 89 Index finger breadth at distal joint
- 90 Index finger breadth at middle joint
- 91 Index finger diameter (minimum aperture)

5.1 Classification

101

Middle finger

- 92 Middle fingertip height
(from floor)
- 93 Middle finger length
- 94 Middle finger length
(distal joint to tip)
- 95 Middle finger length
(middle joint to distal joint)
- 96 Middle finger length
(knuckle to middle joint, hand
clenched)
- 97 Middle finger breadth
at distal joint
- 98 Middle finger breadth
at middle joint
- 99 Middle finger depth at distal joint
- 100 Middle finger depth
at middle joint
- 101 Middle finger diameter
(minimum aperture)

Third finger

- 102 Third finger length
- 103 Third finger breadth at distal joint
- 104 Third finger breadth
at middle joint

Little finger

- 105 Little finger length
- 106 Little finger breadth
(at distal joint)
- 107 Little finger breadth
(at middle joint)
- 108 Little finger diameter
(minimum aperture)

1.5. Legs

- 109 Leg length, buttock to sole
(seated)
- 110 Leg length, buttock to sole
(supine)

Thigh

- 111 Upper leg length, buttock to knee
(seated)
- 112 Upper leg length, buttock to
popliteal (seated)
- 113 Upper leg length, buttock to
popliteal (supine)
- 114 Thigh breadth
(maximum when seated)
- 115 Thigh depth
(clearance when seated)
- 116 Upper thigh depth
- 117 Mid thigh depth
(supine in infants)
- 118 Upper thigh circumference
- 119 Mid thigh circumference
(supine in infants)

Knee

- 120 Knee height (seated)
- 121 Popliteal height (seated)
- 122 Knee breadth (seated)
- 123 Knee circumference

Lower leg

- 124 Lower leg length, knee to sole
(supine)
- 125 Lower leg length, popliteal to
sole (supine)
- 126 Calf height
(at maximum circumference)
- 127 Calf depth
- 128 Calf circumference

Ankle

- 129 Ankle height
- 130 Ankle breadth
- 131 Ankle circumference

Foot

- 132 Foot height
- 133 Foot length
- 134 Foot breadth
- 135 Heel breadth

Section 2 Functional Anthropometry

2.1 Reach

- 136 Overhead reach to grip
(standing)
- 137 Overhead reach to grip (seated)
- 138 Overhead reach to fingertip
(on tiptoes)
- 139 Overhead reach to fingertip
(jumping)
- 140 Forward reach to grip (standing)
- 141 Forward reach to grip (seated)
- 142 Forward reach to grip
(stretching and seated)
- 143 Forward reach to fingertip
(stretching and seated, legs
outstretched)
- 144 Sideways reach to grip
(standing)

2.2 Span

- 145 Span
- 146 Elbow span

2.3 Legs

- 147 Step height

5.1 Classification

Section 3 Physical Abilities

3.1 Strength

Arms/upper body

- 148 Pushing forwards
- 149 Pushing downwards
- 110 Pushing sideways
- 151 Pulling
- 152 Lifting
- 153 Hanging by the arms
- 154 Hitting force

Wrist

- 155 Twisting
- 156 Opening

Hand

- 157 Grip/squeeze
- 158 Pinch (pads of fingers)
- 159 Pinch (tips of fingers)
- 160 Pinch (lateral)
- 161 Shear

Legs

- 162 Pushing forwards

Mouth

- 163 Bite
- 164 Lips

3.2 Movement

Running

- 165 Endurance
- 166 Distance
- 167 Speed

Jumping

- 168 Forwards
- 169 Sideways
- 170 Upwards
- 171 Over a barrier

Other

- 172 Swimming
- 173 Walking across a ladder
- 174 Walking sideways
- 175 Hopping
- 176 Static balance
- 177 Dynamic balance

3.3 Specific performance

- 178 Height at which windows can be opened
- 179 Climbing fences
- 180 Throwing
- 181 Volume of a swallow

Section 4 Perceptual abilities

- 182 Reaction times to visual stimuli
- 183 Reaction times to auditory stimuli
- 184 Reaction times to visual and auditory stimuli

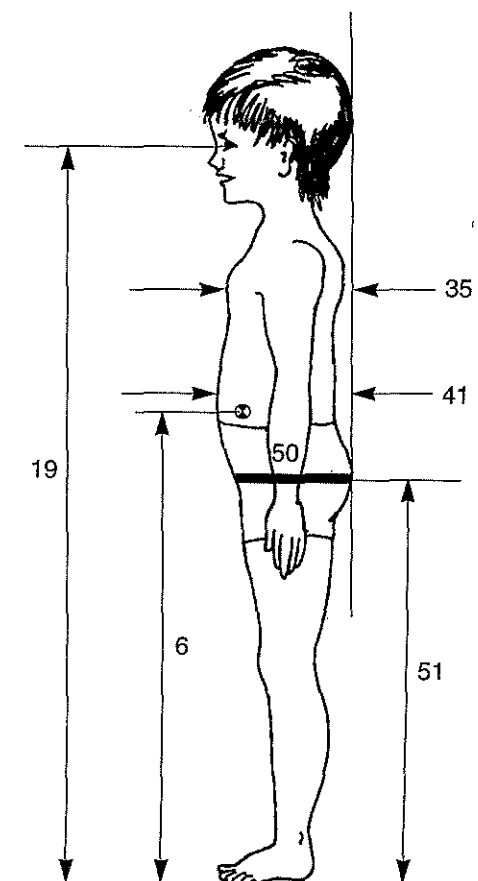
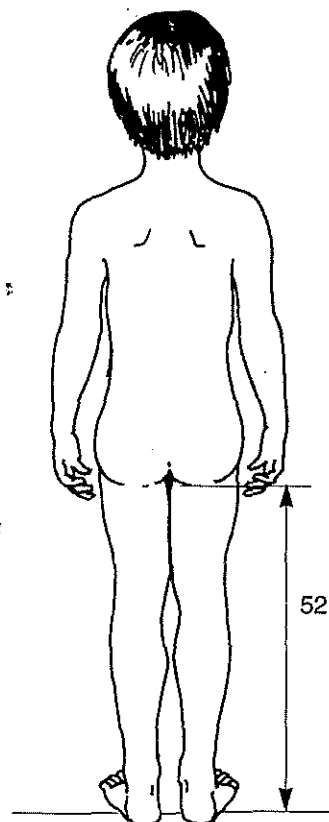
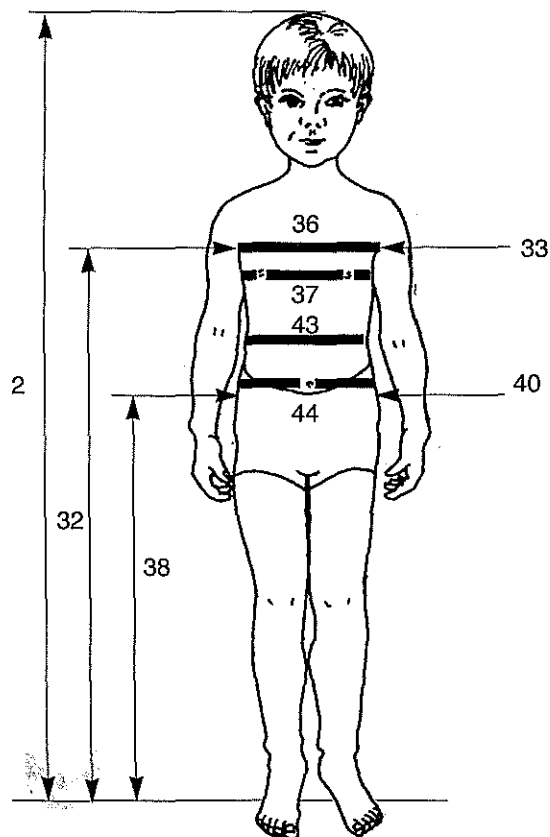
Section 5 Cognitive abilities

- 185 Understanding colour
- 186 Understanding safety symbols
- 187 Attention span

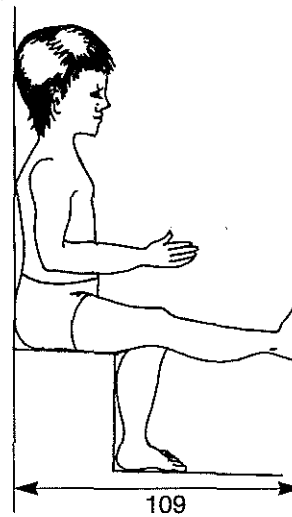
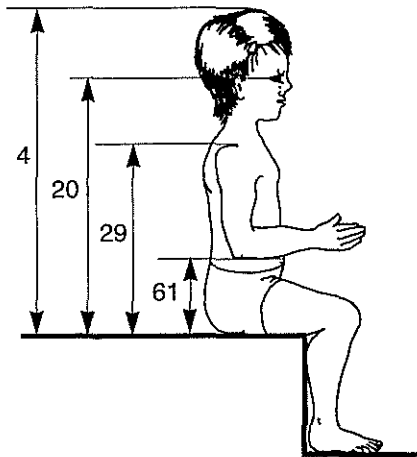
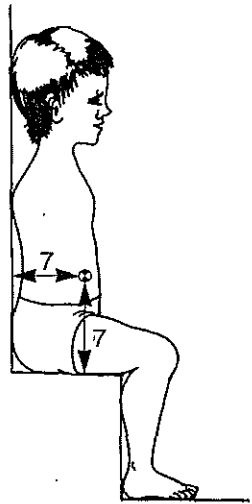
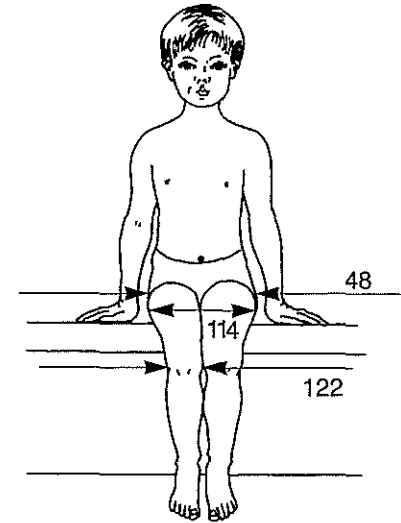
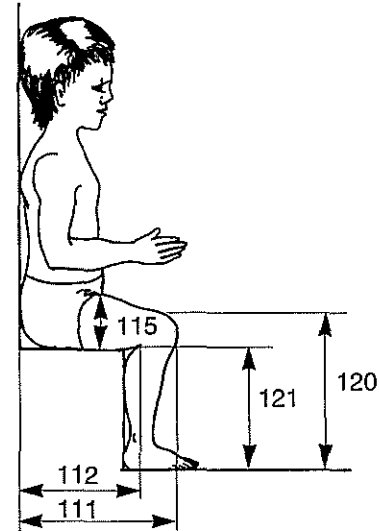
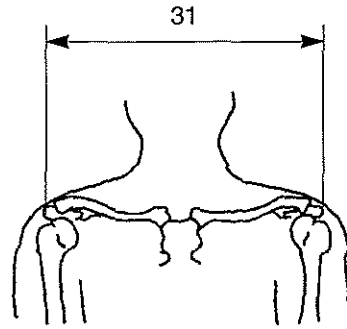
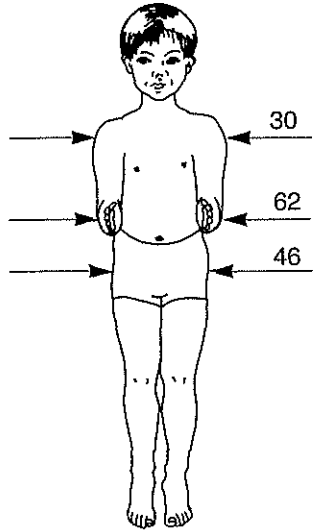
5.2 Anthropometric measurements

The following diagrams are a guide to the anthropometric measurements contained in the databank. All of the measurements are shown here except weight and some functional anthropometric measurements (overhead reach on tiptoes, while jumping and forward reach while seated with legs outstretched). The infant drawings show the measurements taken on children under two years old only. However these are not the complete set of infant measurements as some of the other measurements are collected on all children from birth.

⊗ centre of gravity symbol

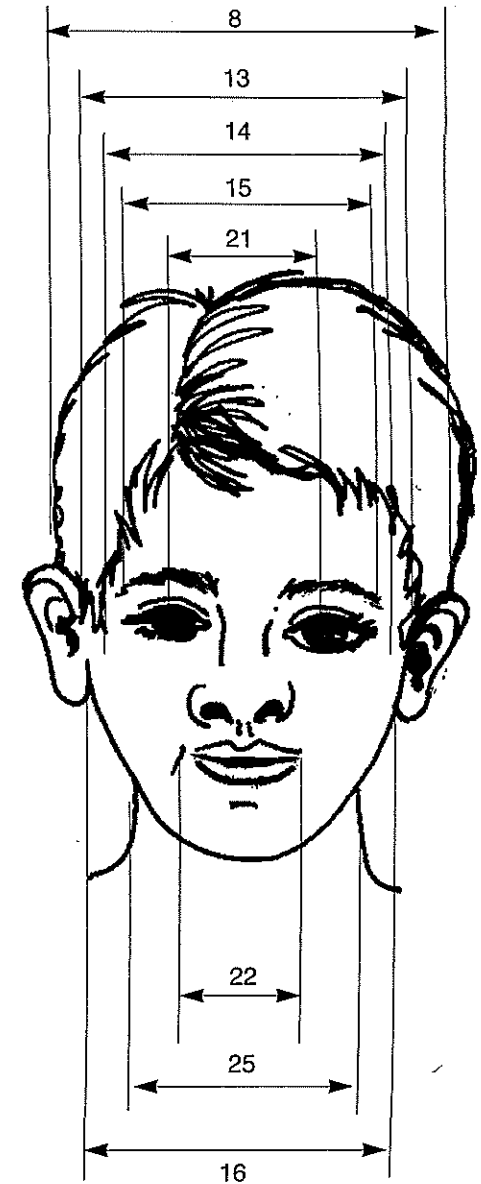
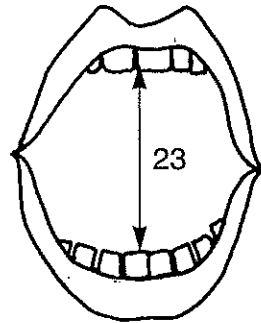
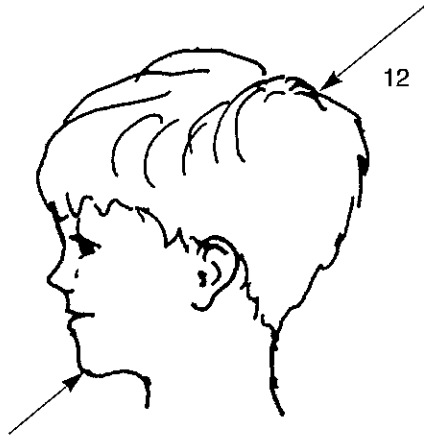
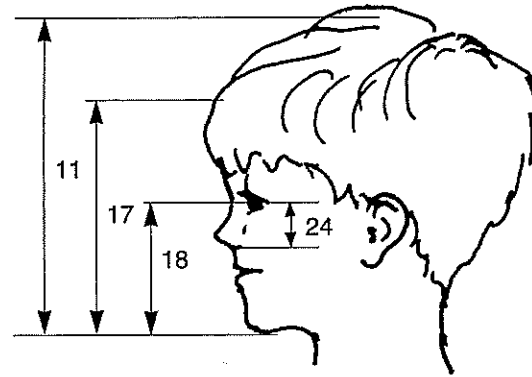
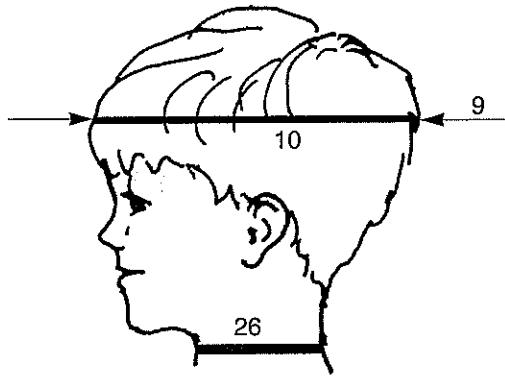


5.2 Anthropometric measurements

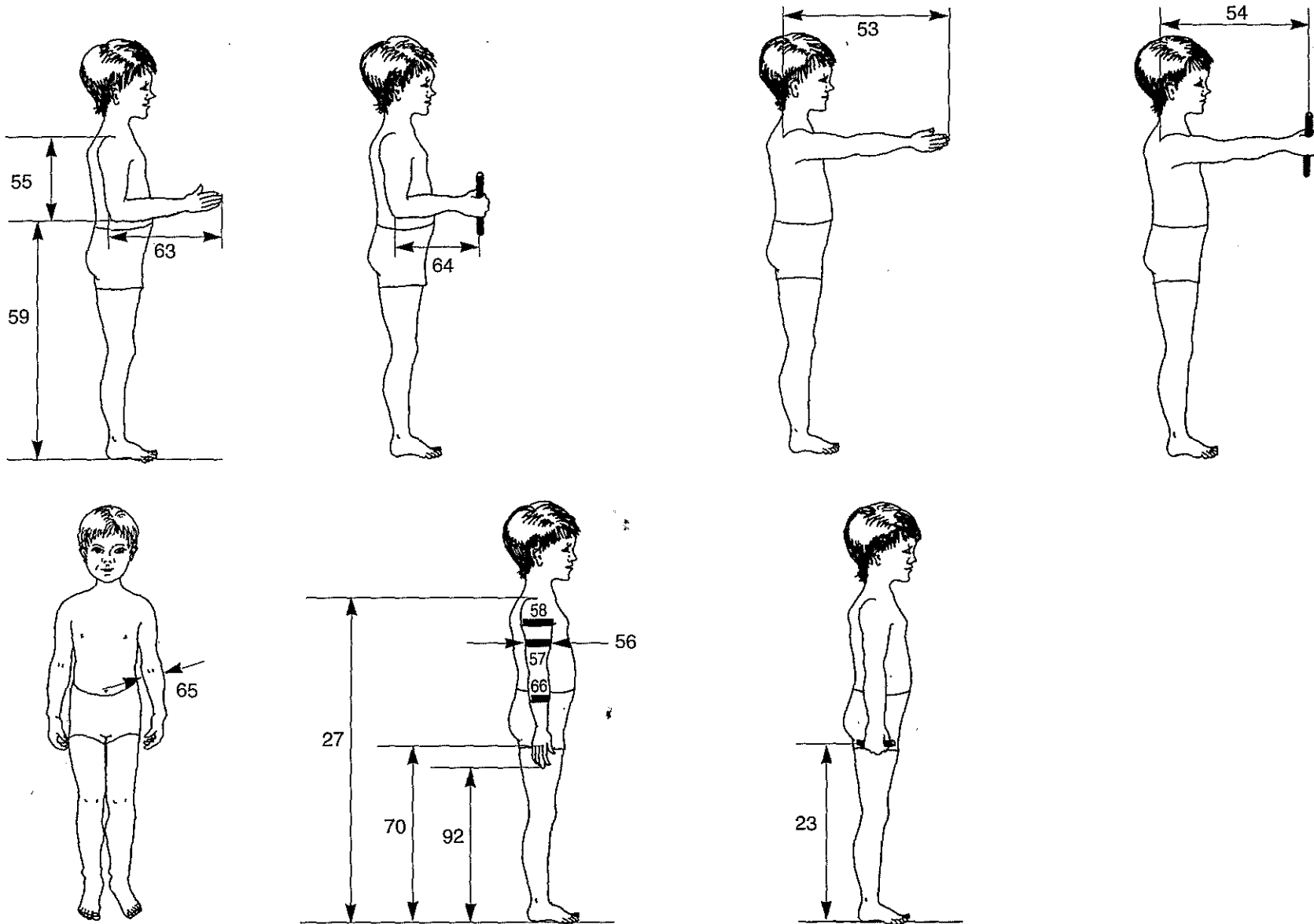


Torso and seated

5.2 Anthropometric measurements

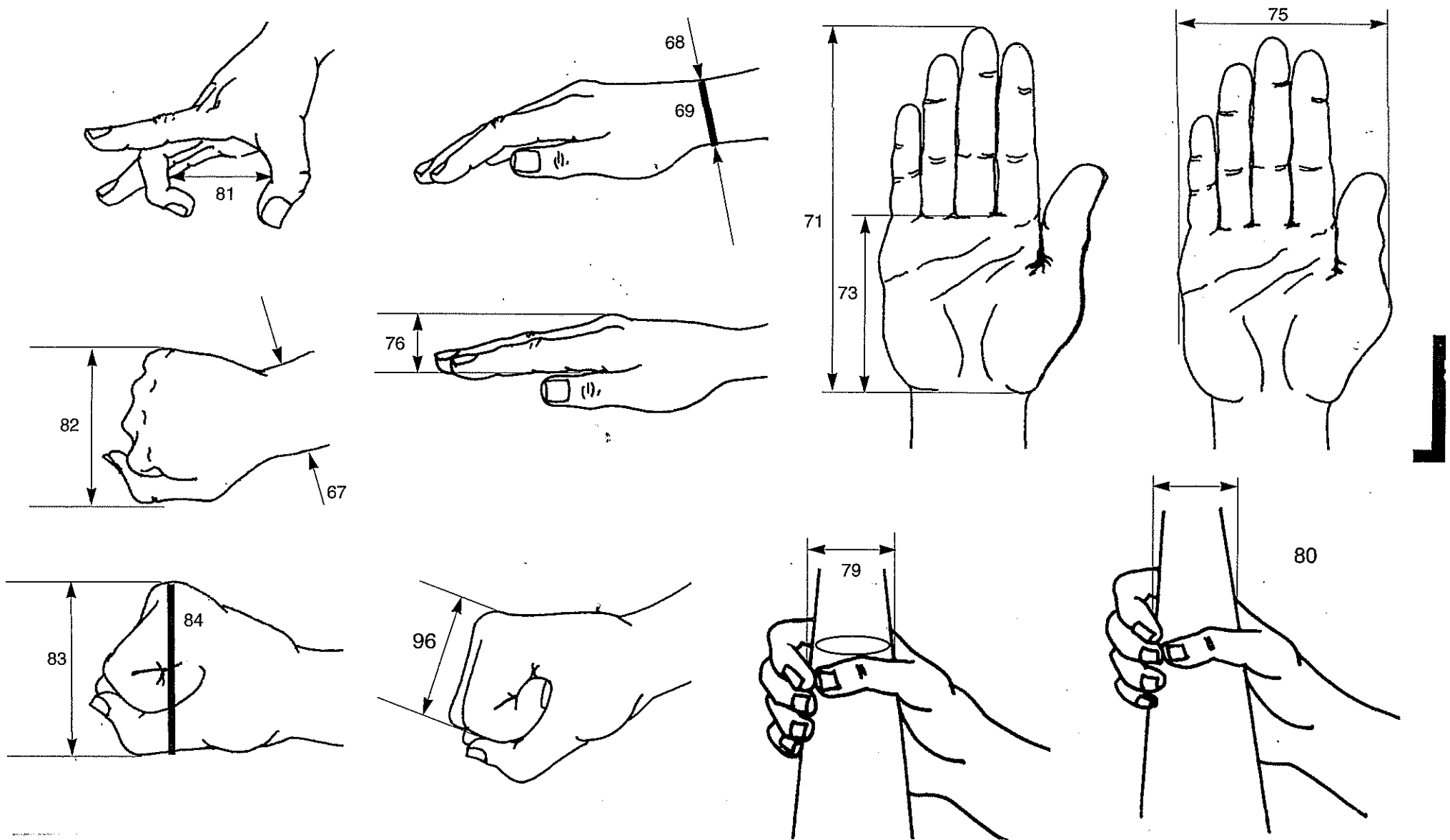


5.2 Anthropometric measurements

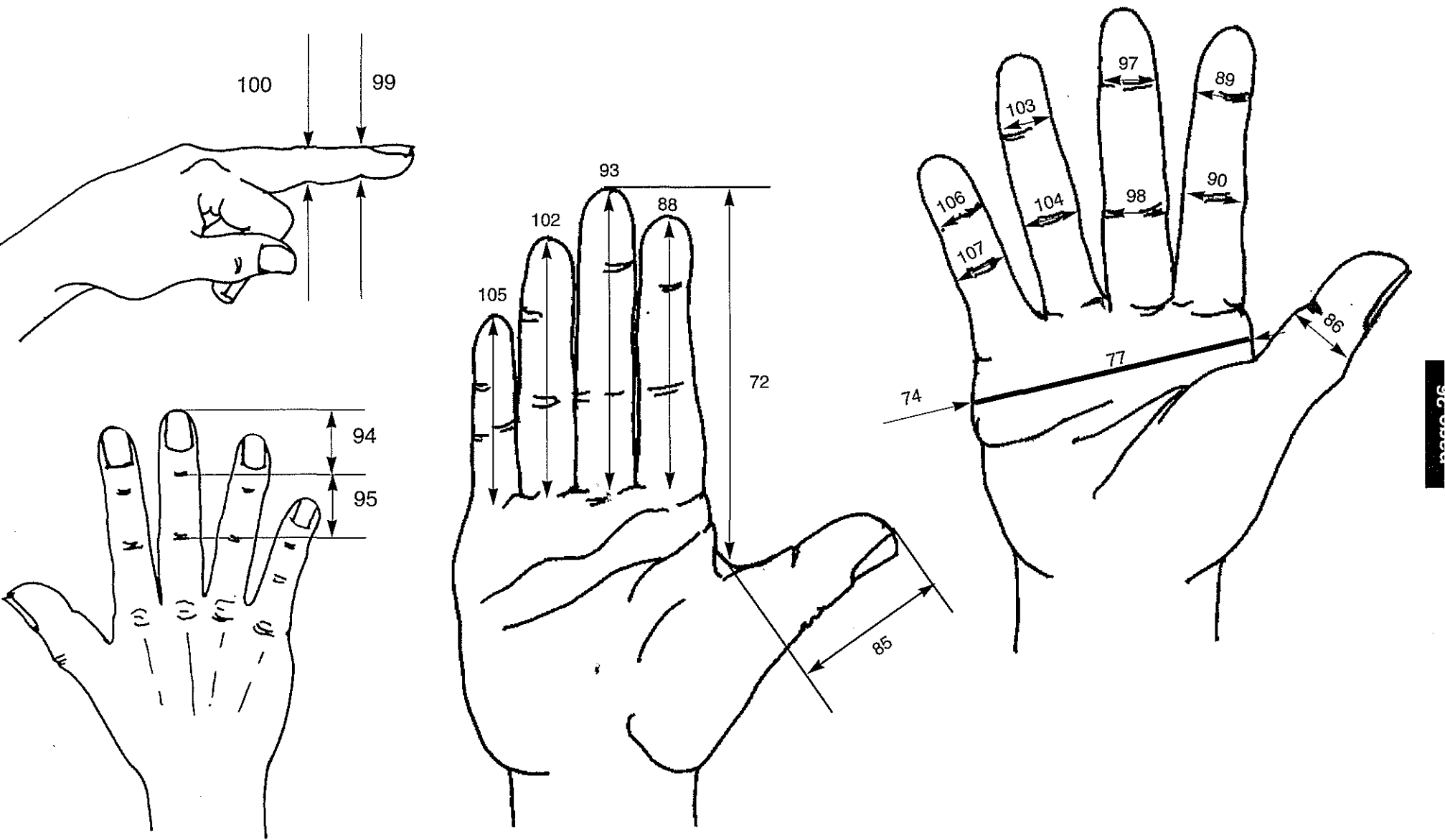


Arm

5.2 Anthropometric measurements

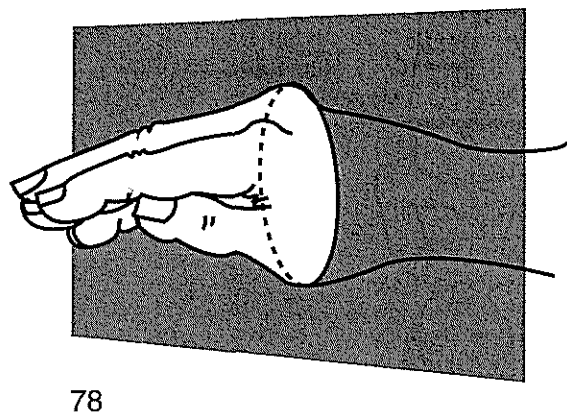
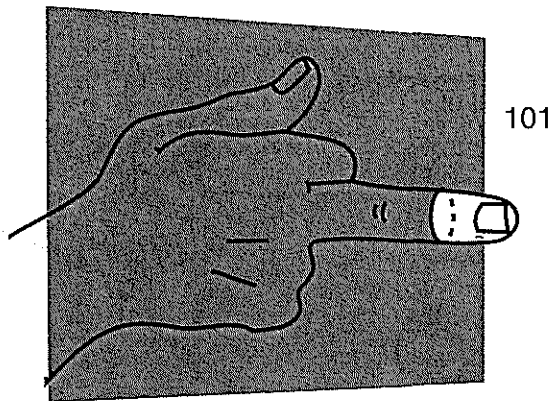
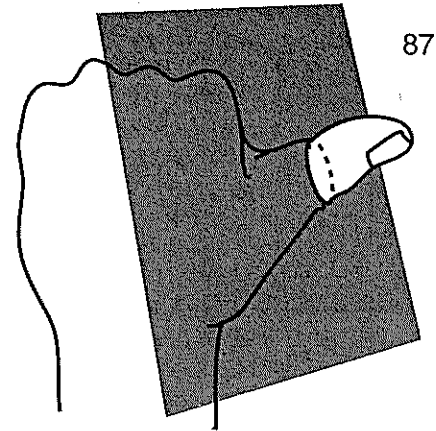
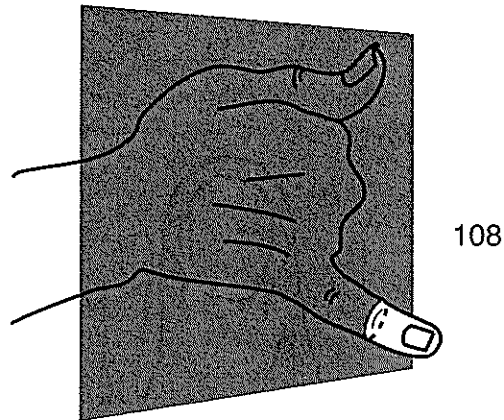
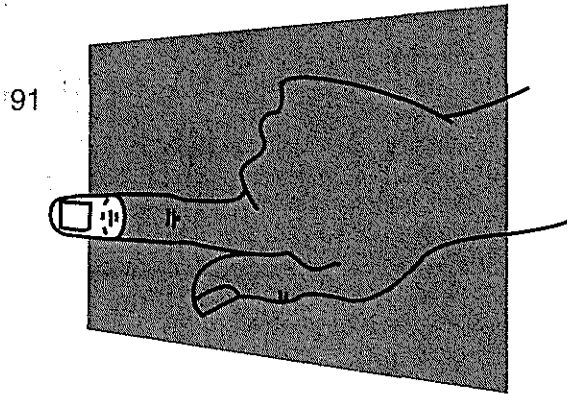


5.2 Anthropometric measurements



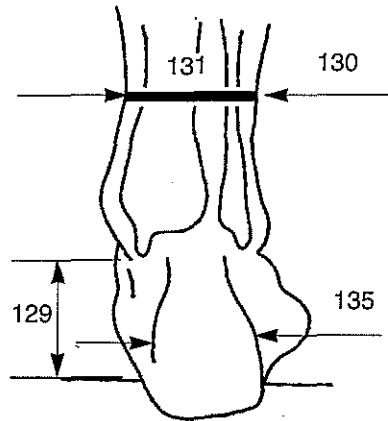
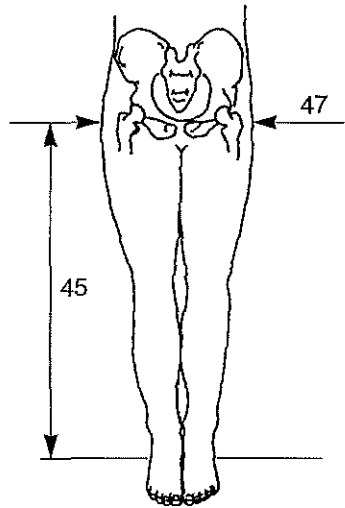
Hand

5.2 Anthropometric measurements



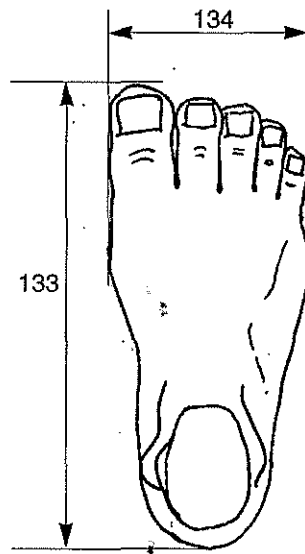
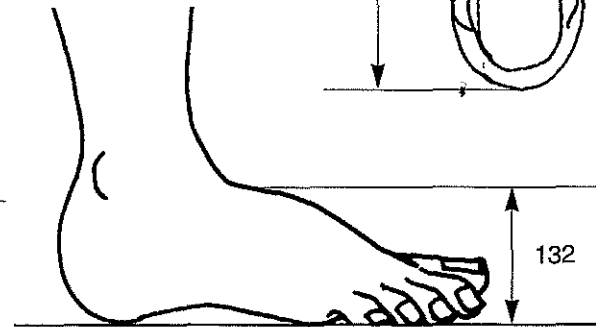
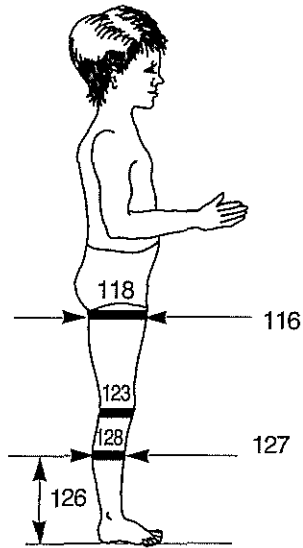
5.2 Anthropometric measurements

Leg

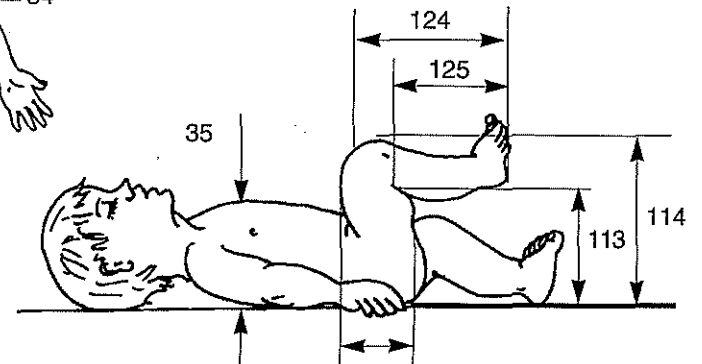
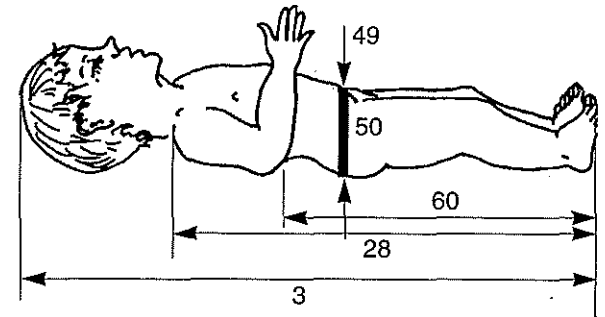
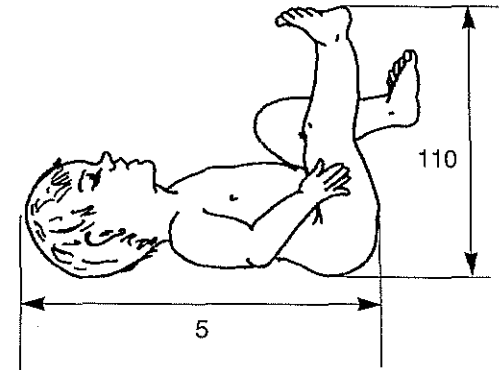
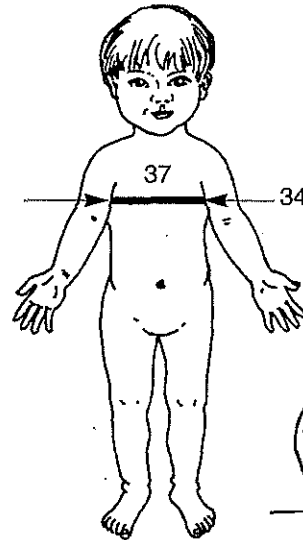
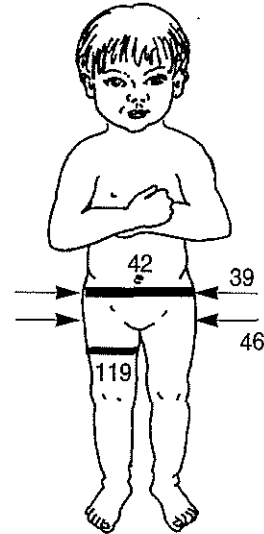


Foot

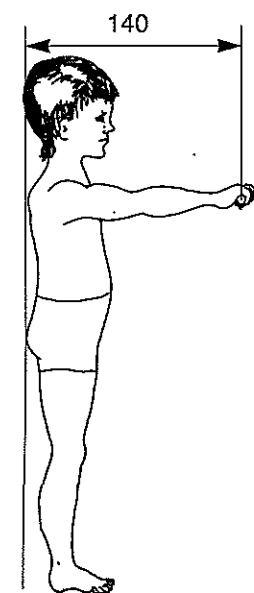
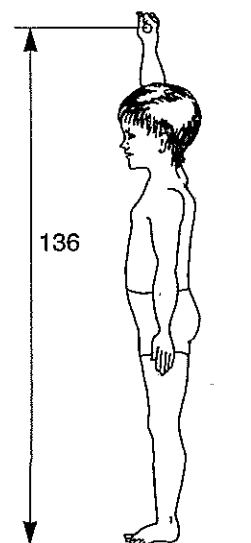
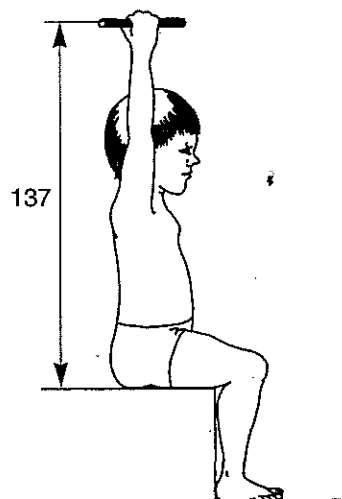
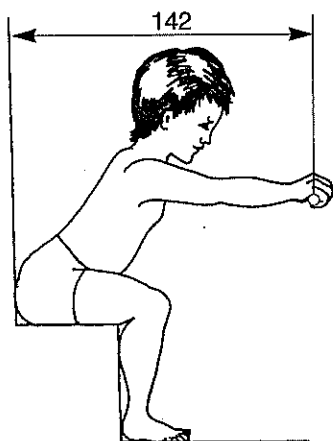
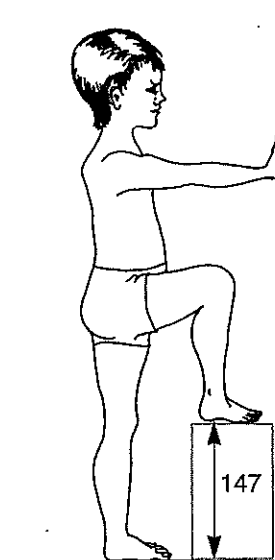
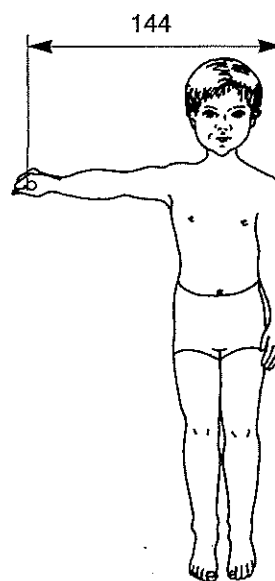
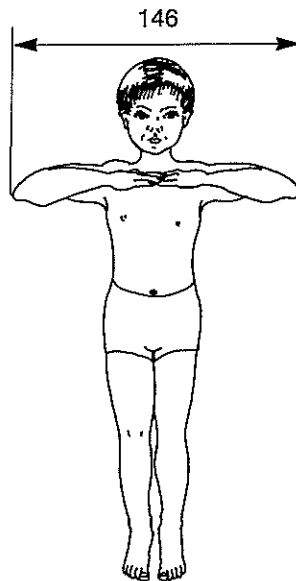
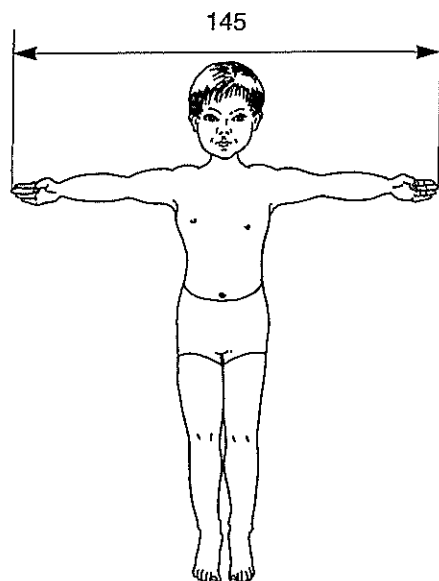
Leg



Infants



5.2 Anthropometric measurements



6 Data sections

DEFINITION

Total body mass (kilogrammes) is measured in children wearing underwear and standing on a scales. Infants (0-2) are measured lying on a clinical scales.

APPLICATION AND SUMMARY OF THE DATA

A number of sources have been included to allow comparison of body weight between different countries, but the date of the survey, size and composition of the sample, age groups and possible differences in measurement techniques should be noted before making direct comparisons. Of the sources, Pheasant (1986) is probably more appropriate for the current UK population. See sections 2 and 4 of the introduction to the Databank for guidance on how to apply data and choose between different sources. Body weight is measured with subjects unshod and in underwear.

SEE ALSO

Centre of gravity (standing), centre of gravity (seated)

NUMBER OF SOURCES: 16

source	reference	country	age
1	Pheasant 1988	UK	3-18
2	Hayes 1983	Ir	newborn
3	Steenbekkers 1993	NL	0-12
4	Copper 1993	US	newborn
5	Snyder 1977	US	0-19
6	Ostyn 1980	Bel	12-18 males only
7	Ferrandez	Sp	0-2
8	Waler 1993	No	3-16
9	Dindar 1989	Tur	6-15
10	Rasheed 1991	SA	newborn
11	Magbool 1993	SA	6-16
12	Singh 1987	In	6-12
13	Ashizawa 1987	Ja	7-15
14	Zhang 1988	Chi	0-7
15	Yi-Ling 1982	Chi	7-17
16	Clymer 1988	NZ	0-9

Section 1.1

Static Anthropometry: Whole body

Weight 1

source 1 of 16

Pheasant 1988

Country United Kingdom
Ages 3-18

age	sex	n	mean (kg)	sd	5th%ile	95th%ile
3	m		16.50	2.00	13.50	19.50
4	m		18.00	2.10	14.50	21.50
5	m		20.00	2.80	15.50	24.50
6	m		22.00	3.60	16.00	28.00
7	m		24.50	3.40	18.50	30.00
8	m		27.00	4.30	20.00	34.00
9	m		30.00	4.60	22.00	37.50
10	m		33.50	5.90	23.50	43.00
11	m		36.50	6.90	25.50	48.00
12	m		40.50	7.90	27.50	54.00
13	m		45.50	9.30	30.50	61.00
14	m		52.00	10.30	35.00	69.00
15	m		57.00	10.00	40.50	73.50
16	m		61.50	9.30	46.50	77.00
17	m		65.50	8.90	51.00	80.50
18	m		67.00	8.20	53.50	80.50
3	f		15.50	1.90	12.50	19.00
4	f		17.50	2.40	13.50	21.50
5	f		19.50	2.80	15.00	24.00
6	f		21.50	3.20	16.50	27.00
7	f		24.00	3.90	17.50	30.50
8	f		27.00	4.70	19.50	35.00
9	f		30.00	5.80	20.50	39.50
10	f		43.00	6.90	22.50	45.50
11	f		38.00	8.30	24.50	51.50
12	f		42.00	8.30	28.50	56.00
13	f		47.50	9.20	32.50	62.50
14	f		52.00	8.50	38.00	65.50
15	f		54.50	8.60	40.50	68.60
16	f		55.50	7.50	43.00	67.50
17	f		56.00	7.80	43.50	69.00
18	f		56.50	7.00	45.00	68.00

source 2 of 16

Hayes 1983

Country Ireland
Ages Newborn
Sample 8050

Gestational age. Data collected in 1979.

age	sex	n	mean (kg)	sd	5th%ile	95th%ile
37wks	m		3.123		2.373	3.997
38	m		3.331		2.611	4.176
39	m		3.510		2.807	4.342
40	m		3.619		2.921	4.443
41	m		3.715		3.012	4.559
42	m		3.816		3.079	4.682
37	f		2.999		2.306	3.884
38	f		3.229		2.550	4.047
39	f		3.386		2.699	4.153
40	f		3.485		2.775	4.225
41	f		3.565		2.838	4.317
42	f		3.614		2.880	4.386

Section 1.1

Static Anthropometry: Whole body

Weight 1

source 3 of 16

Steenbekkers 1993

Country Netherlands
Ages 0-12

age	sex	n	mean (kg)	sd	3rd%ile	97th%ile
0-2mo	m	16	5.6	1.0	3.4	7.7
3-5mo	m	21	7.3	1.3	5.3	9.7
6-8mo	m	22	8.6	0.8	7.3	10.0
9-11mo	m	13	9.5	0.8	8.2	10.9
12-14mo	m	15	10.7	1.1	9.2	12.5
2	m	81	14.5	1.9	11.3	19.0
3	m	97	17.0	2.0	13.8	21.0
4	m	85	18.6	2.0	15.5	21.8
5	m	86	21.6	2.8	17.3	28.0
6	m	98	23.5	2.5	19.4	29.3
7	m	106	26.4	3.6	20.9	33.7
8	m	96	28.9	4.1	22.3	38.0
9	m	122	32.9	4.9	26.3	44.6
10	m	134	36.4	6.1	27.3	51.7
11	m	143	40.0	7.1	29.7	56.5
12	m	78	42.5	7.4	31.0	57.1

0-2mo	f	9	5.0	0.8	3.7	5.9
3-5mo	f	20	6.1	0.6	5.0	7.1
6-8mo	f	14	8.1	0.8	6.9	9.2
9-11mo	f	16	9.1	1.2	7.3	11.4
12-14mo	f	23	9.6	1.2	7.1	11.5
2	f	92	14.1	1.6	11.7	17.6
3	f	86	16.0	1.8	12.9	19.6
4	f	79	18.4	2.1	15.0	22.7
5	f	94	21.0	3.0	16.6	28.0
6	f	92	23.6	2.6	19.4	29.6
7	f	93	26.9	4.3	19.0	36.2
8	f	95	29.2	4.1	21.2	39.2
9	f	122	32.1	5.2	23.1	43.6
10	f	136	38.6	7.0	30.2	56.4
11	f	151	40.6	7.1	29.6	55.0
12	f	79	44.4	8.6	33.0	62.0

source 4 of 16

Copper 1993

Country USA
Ages Fullterm newborn
Sample 1200

Data collected from 1985 to 1988. 69% of mothers were black.

age	sex	n	mean (kg)	sd	5th%ile	95th%ile
0	m		3.239			
0	f		3.080			

Section 1.1 Static Anthropometry: Whole body

Weight 1

source 5 of 16

Snyder 1977

Country United States
Ages 0-19

age	sex	n	mean (kg)	sd	5th%ile	95th%ile
0-2mo	mf	30.00	5.10	1.10	3.20	6.90
3-5mo		29.00	6.90	1.00	4.90	8.20
6-8mo		28.00	8.10	0.90	6.40	9.40
9-11mo		22.00	9.20	1.10	7.00	10.90
12-15mo		28.00	10.10	1.20	8.40	12.60
16-19mo		19.00	10.60	1.20	n/a	n/a
20-23mo		24.00	11.50	1.50	7.80	13.20
2-3.5		212.00	14.10	1.90	11.30	17.10
3.5-4.5		228.00	16.20	2.10	13.10	19.60
4.5-5.5		271.00	18.30	2.50	15.10	22.10
5.5-6.5		243.00	20.50	3.00	16.10	25.60
6.5-7.5		231.00	23.70	4.10	18.30	31.10
7.5-8.5		197.00	26.60	5.20	20.40	36.90
8.5-9.5		256.00	29.70	5.50	22.70	40.00*
9.5-10.5		258.00	33.10	6.60	24.80	45.50
10.5-11.5		282.00	37.20	8.20	27.40	53.20
11.5-12.5		287.00	40.30	8.10	29.30	54.70
12.5-13.5		315.00	45.70	9.00	33.60	62.00
13.5-14.5		271.00	50.80	9.20	37.70	67.80
14.5-15.5		264.00	55.50	10.00	40.20	72.10
15.5-16.5		198.00	60.70	11.50	44.70	80.10
16.5-17.5		221.00	62.20	11.60	47.00	81.10
17.5-19		156.00	65.80	13.10	45.60	86.50

source 6 of 16

Ostyn 1980

Country Belgium
Ages 12-18 males only
Sample 21,174

Data collected from 1968 to 1974 (longitudinal study).

age	sex	n	mean (kg)	sd	3rd%ile	97th%ile
12.5-13	m		41.2		31.3	59.3
13.5-14	m		46.6		34.4	67.4
14.5-15	m		53.2		38.6	73.6
15.5-16	m		58.4		43.2	77.4
16.5-17	m		62.1		47.7	80.4
17.5-18	m		64.7		50.7	83.2

Section 1.1

Static Anthropometry: Whole body

Weight 1

source 7 of 16

Ferrandez 1986

Country Spain
Ages 0-2
Sample 332

Subjects from Zaragoza only. Data collected in 1979.

age	sex	n	mean (kg)	sd	5th%ile	95th%ile
0	m		3.257	0.368		
3mo	m		6.319	0.607		
6mo	m		9.148	0.802		
9mo	m		9.324	0.952		
12mo	m		10.213	0.998		
18mo	m		11.608	1.240		
24mo	m		12.787	1.317		
0	f		3.112	0.323		
3mo	f		5.708	0.519		
6mo	f		7.401	0.675		
9mo	f		8.490	0.811		
12mo	f		9.386	0.893		
18mo	f		10.649	1.073		
24mo	f		12.081	1.410		

source 8 of 16

Waaler 1993

Country Norway
Ages 3-16
Sample 966

Ages are mean ages ie age 5 includes children aged 4.5 to 5.5 years. Data collected 1971-1974.

age	sex	n	mean (kg)	sd
3.2	m	5	16.1	1.7
4.1	m	37	17.6	2.1
5	m	126	19.8	2.3
6	m	186	21.9	2.7
7	m	258	24.1	3.1
8	m	326	26.9	4.0
9	m	364	30.0	4.5
10	m	350	32.7	5.1
11	m	310	36.7	6.2
12	m	309	40.2	7.1
13	m	369	44.5	7.5
14	m	403	50.3	8.5
15	m	429	56.3	9.4
16	m	410	61.1	8.6
16.9	m	328	65.1	8.8
3.2	f	50	15.1	2.0
4.1	f	131	17.1	2.2
5	f	189	18.9	2.4
6	f	254	21.0	2.4
7	f	305	23.3	3.0
8	f	338	25.9	3.7
9	f	333	28.7	4.5
10	f	290	32.3	5.5
11	f	313	35.8	6.4
12	f	346	40.5	7.5
13	f	394	45.8	7.8
14	f	408	50.1	7.2
15	f	389	53.5	7.0
16	f	292	55.8	7.5
16.9	f	77	56.6	8.4

Section 1.1

Static Anthropometry: Whole body

Weight 1

source 9 of 16

Dindar 1989

Country Turkey
Ages 6-15
Sample 18,719

Data collected in 1982.

age	sex	n	mean (kg)	sd	5th%ile	95th%ile
6	m		21.00	2.10		
7	m		22.61	2.51		
8	m		25.31	2.81		
9	m		27.29	2.89		
10	m		30.21	3.41		
11	m		33.11	3.71		
12	m		35.51	4.01		
13	m		38.20	4.50		
14	m		44.39	5.59		
15	m		50.71	7.74		
6	f		20.44	2.40		
7	f		22.01	2.51		
8	f		24.20	2.70		
9	f		26.81	3.11		
10	f		29.19	3.79		
11	f		32.30	4.20		
12	f		34.70	4.80		
13	f		39.91	5.51		
14	f		45.39	5.59		
15	f		51.81	5.81		

source 10 of 16

Rasheed 1991

Country Saudi Arabia
Ages full term newborn (37-42 weeks gestation)
Sample 1094

Subjects were from the Eastern Province of Saudi Arabia. Data collected from 1985 to 1986.

age	sex	n	mean (kg)	sd	5th%ile	95th%ile
0	m		3.24	5.3		
0	f		3.18	4.5		

Section 1.1

Static Anthropometry: Whole body

Weight 1

source 11 of 16

Magbool 1993

Country Saudi Arabia

Ages 6-16

Sample 21,638

Subjects were from the Eastern Province of Saudi Arabia. Age is measured in Hegira years (according to the Moslem calendar), and should be converted; Hegiran years are 11 days shorter than Gregorian years. Data collected from 1988 to 1990.

age	sex	n	mean (kg)	sd	5th%ile	95th%ile
6	m	600	19.99	3.19		
7	m	1386	20.77	3.80		
8	m	1165	23.01	5.43		
9	m	1121	25.31	5.71		
10	m	1163	27.57	6.61		
11	m	1130	30.55	8.78		
12	m	1036	33.82	9.53		
13	m	975	37.20	11.51		
14	m	915	44.37	12.22		
15	m	731	49.15	12.12		
16	m	509	52.63	13.44		
6	f	412	19.52	3.31		
7	f	1415	20.4	6.02		
8	f	1390	22.28	5.34		
9	f	1475	25.22	6.60		
10	f	1230	27.87	8.02		
11	f	1113	32.72	9.43		
12	f	1054	38.76	11.44		
13	f	996	43.70	12.39		
14	f	862	47.70	12.54		
15	f	616	50.55	13.19		
16	f	344	52.23	12.97		

source 12 of 16

Singh 1987

Country India

Ages 6-12

Sample 1380

Punjabi children. Data collected in 1974.

age	sex	n	mean (kg)	sd	5th%ile	95th%ile
6	m	60	17.25	3.12		
7	m	87	19.57	2.82		
8	m	109	21.62	3.27		
9	m	123	24.08	3.13		
10	m	126	25.66	2.95		
11	m	84	27.71	3.89		
12	m	67	29.29	3.75		
6	f	52	16.21	2.17		
7	f	133	17.51	2.04		
8	f	123	19.15	3.05		
9	f	163	21.05	2.65		
10	f	167	23.02	3.31		
11	f	45	24.51	4.82		
12	f	41	26.90	4.58		

source 13 of 16
Ashizawa 1987

Country Japan
Ages 7-15

Report quotes Japanese Growth Standard. Mean ages in years.

age	sex	n	mean (kg)	sd	5th%ile	95th%ile
7.10	m		25.1	4.0		
8.04	m		28.0	4.8		
8.96	m		31.1	5.8		
10.03	m		34.7	6.8		
11.12	m		39.2	7.9		
12.03	m		44.6	8.8		
12.95	m		50.2	9.2		
13.90	m		55.5	9.4		
14.77	m		59.0	9.3		
15.53	m		60.8	8.9		
7.13	f		24.6	3.9		
7.99	f		27.6	4.8		
9.00	f		31.2	5.8		
10.02	f		35.5	6.8		
11.03	f		40.4	7.4		
12.08	f		44.9	7.4		
12.93	f		48.3	7.1		
14.22	f		50.9	7.1		
14.59	f		52.3	7.1		

source 14 of 16
Zhang 1988

Country China
Ages 0-7
Sample 15,874

Data collected in 1985. Cross-sectional study in nine cities.

age	sex	n	mean (kg)	sd	5th%ile	95th%ile
0-3day	m	1800	3.21	0.37		
1mo	m	1800	4.90	0.61		
2mo	m	1800	6.02	0.73		
3mo	m	1800	6.74	0.77		
4mo	m	1800	7.36	0.80		
5mo	m	1800	7.79	0.83		
6mo	m	1800	8.39	0.94		
8mo	m	1800	9.00	0.98		
10mo	m	1800	9.44	1.04		
12mo	m	1800	9.87	1.04		
15mo	m	1800	10.38	1.12		
18mo	m	1800	10.88	1.14		
21mo	m	1800	11.42	1.23		
2	m	1800	12.24	1.28		
2.5	m	1800	13.13	1.34		
3	m	1800	13.95	1.51		
3.5	m	1800	14.75	1.58		
4	m	1800	15.61	1.75		
4.5	m	1800	16.49	1.84		
5	m	1800	17.39	2.05		
5.5	m	1800	18.30	2.13		
6-7	m	1800	19.81	2.56		

continued

Section 1.1

Static Anthropometry: Whole body

Weight 1

source 14 of 16 *continued*

age	sex	n	mean (kg)	sd	5th%ile	95th%ile
0-3day	f	1794	3.12	0.34		
1mo	f	1800	4.60	0.56		
2mo	f	1800	5.54	0.66		
3mo	f	1800	6.22	0.70		
4mo	f	1800	6.78	0.75		
5mo	f	1800	7.24	0.79		
6mo	f	1800	7.78	0.89		
8mo	f	1800	8.36	0.93		
10mo	f	1800	8.80	0.97		
12mo	f	1800	9.24	1.03		
15mo	f	1800	9.78	1.05		
18mo	f	1800	10.33	1.09		
21mo	f	1800	10.87	1.15		
2	f	1800	11.66	1.21		
2.5	f	1800	12.55	1.32		
3	f	1800	13.44	1.42		
3.5	f	1800	14.26	1.47		
4	f	1800	15.21	1.74		
4.5	f	1800	16.12	1.84		
5	f	1800	16.79	1.82		
5.5	f	1800	17.72	2.17		
6-7	f	1800	19.08	2.42		

source 15 of 16

Yi-Ling 1982

Country China
 Ages 7-17
 Sample 8099

Data collected on children in Shanghai only, in 1981.

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
7	m	305	20.87	2.43		
8	m	299	23.10	2.75		
9	m	285	25.10	3.00		
10	m	371	27.83	3.49		
11	m	343	30.18	3.80		
12	m	484	33.90	4.87		
13	m	402	38.40	6.45		
14	m	380	43.70	7.01		
15	m	371	47.97	6.12		
16	m	321	52.10	6.40		
17	m	347	54.04	5.91		
7	f	327	20.20	2.47		
8	f	275	22.37	2.61		
9	f	288	24.72	3.54		
10	f	355	27.41	4.12		
11	f	341	31.79	5.49		
12	f	462	35.85	5.55		
13	f	452	39.57	5.83		
14	f	371	42.90	5.58		
15	f	410	45.65	6.35		
16	f	297	47.65	5.50		
17	f	353	49.15	5.95		

Section 1.1

Static Anthropometry: Whole body

Weight 1

source 16 of 16

Clymer 1988

Country New Zealand

Ages 0-9

Sample 1037

Data collected 1972-1987 (longitudinal study).

age	sex	n	mean (kg)	sd	5th%ile	9th%ile
birth	mf	907	3.6	0.52		
3		832	14.7	1.65		
5		816	18.6	2.22		
7		801	23.3	3.00		
9		773	28.7	4.19		

Section 1.1

Static Anthropometry: Whole body

Stature 2

DEFINITION

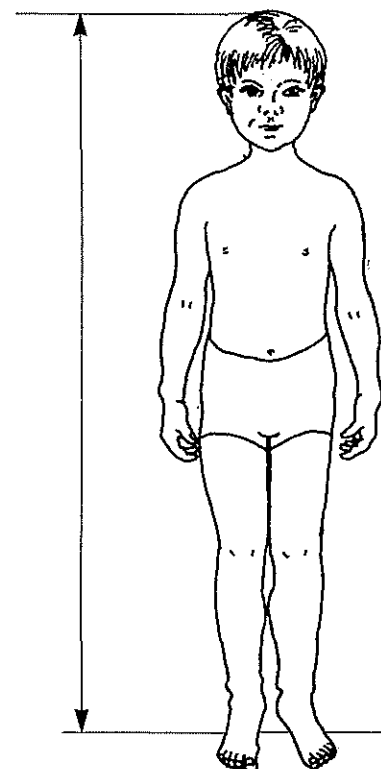
The subject stands erect with the head oriented in the Frankfort plane, arms hanging at sides. The vertical distance from the standing surface to the vertex (the top of the head) is measured (centimetres).

APPLICATION AND SUMMARY OF THE DATA

A number of sources have been included to allow comparison of stature between different countries, but the date of the survey, size and composition of the sample, age groups and possible differences in measurement techniques should be noted before making direct comparisons. Of the sources, Pheasant (1986) is probably more appropriate for the current UK population. See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and choose between different sources. Stature is measured with subjects unshod. Children under two years of age are measured supine (lying on their back) and stature is called crown to sole length (see measurement number 3). Static anthropometric measurements do not account for stretching, twisting or forcing the body into different positions or postures (eg stretching the body or forcing the head backwards to reach maximum stature).

SEE ALSO

Crown to sole (supine), centre of gravity (standing)



NUMBER OF SOURCES: 15

source	reference	country	age
1	Pheasant 1988	UK	2-18
2	Steenbekkers 1993	NL	2-12
3	Snyder 1977	US	2-19
4	Joubert 1982	Fr	2-16
5	Ostyn 1980	Bel	12-18 males only
6	DIN 1981	D	3-17
7	Waalder 1983	No	3-16
8	Budavari 1982	Hu	6-14
9	Dindar 1989	Tur	6-15
10	Magbool 1993	SA	6-16
11	Singh 1987	In	6-12
12	Ashizawa 1987	Ja	7-15
13	Yi-Ling 1982	Ch	7-17
14	Zhang 1988	Ch	2-7
15	Clymer 1988	NZ	3-9

Section 1.1

Static Anthropometry: Whole body

Stature 2

source 1 of 15

Pheasant 1988

Country United Kingdom
Ages 2-18

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2	m		93.0	4.9	85.0	101.0
3	m		99.0	4.8	91.0	107.0
4	m		105	4.7	97.5	112.5
5	m		111	5.2	102.5	119.5
6	m		117	6.0	107.0	127.0
7	m		123	5.6	114.0	132.0
8	m		128	6.0	118.0	138.0
9	m		133	6.3	122.5	143.5
10	m		139	6.1	129.0	149.0
11	m		143	6.5	132.5	153.5
12	m		149	7.8	136.0	162.0
13	m		155	9.1	140.0	170.0
14	m		163	9.0	148.0	178.0
15	m		169	8.3	155.5	182.5
16	m		173	6.8	162.0	184.0
17	m		175	6.6	164.0	186.0
18	m		176	6.0	166.0	186.0

2	f		89	4.0	82.5	95.5
3	f		97	4.6	89.5	104.5
4	f		105	5.2	96.5	113.5
5	f		110	5.3	101.5	118.5
6	f		116	5.6	107.0	125.0
7	f		122	5.9	112.5	131.5
8	f		128	5.9	118.5	137.5
9	f		133	6.8	122.0	144.0
10	f		139	7.2	127.0	151.0
11	f		144	7.9	131.0	157.0
12	f		150	7.9	137.0	163.0
13	f		155	7.3	143.0	167.0
14	f		159	6.6	148.0	170.0
15	f		161	6.2	151.0	171.0
16	f		162	6.1	152.0	172.0
17	f		162	6.1	152.0	172.0
18	f		162	5.6	153.0	171.0

source 2 of 15

Steenbekkers 1993

Country Netherlands
Ages 2-12

age	sex	n	mean (cm)	sd	3rd%ile	97th%ile
2	m	81	93.9	4.5	86.5	101.8
3	m	97	102.1	4.4	94.8	110.7
4	m	85	108.5	4.7	100.2	116.7
5	m	86	117.0	4.8	107.4	126.1
6	m	98	122.5	4.7	111.4	132.1
7	m	106	128.7	5.3	118.1	137.7
8	m	96	134.0	5.0	123.2	144.2
9	m	122	141.8	5.5	132.4	152.7
10	m	134	146.0	6.8	133.5	159.2
11	m	143	150.9	7.0	138.8	164.6
12	m	78	156.3	8.0	140.6	171.9

2	f	92	92.9	4.6	85.0	103.4
3	f	86	100.4	4.5	92.2	109.2
4	f	79	108.2	4.0	101.8	115.6
5	f	94	115.9	4.9	107.5	125.0
6	f	92	122.7	4.9	113.6	132.6
7	f	93	128.6	5.7	117.1	139.7
8	f	95	134.1	5.4	124.1	144.4
9	f	122	139.2	6.4	127.0	148.7
10	f	136	147.1	6.6	135.9	160.5
11	f	151	151.0	6.7	139.3	165.0
12	f	79	156.6	7.7	143.5	170.8

Section 1.1

Static Anthropometry: Whole body

Stature 2

source 3 of 15

Snyder 1977

Country United States 1977
Ages 2-19

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2-3.5	mf	213	93.40	5.00	85.70	100.80
3.5-4.5		228	101.40	4.50	93.90	109.10
4.5-5.5		271	108.30	4.70	100.60	115.80
5.5-6.5		242	114.60	5.10	105.80	123.70
6.5-7.5		227	121.20	5.50	111.80	130.50
7.5-8.5		198	126.90	5.60	118.20	136.90
8.5-9.5		257	133.00	6.00	124.10	142.30
9.5-10.5		258	137.70	6.30	127.10	148.30
10.5-11.5		282	143.30	6.60	133.10	154.60
11.5-12.5		287	148.80	7.20	137.50	160.40
12.5-13.5		315	154.60	7.70	142.10	167.60
13.5-14.5		271	160.10	8.20	147.00	173.60
14.5-15.5		264	164.20	8.00	151.50	177.60
15.5-16.5		498	168.40	9.30	153.50	183.40
16.5-17.5		221	168.80	8.90	154.60	182.90
17.5-19		156	170.90	9.50	156.40	185.70

source 4 of 15

Joubert 1982

Country France
Ages 2-16
Sample unknown

Year of data collection unknown.

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2	mf		86			
3	mf		94			
4	mf		102			
5	mf		108			
6	mf		114			
7-8	mf		126			
9-10	mf		138			
11-12	mf		150			
13-14	m		162			
15-16	m		174			
13-14	f		156			
15-16	f		162			

Section 1.1

Static Anthropometry: Whole body

Stature 2

source 5 of 15

Ostyn 1980

Country Belgium
 Ages 12-18 males only
 Sample 21,174

Data collected from 1968 to 1974 (longitudinal study).

age	sex	n	mean (cm)	sd	3rd%ile	97th%ile
12.5-13	m		152.6		140.2	166.4
13.5-14	m		158.4		144.3	174.2
14.5-15	m		165.6		150.0	179.9
15.5-16	m		170.9		154.9	183.7
16.5-17	m		173.8		159.1	186.1
17.5-18	m		175.4		161.7	187.3

source 6 of 15

DIN 1981

Country Germany
 Ages 3-17
 Sample unknown

German Standard.

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
3	m		101.4		92.4	110.9
4	m		109.3		100.8	117.8
5	m		115.7		106.0	126.0
6	m		120.3		110.9	128.9
7	m		128.0		118.3	137.6
8	m		131.1		119.6	144.8
9	m		137.3		127.4	148.4
10	m		143.9		133.0	155.2
11	m		145.0		136.1	157.5
12	m		152.9		139.0	164.3
13	m		162.7		148.7	172.5
14	m		167.8		159.6	180.4
15	m		171.1		159.5	182.6
16-17	m		175.8		164.2	187.5
3	f		101.4		92.4	110.9
4	f		109.3		100.8	117.8
5	f		115.7		106.0	126.0
6	f		120.3		110.9	128.9
7	f		128.0		118.3	137.6
8	f		131.1		119.6	144.8
9	f		137.3		127.4	148.4
10	f		143.9		133.0	155.2
11	f		148.0		133.7	160.0
12	f		153.1		141.8	168.2
13	f		160.2		152.8	171.9
14	f		161.7		154.6	172.9
15	f		163.0		155.0	173.6
16-17	f		165.0		155.1	174.6

Section 1.1

Static Anthropometry: Whole body

Stature 2

source 7 of 15

Waler 1983

Country Norway

Ages 3-16

Sample 966

Ages are mean ages so that age 5 represents children ages 4.5 to 5.5 years. Data collected 1971-1974.

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
3.2	m	37	99.40	3.80		
4.1	m	126	105.70	4.40		
5	m	186	112.40	4.80		
6	m	258	118.70	5.30		
7	m	326	124.30	5.30		
8	m	364	130.00	5.50		
9	m	351	135.40	5.90		
10	m	310	139.70	5.80		
11	m	309	145.40	6.20		
12	m	370	150.40	6.80		
13	m	403	156.40	7.70		
14	m	430	163.80	8.50		
15	m	410	169.90	7.80		
16	m	329	174.90	6.80		
16.9	m	87	176.60	7.10		
3.2	f	50	97.30	4.30		
4.1	f	131	104.30	4.70		
5	f	189	110.60	4.70		
6	f	255	117.30	4.60		
7	f	305	123.20	4.90		
8	f	338	128.50	5.60		
9	f	332	133.90	5.90		
10	f	290	139.10	6.30		
11	f	313	145.00	7.10		
12	f	346	151.40	7.90		
13	f	394	157.50	7.00		
14	f	408	162.10	6.30		
15	f	389	164.50	5.80		
16	f	294	165.90	5.90		
16.9	f	77	165.80	6.60		

source 8 of 15

Budavari 1982

Country Hungary

Ages 6-14

Sample unknown

Year of data collection unknown.

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
6	m	54	118.30	4.32		
7	m	111	121.90	4.95		
8	m	138	127.10	5.48		
9	m	140	132.60	5.64		
10	m	138	138.60	6.25		
11	m	153	142.60	6.22		
12	m	126	148.10	7.27		
13	m	130	154.30	8.29		
14	m	59	162.80	8.26		
6	f	54	115.70	4.13		
7	f	116	120.40	5.54		
8	f	133	126.10	6.00		
9	f	113	132.70	5.69		
10	f	136	137.90	6.28		
11	f	141	143.90	7.00		
12	f	129	151.50	6.82		
13	f	124	156.30	6.40		
14	f	48	157.40	6.19		

Section 1.1

Static Anthropometry: Whole body

Stature 2

source 9 of 15

Dindar 1989

Country Turkey

Ages 6-15

Sample 18,719

Data collected in 1982.

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
6	m		115.93	4.64		
7	m		119.86	4.04		
8	m		124.84	4.31		
9	m		129.98	4.17		
10	m		134.69	4.52		
11	m		139.93	4.69		
12	m		144.53	4.55		
13	m		148.56	4.91		
14	m		156.70	6.14		
15	m		164.86	6.32		
6	f		115.16	4.23		
7	f		119.46	3.72		
8	f		124.10	3.78		
9	f		129.35	4.05		
10	f		133.84	4.61		
11	f		139.59	4.91		
12	f		144.87	5.27		
13	f		151.19	5.27		
14	f		157.55	5.30		
15	f		163.91	5.36		

source 10 of 15

Magbool 1993

Country Saudi Arabia

Ages 6-16

Sample 21,638

Subjects were from the Eastern Province of Saudi Arabia. Age is measured in Hegira years (according to the Moslem calender), and should be converted; Hegiran years are 11 days shorter than Gregorian years. Data collected from 1988 to 1990.

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
6	m		116.40	6.38		
7	m		118.70	5.98		
8	m		124.10	6.13		
9	m		128.90	6.20		
10	m		132.20	5.95		
11	m		136.90	6.77		
12	m		141.30	7.56		
13	m		147.20	8.59		
14	m		154.44	9.00		
15	m		160.50	8.84		
16	m		164.90	8.48		
6	f		114.6	5.74		
7	f		118.3	5.93		
8	f		122.4	6.43		
9	f		127.4	6.63		
10	f		132.1	6.99		
11	f		138.4	7.31		
12	f		145.1	8.06		
13	f		150.2	6.88		
14	f		153.4	6.56		
15	f		154.5	5.89		
16	f		155.1	6.49		

Section 1.1

Static Anthropometry: Whole body

Stature 2

source 11 of 15

Singh 1987

Country India
Ages 6-12
Sample 1380

Punjabi children. Data collected in 1974.

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
6	m	60	112.30	7.22		
7	m	87	118.50	6.19		
8	m	109	124.10	7.26		
9	m	123	129.70	6.37		
10	m	126	132.60	5.85		
11	m	84	136.20	6.41		
12	m	67	140.90	6.68		
6	f	52	102.50	8.14		
7	f	133	110.10	5.98		
8	f	123	115.90	6.97		
9	f	163	121.00	6.97		
10	f	167	125.80	6.20		
11	f	45	128.70	6.62		
12	f	41	133.30	6.90		

source 12 of 15

Ashizawa 1987

Country Japan
Ages 7-15

Report quotes Japanese Growth Standard. Mean ages in years.

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
7.10	m		124.8	5.1		
8.04	m		130.1	5.3		
8.96	m		135.2	5.7		
10.03	m		140.5	6.3		
11.12	m		146.6	7.2		
12.03	m		153.9	7.8		
12.95	m		160.8	7.4		
13.90	m		165.7	6.4		
14.77	m		168.4	5.8		
15.53	m		169.7	5.6		
7.13	f		124.2	5.2		
7.99	f		129.8	5.6		
9.00	f		135.7	6.2		
10.02	f		142.2	6.6		
11.03	f		148.2	6.3		
12.08	f		152.7	5.7		
12.93	f		155.4	5.3		
14.22	f		156.7	5.1		
14.59	f		157.2	5.0		

Section 1.1 Static Anthropometry: Whole body

Stature 2

source 13 of 15

Yi-Ling 1982

Country China

Ages 7-17

Sample 8099

Data collected on children in Shanghai only, in 1981.

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
7	m	305	120.79	5.01		
8	m	299	125.37	4.88		
9	m	285	129.81	5.47		
10	m	371	135.03	5.85		
11	m	343	139.13	5.40		
12	m	484	145.22	6.54		
13	m	402	150.69	7.84		
14	m	380	158.53	6.46		
15	m	371	162.82	6.44		
16	m	321	166.14	6.30		
17	m	347	168.66	5.52		
7	f	327	120.12	4.67		
8	f	275	124.37	5.34		
9	f	288	130.20	5.92		
10	f	355	135.56	6.08		
11	f	341	142.45	7.46		
12	f	462	148.07	6.47		
13	f	452	151.71	6.17		
14	f	371	154.34	5.32		
15	f	410	156.04	5.38		
16	f	297	158.14	4.90		
17	f	353	158.86	4.96		

source 14 of 15

Zhang 1988

Country China

Ages 2-7

Sample 15,874

Data collected in 1985. Cross-sectional study in nine cities.

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2	m	1800	87.9	3.5		
2.5	m	1800	91.7	3.7		
3	m	1800	95.1	3.7		
3.5	m	1800	98.5	3.9		
4	m	1800	102.1	4.2		
4.5	m	1800	105.3	4.3		
5	m	1800	108.6	4.5		
5.5	m	1800	111.6	4.5		
6-7	m	1800	116.2	4.9		
2	f	1800	86.6	3.5		
2.5	f	1800	90.3	3.6		
3	f	1800	94.2	3.7		
3.5	f	1800	97.3	3.8		
4	f	1800	101.2	4.1		
4.5	f	1800	104.5	4.2		
5	f	1800	107.6	4.2		
5.5	f	1800	110.8	4.6		
6-7	f	1800	115.1	4.9		

Section 1.1

Static Anthropometry: Whole body

Stature 2

source 15 of 15

Clymer 1988

Country New Zealand
Ages 3-9
Sample 1037

Data collected 1972-1987 (longitudinal study).

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
3		817	94.6	3.79		
5		820	108.2	4.46		
7		807	120.9	5.01		
9		773	132.1	5.90		

Section 1.1

Static Anthropometry: Whole body

Body length, crown to sole (supine) 3

DEFINITION

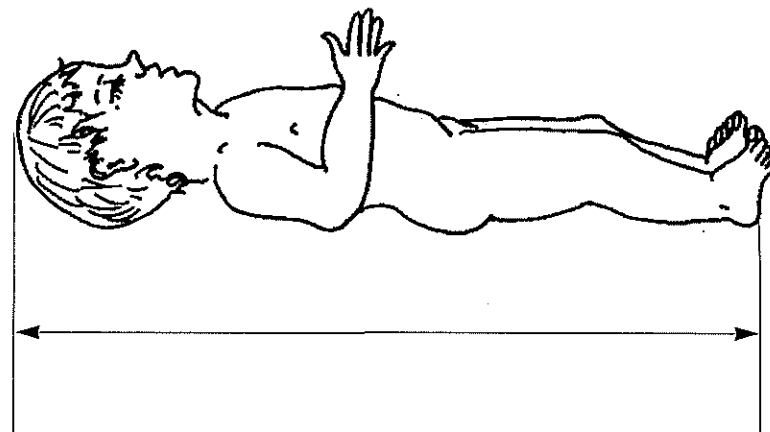
Subject lies on back with feet firmly against a reference plane, head held in the Frankfort plane (looking straight ahead), arms at sides with the legs straight. The distance from the reference plane (or heel of right foot in infants) to the vertex (top of the head) is measured (centimetres).

APPLICATION AND SUMMARY OF THE DATA

A number of sources have been included to allow comparison of crown to sole length between different countries, but the date of the survey, size and composition of the sample, age groups and possible differences in measurement techniques should be noted before making direct comparisons. Of the sources, Pheasant (1986) is probably more appropriate for the current UK population. See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and choose between different sources. Crown to sole length is infant stature (0 to 2 years) measured with subject supine (lying on their back); see measurement number 2 for stature for children over 2 years. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different positions or postures (eg stretching the body or forcing the head backwards to reach maximum stature).

SEE ALSO

Stature



NUMBER OF SOURCES: 10

source	reference	country	age
1	Pheasant 1988	UK	0-2
2	Hayes 1983	Ir	newborn
3	Joubert 1982	Fr	0-18mo
4	Snyder 1977	US	0-19
5	Copper 1993	US	newborn
6	Steenbekkers 1993	NL	0-14mo
7	Ferrandez 1986	Sp	0-2
8	Rasheed 1991	SA	newborn
9	Zhang 1988	Ch	0-21mo
10	Clymer 1988	NZ	newborn

Section 1.1 Static Anthropometry: Whole body

Body length, crown to sole (supine) 3

source 1 of 10

Pheasant 1988

Country United Kingdom
Ages 0-2

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
0	mf		50.0	2.0	46.5	53.5
0-6mo			60.0	5.4	51.0	69.0
6-12mo			71.5	3.7	65.5	77.5
12-18mo			74.5	3.5	69.0	80.0
18-24mo			84.0	3.6	78.0	90.0

source 2 of 10

Hayes 1983

Country Ireland
Ages Newborn
Sample 8050

Data collected 1979.

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
0	m		52.37			
0	m		52.37			
0	f		51.60			
0	f		51.60			

source 3 of 10

Joubert 1982

Country France
Ages 0-18 mo
Sample unknown

Year of data collection unknown.

age	sex	n	mean (cm)	sd	3rd%ile	97th%ile
1mo	mf		54			
3mo	mf		60			
6mo	mf		67			
9mo	mf		71			
12mo	mf		74			
18mo	mf		81			

Section 1.1 Static Anthropometry: Whole body

Body length, crown to sole (supine) 3

source 4 of 10

Snyder 1977

Country United States
Ages 0-19

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
0-2mo	mf	31	56.30	3.90	50.70	63.30
3-5mo		45	63.10	3.60	56.20	68.20
6-8mo		31	68.50	2.60	64.20	72.20
9-11mo		26	73.00	3.30	66.20	77.40
12-15mo		32	76.50	3.20	69.80	80.70
16-19mo		27	79.20	3.40	72.60	84.60
20-23mo		31	82.60	4.00	74.40	88.30
2-3.5		20	97.30	5.00	n/a	n/a
3.5-4.5		21	102.30	5.20	94.60	110.60
4.5-5.5		26	112.50	3.90	105.90	119.10
5.5-6.5		67	116.00	5.50	106.00	123.90
6.5-7.5		47	122.90	6.00	112.30	133.30
7.5-8.5		46	128.80	5.50	121.30	137.40
8.5-9.5		57	134.80	6.20	125.10	143.50
9.5-10.5		43	138.60	6.30	128.20	149.00
10.5-11.5		53	145.30	6.30	134.70	154.00
11.5-12.5		65	150.90	7.90	139.20	161.80
12.5-13.5		66	157.20	8.10	143.30	170.70
13.5-14.5		57	162.60	7.80	150.80	176.50
14.5-15.5		59	166.00	7.30	153.10	176.60
15.5-16.5		43	170.40	8.30	156.10	182.70
16.5-17.5		45	170.50	7.20	159.20	182.00
17.5-19		33	174.10	9.60	158.50	187.60

source 5 of 10

Copper 1993

Country USA
Ages Fullterm newborn
Sample 1200

Data collected from 1985 to 1988. 69% of mothers were black.

age	sex	mean (cm)
birth	m	50.9
birth	f	50.1

source 6 of 10

Steenbekkers 1993

Country Netherlands
Ages 0-14 months

age	sex	n	mean (cm)	sd	3rd%ile	97th%ile
0-2mo	m	16	59.8	3.1	53.5	64.2
3-5	m	21	65.6	3.5	59.1	70.8
6-8	m	22	71.2	3.0	64.7	76.7
9-11	m	13	75.5	2.7	71.8	80.9
12-14	m	15	78.1	3.1	72.0	83.8
0-2mo	f	9	57.0	3.5	51.3	61.2
3-5	f	20	62.3	2.9	58.3	68.1
6-8	f	14	69.3	2.6	64.6	74.5
9-11	f	16	73.5	3.4	68.2	79.2
12-14	f	23	77.3	2.7	70.9	82.2

source 7 of 10
Ferrandez 1986

Country Spain
Ages 0-2
Sample 332

Data collected in 1979.

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
0	m		50.52	1.54		
3mo	m		60.97	2.20		
6mo	m		67.83	2.37		
9mo	m		72.22	2.52		
12mo	m		75.78	2.56		
18mo	m		82.32	2.80		
24mo	m		88.10	3.07		
0	f		49.85	1.48		
3mo	f		59.30	1.98		
6mo	f		65.78	2.06		
9mo	f		70.05	2.08		
12mo	f		73.64	2.15		
18mo	f		80.26	2.50		
24mo	f		86.24	2.86		

source 8 of 10
Rasheed 1991

Country Saudi Arabia
Ages Full term newborn (37-42 weeks gestation)
Sample 1094

Subjects were from the Eastern Province of Saudi Arabia. Data collected from 1985 to 1986.

age	sex	n	mean (cm)	sd
37-40wks	m	491	49.40	2.6
41-42	m	38	49.27	1.7
37-40	f	410	48.94	2.2
41-42	f	43	49.48	1.9
Combined sex:				
37-42wks	mf	982	49.21	2.4

Section 1.1 Static Anthropometry: Whole body

Body length, crown to sole (supine) 3

source 9 of 10

Zhang 1988

Country China
Ages 0-21 months
Sample 15,874

Data collected in 1985. Cross-sectional study in nine cities.

age	sex	n	mean (cm)	sd	3rd%ile	97th%ile
0-3day	m	1800	50.2	1.7		
1mo	m	1800	56.5	2.3		
2mo	m	1800	60.1	2.4		
3mo	m	1800	62.4	2.4		
4mo	m	1800	64.5	2.4		
5mo	m	1800	66.3	2.3		
6mo	m	1800	68.6	2.6		
8mo	m	1800	71.3	2.6		
10mo	m	1800	73.8	2.7		
12mo	m	1800	76.5	2.8		
15mo	m	1800	79.2	2.9		
18mo	m	1800	81.6	3.2		
21mo	m	1800	84.4	3.2		
0-3 day	f	1794	49.6	1.6		
1mo	f	1800	55.6	2.2		
2mo	f	1800	58.8	2.3		
3mo	f	1800	61.1	2.1		
4mo	f	1800	63.1	2.3		
5mo	f	1800	64.8	2.2		
6mo	f	1800	67.0	2.5		
8mo	f	1800	69.7	2.5		
10mo	f	1800	72.3	2.6		
12mo	f	1800	75.1	2.7		
15mo	f	1800	77.9	3.0		
18mo	f	1800	80.4	3.0		
21mo	f	1800	83.1	3.1		

source 10 of 10

Clymer 1988

Country New Zealand
Ages Newborn
Sample 1037

Data collected 1972-1987 (longitudinal study).

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
birth	mf	905	51.8cm	2.37		

DEFINITION

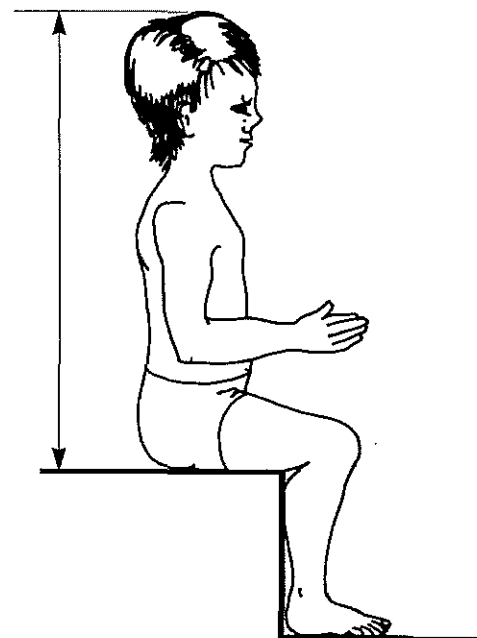
Subject sits erect with head oriented in the Frankfort Plane (looking straight ahead), arms hanging at the sides. The vertical distance from the sitting surface to the vertex (top of the head) is measured (centimetres).

APPLICATION AND SUMMARY OF THE DATA

Two sources of data have been included to allow comparison between different countries. Of the two sources, Pheasant (1986) is more probably appropriate for use with the current UK population. Steenbekkers is the most recent data on European children and Dutch children are amongst the tallest in Europe. See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and choose between different sources. Sitting height is measured supine in children under two years old (see measurement number 5). Static anthropometric measurements do not account for stretching, twisting or forcing the body into different positions or postures (eg stretching the body or forcing the head backwards to reach maximum sitting height).

SEE ALSO

Crown to rump (supine), centre of gravity (seated), shoulder height (seated)

**NUMBER OF SOURCES: 2**

source	reference	country	age
1	Pheasant 1988	UK	2-18
2	Steenbekkers 1993	NL	2-12

Source 1 of 2
Pheasant 1988

Country United Kingdom
Ages 2-18

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2	m		54.5	2.4	50.5	58.5
3	m		57.0	2.5	53.0	38.0
4	m		59.5	2.6	55.0	64.0
5	m		62.0	2.8	57.5	66.5
6	m		64.0	3.2	58.5	69.5
7	m		66.5	3.0	61.5	71.5
8	m		68.0	3.1	63.0	73.0
9	m		70.0	3.1	65.0	75.0
10	m		72.5	3.2	67.0	78.0
11	m		74.0	3.4	68.5	79.5
12	m		76.5	3.9	70.0	83.0
13	m		79.0	4.9	71.0	87.0
14	m		83.5	5.2	75.0	92.0
15	m		87.0	5.1	78.5	95.5 ^a
16	m		89.5	3.9	93.0	96.0
17	m		91.0	3.5	85.0	97.0
18	m		91.5	3.2	86.0	97.0

continued

Source 1 of 2 continued

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2	f		52.0	2.1	48.5	55.5
3	f		55.5	2.5	51.5	59.5
4	f		59.0	2.9	54.0	64.0
5	f		61.0	2.9	56.0	66.0
6	f		63.5	3.1	58.5	68.5
7	f		66.0	3.1	61.0	71.0
8	f		68.5	2.8	64.0	73.0
9	f		70.0	3.3	64.5	75.5
10	f		72.5	3.6	66.5	78.5
11	f		74.5	4.1	68.0	81.0
12	f		77.5	4.5	70.0	85.0
13	f		80.5	4.1	74.0	87.0
14	f		83.0	3.6	77.0	89.0
15	f		84.5	3.3	79.0	90.0
16	f		85.5	3.3	80.0	91.0
17	f		85.5	3.3	80.0	91.0
18	f		85.5	3.2	80.0	91.0

Section 1.1

Static Anthropometry: Whole body

Sitting height 4

Source 2 of 2

Steenbekkers 1993

Country Netherlands
Ages 2-12

age	sex	n	mean (cm)	sd	3rd%ile	97th%ile
2	m	81	55.4	2.3	51.8	59.2
3	m	97	58.1	2.3	54.7	62.5
4	m	85	60.8	2.5	56.5	65.4
5	m	86	63.9	2.2	59.8	67.9
6	m	98	66.4	2.7	61.2	71.4
7	m	106	69.0	2.7	64.0	73.9
8	m	96	70.9	2.7	66.3	76.6
9	m	122	74.2	2.9	68.5	78.7
10	m	134	75.7	3.5	67.9	81.3
11	m	143	77.7	3.5	70.5	83.6
12	m	78	80.0	3.7	73.7	86.4
2	f	92	54.4	2.5	50.2	60.1
3	f	86	56.7	2.4	52.2	61.4
4	f	79	60.1	2.3	57.1	65.2
5	f	94	63.1	2.9	57.4	69.2
6	f	92	66.4	2.6	61.4	72.5
7	f	93	68.7	2.7	63.7	73.6
8	f	95	71.1	2.9	65.4	76.1
9	f	122	72.9	3.2	66.3	78.3
10	f	136	76.2	3.3	70.1	82.1
11	f	151	78.0	3.6	72.1	85.3
12	f	79	80.2	4.1	73.0	88.1

Section 1.1 Static Anthropometry: Whole body Sitting height, crown to rump (supine) 5

DEFINITION

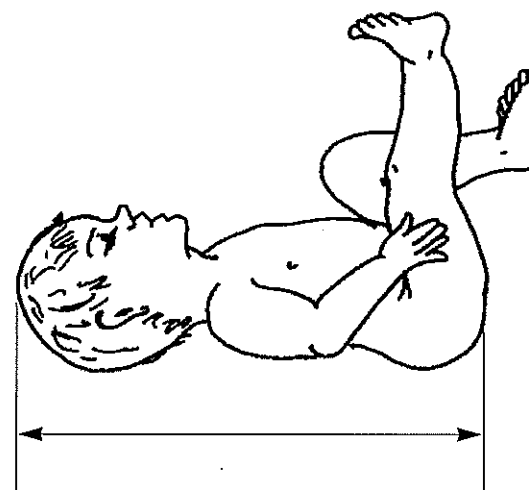
The subject lies on their back with the head in the Frankfort Plane (looking straight ahead) and with the legs placed so that the knees form a 90 degree angle and the upperlegs are approximately 90 degrees to the torso. The arms are placed at the sides. The distance from the vertex (top of the head) to a buttocks reference plane (or the surface of the right buttock in infants) is measured (centimetres).

APPLICATION AND SUMMARY OF THE DATA

Two sources of data have been included to allow comparison between different countries. Of the two sources, Pheasant (1986) is more probably appropriate for use with the current UK population. Steenbekkers is the most recent data on European children and Dutch children are amongst the tallest in Europe. See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and choose between different sources. Sitting height for children over two years old is shown in measurement number 4. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different positions or postures (eg stretching the body or forcing the head backwards to reach maximum sitting height).

SEE ALSO

Sitting height



NUMBER OF SOURCES: 2

source	reference	country	age
1	Pheasant 1988	UK	0-2
2	Steenbekkers 1993	NL	0-14mo

Section 1.1 Static Anthropometry: Whole body Sitting height, crown to rump (supine) 5

source 1 of 2
Pheasant 1988

Country United Kingdom
Ages 0-2

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
0	mf		35.0	1.1	33.0	37.0
0-6mo	mf		41.0	3.1	36.0	46.0
6-12mo	mf		47.0	2.1	43.5	50.5
12-18mo	mf		47.5	2.0	44.0	50.5
18-24mo	mf		52.5	2.0	49.0	55.0

source 2 of 2
Steenbekkers 1993

Country Netherlands
Ages 0-14 months

age	sex	n	mean (cm)	sd	3rdh%ile	97th%ile
0-2mo	m	16	41.8	2.3	36.0	44.3
3-5	m	21	44.6	2.7	40.1	48.8
6-8	m	22	47.9	2.1	43.5	51.7
9-11	m	13	49.8	1.7	47.0	53.5
12-14	m	15	50.8	2.5	47.0	54.0
0-2mo	f	9	40.0	1.6	36.8	43.0
3-5	f	20	42.8	1.9	39.0	46.3
6-8	f	14	46.6	1.5	44.2	50.4
9-11	f	16	48.0	2.5	43.0	51.5
12-14	f	23	50.1	2.1	45.5	54.0

Section 1.1

Static Anthropometry: Whole body

Centre of gravity (standing) 6

DEFINITION

Subject lies on back on a 'centre of gravity device' with feet placed firmly against a foot reference plane. The horizontal distance of the center of gravity from the reference plane (ie from the feet) is measured (centimetres). This distance is also presented as a percentage of stature.

APPLICATION AND SUMMARY OF THE DATA

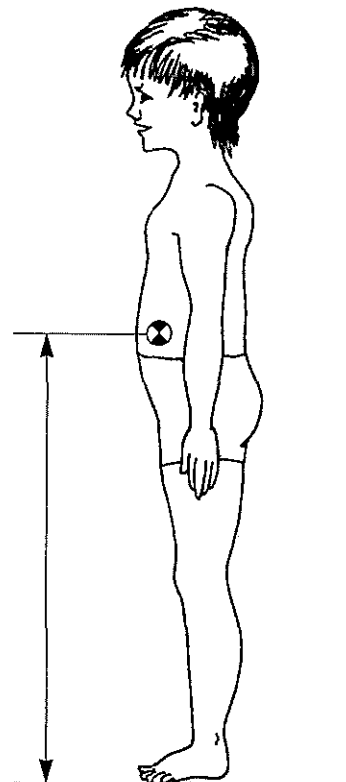
Two sources of data have been included due to different age groups. See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and the validity of USA data for the current UK population. Information on the centre of gravity (and mass) of body parts can be found elsewhere (Reynolds, 1976, see Bibliography).

SEE ALSO

Centre of gravity (seated), weight, stature

NUMBER OF SOURCES: 2

source	reference	country	age
1	Snyder 1977	US	2-19
2	Snyder 1975	US	0-13



Section 1.1

Static Anthropometry: Whole body

Centre of gravity (standing) 6

source 1 of 2
Snyder 1977

Country United States
Ages 2-19

The vertical distance of the centre of gravity from the reference plane.

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2-3.5	mf	20	56.00	2.90		
3.3-4.5		21	59.40	2.70	54.90	63.30
4.5-5.5		26	64.50	2.30	60.60	68.20
5.5-6.5		67	66.20	3.10	60.50	71.20
6.5-7.5		47	70.00	3.20	64.50	75.10
7.5-8.5		46	72.80	3.10	67.90	77.40
8.5-9.5		57	76.30	3.30	71.00	81.60
9.5-10.5		43	78.10	3.50	72.60	84.10
10.5-11.5		53	81.40	3.50	75.30	86.90
11.5-12.5		65	84.60	4.20	78.40	90.90
12.5-13.5		66	87.70	4.50	80.90	95.00
13.5-14.5		57	90.50	4.40	85.00	97.10
14.5-15.5		59	92.20	4.20	84.90	98.50
15.5-16.5		43	95.00	4.90	86.90	103.00
16.5-17.5		45	95.10	4.50	87.50	102.50
17.5-19		33	97.20	6.00	87.50	106.40

source 2 of 2
Snyder 1975

Country United States
Ages 0-13

The vertical distance of the centre of gravity from the reference plane expressed as a percentage of stature.

age	sex	n	mean	sd	5th%ile	95th%ile
0-3mo	m	30	58.5	2.1	54.1	62.2
4-6mo	m	13	59.1	2.3	55.2	62.3
7-9mo	m	6	57.7	2.7	54.3	61.4
10-12mo	m	12	58.5	2.4	53.3	62.3
13-18mo	m	6	59.4	2.1	57.0	62.9
19-24mo	m	5	57.5	1.1	56.2	59.2
2-2.5	m	9	59.1	2.5	55.7	63.2
2.5-3	m	4	58.9	1.0	57.7	60.2
3-3.5	m	18	59.2	2.0	54.1	62.7
3.5-4	m	13	59.7	1.7	57.0	62.5
4-4.5	m	19	59.2	2.0	55.4	63.7
4.5-5	m	10	58.9	1.7	57.1	62.3
5.5-6	m	22	59.1	1.1	56.6	61.0
6-6.5	m	30	59.1	1.3	56.5	61.1
6.5-7	m	26	58.9	1.2	56.7	60.7
7	m	27	58.7	1.3	56.3	60.3
8	m	47	58.6	1.1	56.7	60.5
9	m	42	57.9	1.1	56.0	59.7
10	m	45	58.0	1.1	56.0	60.3
11	m	45	57.7	1.0	56.1	59.7
12	m	29	57.8	1.0	55.8	59.4
13	m	14	58.0	1.5	55.9	62.3

continued

Section 1.1

Static Anthropometry: Whole body

Centre of gravity (standing) 6

source 2 of 2 continued

age	sex	n	mean	sd	5th%ile	95th%ile
0-3mo	f	22	59.4	1.9	56.0	62.3
4-6mo	f	21	58.1	2.5	51.4	61.2
7-9mo	f	6	58.3	2.2	55.1	61.4
10-12mo	f	6	58.1	1.8	55.2	60.5
13-18mo	f	3	57.4	0.8	56.5	58.0
19-24mo	f	5	57.5	1.0	56.	59.2
2-2.5	f	10	60.5	2.1	57.5	65.0
2.5-3	f	10	59.3	2.5	56.2	64.5
3-3.5	f	10	58.9	2.0	56.7	63.3
3.5-4	f	21	58.8	2.0	54.3	61.4
4-4.5	f	19	59.2	2.1	55.5	64.4
4.5-5	f	18	59.3	2.0	54.1	62.6
5.5-6	f	31	59.2	1.7	55.0	61.8
6-6.5	f	25	59.3	1.5	56.8	60.9
6.5-7	f	39	58.8	1.2	56.8	60.7
7	f	29	58.6	1.1	56.5	60.7
8	f	45	58.8	1.7	54.6	60.7
9	f	43	58.0	1.4	55.8	60.2
10	f	59	57.5	0.9	55.7	59.0
11	f	52	57.4	0.7	56.0	58.7
12	f	30	57.4	1.1	55.9	59.2
13	f	13	57.4	1.3	55.7	59.7

Section 1.1

Static Anthropometry: Whole body

Centre of gravity, seated 7

DEFINTION

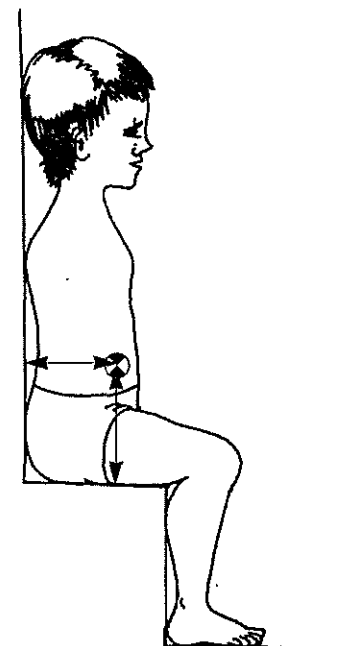
The subject lies on back on a 'centre of gravity device' with legs placed over an adjustable support so that the knees form a 90 degree angle, the buttocks are firmly against a reference plane and the upperlegs are approximately 90 degrees to the torso. The arms are placed at the sides. The distance of the centre of gravity from the backrest and the distance of the CG from the buttocks reference plane is measured. The distance from the buttocks reference plane is also presented as a percentage of sitting height(all in centimetres).

APPLICATION AND SUMMARY OF THE DATA

Two sources of data have been included due to different age groups. See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and the validity of USA data for the current UK population. Information on the centre of gravity (and mass) of body parts can be found elsewhere (Reynolds, 1976, see Bibliography).

SEE ALSO

Centre of gravity (standing), weight, sitting height



NUMBER OF SOURCES: 2

source	reference	country	age
1	Snyder 1977	US	2-19
2	Snyder 1975	US	0-13

Section 1.1

Static Anthropometry:Whole body

Centre of gravity, seated 7

source 1 of 2
Snyder 1977

Country United States
Ages 2-19

Distance of centre of gravity from backrest.

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2-3.5	mf	15	13.1	1.7	n/a	n/a
3.5-4.5		18	13.4	1.1	n/a	n/a
4.5-5.5		25	14.8	2.1	12.1	18.6
5.5-6.5		55	15.3	2.1	11.7	18.6
6.5-7.5		42	16.2	1.9	13.0	19.4
7.5-8.5		38	17.7	1.8	14.3	20.5
8.5-9.5		51	18.1	2.0	14.7	21.3
9.5-10.5		41	19.4	2.0	16.1	22.6
10.5-11.5		52	20.5	1.9	17.3	23.1
11.5-12.5		62	21.2	2.1	17.6	24.5
12.5-13.5		64	21.8	2.1	19.0	25.8
13.4-14.5		54	22.8	2.2	18.5	25.2
14.5-15.5		60	23.3	2.0	19.9	26.9
15.5-16.5		41	23.8	1.8	20.4	26.6
16.5-17.5		43	23.9	2.0	21.4	27.9
17.5-19.0		31	24.4	2.4	21.2	28.6

continued

source 1 of 2 continued

Distance of centre of gravity from the buttocks reference plane.

age	sex	n	mean(cm)	sd	5th%ile	95th%ile
2-3.5	mf	20	56.00	2.90	n/a	n/a
3.5-4.5		21	59.40	2.70	54.90	63.30
4.5-5.5		26	64.50	2.30	60.60	68.20
5.5-6.5		67	66.20	3.10	60.50	71.20
6.5-7.5		47	70.00	3.20	64.50	75.10
7.5-8.5		46	72.80	3.10	67.90	77.40
8.5-9.5		57	76.30	3.30	71.00	81.60
9.5-10.5		43	78.10	3.50	72.60	84.10
10.5-11.5		53	81.40	3.50	75.30	86.90
11.5-12.5		65	84.60	4.20	78.40	90.90
12.5-13.5		66	87.70	4.50	80.90	95.00
13.5-14.5		57	90.50	4.40	85.00	97.10
14.5-15.5		59	92.20	4.20	84.90	98.50
15.5-16.5		43	95.00	4.90	86.90	103.00
16.5-17.5		45	95.10	4.50	87.50	102.50
17.5-19		33	97.20	6.00	87.50	106.40

Section 1.1

Static Anthropometry: Whole body

Centre of gravity, seated 7

source 2 of 2

Snyder 1975

Country United States
Ages 0-13

Distance of centre of gravity from the buttocks reference plane as a percentage of sitting height.

age	sex	n	mean	s.d	5th%ile	95th%ile
0-3mo	m	27	48.0	4.4	41.3	55.9
4-6mo	m	11	46.6	3.7	41.5	54.0
7-9mo	m	5	45.6	2.6	41.5	48.1
10-12mo	m	5	45.6	2.7	42.7	49.9
13-18mo	m	5	43.4	1.6	41.7	45.4
19-24mo	m	4	39.3	2.6	37.2	43.0
2-2.5	m	6	39.2	3.0	35.7	43.4
2.5-3	m	4	37.6	1.2	36.3	39.1
3-3.5	m	19	38.2	1.7	35.2	41.3
3.5-4	m	11	37.2	2.2	31.9	41.0
4-4.5	m	20	36.1	1.7	32.6	39.1
4.5-5	m	10	36.6	2.6	31.1	40.2
5.5-6	m	22	34.9	2.2	30.4	39.2
6-6.5	m	28	35.0	1.9	31.4	37.9
6.5-7	m	24	33.8	2.7	30.1	38.0
7	m	27	33.1	2.1	28.7	36.6
8	m	48	32.2	2.2	28.9	35.9
9	m	42	32.1	1.8	28.2	34.5
10	m	44	31.1	1.9	27.6	34.1
11	m	44	30.0	1.6	26.2	32.9
12	m	28	30.1	2.1	27.1	33.6
13	m	14	29.7	1.5	26.1	32.3

continued

source 2 of 2 continued

age	sex	n	mean	s.d	5th%ile	95th%ile
0-3mo	f	20	50.2	3.3	45.2	60.0
4-6mo	f	16	47.1	2.8	43.1	53.0
7-9mo	f	3	48.2	2.5	45.6	50.7
10-12mo	f	3	44.6	2.3	42.0	46.3
13-18mo	f	3	42.2	6.1	38.0	49.3
19-24mo	f	5	41.3	2.4	39.3	45.4
2-2.5	f	10	41.9	2.7	38.3	47.3
2.5-3	f	10	39.1	1.9	35.9	41.9
3-3.5	f	10	39.5	2.8	35.9	45.3
3.5-4	f	21	37.9	3.3	33.5	43.2
4-4.5	f	20	36.7	2.6	32.7	41.7
4.5-5	f	18	35.3	2.6	30.3	40.3
5.5-6	f	31	36.8	5.0	32.6	39.4
6-6.5	f	24	34.0	2.3	29.3	37.8
6.5-7	f	40	33.6	2.3	28.3	37.0
7	f	25	33.3	1.8	29.6	36.6
8	f	43	32.2	2.4	28.7	36.4
9	f	42	30.7	1.6	27.6	32.8
10	f	58	30.2	2.0	26.5	33.9
11	f	50	29.5	1.6	26.9	32.4
12	f	29	29.4	1.4	27.3	32.0
13	f	13	29.2	1.3	27.4	31.6

Section 1.2

Static Anthropometry: Head

Head breadth 8

DEFINITION

Subject sits erect with head oriented in the Frankfort Plane (looking straight ahead) and arms hanging at sides. The maximum breadth of the head above and behind the ears is measured (centimetres).

APPLICATION AND SUMMARY OF THE DATA

Two sources of data have been included to allow comparison between different countries. Of the two sources, Pheasant (1986) is probably more appropriate for use with the current UK population. Steenbekkers is the most recent data on European children and Dutch children are amongst the tallest in Europe. See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and choose between different sources. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different positions or postures (eg pushing the head through an aperture).

SEE ALSO

Ear to ear (bitracion) breadth, face breadth (bizygomatic or cheekbones), face breadth (brow ridges), jaw breadth, head length, maximum head diameter (chin to back of head)

NUMBER OF SOURCES: 2

source	reference	country	age
1	Pheasant 1988	UK	0-18
2	Steenbekkers 1993	NL	0-12



Section 1.2

Static Anthropometry: Head

Head breadth 8

source 1 of 2

Pheasant 1988

Country United Kingdom
Ages 0-18

age	sex	n	mean (cm)	sd	3rd%ile	97th%ile
0	mf		9.5	3	9.0	10.0
0-6mo	mf		11.0	7	10.0	12.0
6-12mo	mf		12.0	5	11.5	13.0
12-18mo	mf		12.0	5	11.5	13.0
18-24mo	mf		13.0	5	12.5	14.0
2	m		14.0	6	13.0	15.0
3	m		14.0	6	13.0	19.0
4	m		14.0	6	13.0	15.0
5	m		14.0	5	13.0	15.0
6	m		14.0	6	13.0	15.0
7	m		14.0	5	13.0	15.0
8	m		14.0	5	13.0	15.0
9	m		14.5	5	13.5	15.5
10	m		14.5	5	13.5	15.5
11	m		14.5	5	13.5	15.5
12	m		14.5	5	13.5	15.5
13	m		15.0	5	14.0	16.0
14	m		15.0	6	14.0	16.0
15	m		15.5	6	14.5	16.5
16	m		15.5	5	14.5	16.5
17	m		15.5	6	14.5	16.5
18	m		15.5	5	14.5	16.5

continued

source 1 of 2 continued

age	sex	n	mean (cm)	sd	3rd%ile	97th%ile
2	f		13.0	4	12.5	13.5
3	f		13.0	5	12.0	14.0
4	f		13.5	6	12.5	14.5
5	f		13.0	5	12.0	14.0
6	f		13.5	6	12.5	14.5
7	f		13.5	5	12.5	14.5
8	f		13.5	5	12.5	14.5
9	f		13.5	6	12.5	14.5
10	f		13.5	5	12.5	14.5
11	f		14.0	6	13.0	15.0
13	f		14.0	5	13.0	15.0
14	f		14.0	5	13.0	15.0
15	f		14.0	5	13.0	15.0
16	f		14.5	5	13.5	15.5
17	f		14.5	5	13.5	15.5
18	f		14.5	5	13.5	15.5

Section 1.2

Static Anthropometry: Head

Head breadth 8

source 2 of 2

Steenbekkers 1993

Country Netherlands
Ages 0-12

age	sex	n	mean (cm)	sd	5th%ile	97th%ile
0-2mo	m	16	10.5	0.6	8.9	11.2
3-5mo	m	21	11.0	0.6	9.9	11.2
6-8mo	m	22	11.8	0.5	11.0	13.2
9-11mo	m	13	11.8	0.4	11.3	12.5
12-14mo	m	15	12.3	0.4	11.7	13.2
2	m	81	13.4	0.4	12.5	14.4
3	m	97	13.6	0.5	12.8	14.7
4	m	85	13.8	0.5	12.9	14.9
5	m	86	13.9	0.5	12.9	14.8
6	m	98	14.1	0.5	13.1	15.3
7	m	106	14.2	0.5	13.3	15.4
8	m	96	14.3	0.5	13.3	15.4
9	m	122	14.4	0.5	13.5	15.3
10	m	134	14.4	0.5	13.3	15.4
11	m	143	14.6	0.6	13.5	15.7
12	m	78	14.7	0.7	13.6	16.2

continued

source 2 of 2 continued

age	sex	n	mean (cm)	sd	5th%ile	97th%ile
0-2mo	f	9	10.0	0.5	9.3	10.9
3-5mo	f	20	10.6	0.4	10.0	11.6
6-8mo	f	14	11.5	0.5	10.9	12.3
9-11mo	f	16	11.8	0.6	10.9	12.8
12-14mo	f	23	12.2	0.6	11.0	13.2
2	f	92	13.0	0.5	12.0	13.9
3	f	86	13.3	0.5	12.3	14.0
4	f	79	13.6	0.4	12.9	14.5
5	f	94	13.7	0.5	13.0	14.6
6	f	92	13.8	0.4	13.0	14.6
7	f	93	14.0	0.5	12.9	14.9
8	f	95	13.9	0.5	12.8	15.3
9	f	122	14.0	0.5	13.2	15.0
10	f	136	14.3	0.5	13.5	15.4
11	f	151	14.3	0.5	13.4	15.5
12	f	79	14.3	0.5	13.2	15.4

DEFINITION

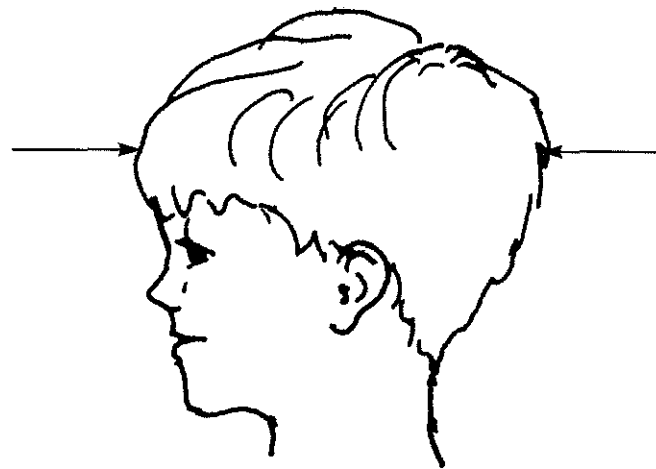
Subject sits erect with head oriented in the Frankfort Plane (looking straight ahead) and arms hanging at sides. The distance from the glabella (the most anterior ie forward protrusion of the forehead) to the opisthocranium (the most posterior ie rearward point from glabella on the back of the head) is measured (centimetres).

APPLICATION AND SUMMARY OF THE DATA

Two sources of data have been included to allow comparison between different countries. Of the two sources, Pheasant (1986) is more appropriate for use with the current UK population. Steenbekkers is the most recent data on European children and Dutch children are amongst the tallest in Europe. See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and choose between different sources. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different positions or postures (eg pushing the head through an aperture).

SEE ALSO

Head breadth, maximum head diameter (chin to back of head)

**NUMBER OF SOURCES: 2**

source	reference	country	age
1	Pheasant 1988	UK	0-18
2	Steenbekkers 1993	NL	2-12

source 1 of 2

Pheasant 1988

Country	United Kingdom					
Ages	0-18					
age	sex	n	mean (cm)	sd	5th%ile	95th%ile
0	mf		12.0	0.4	11.5	12.5
0-6mo	mf		14.0	1.1	12.0	16.0
6-12mo	mf		16.0	0.8	14.5	17.0
12-18mo	mf		16.0	0.7	15.0	17.0
18-24mo	mf		17.5	0.7	16.0	18.5
2	m		18.0	0.7	17.0	19.0
3	m		18.0	0.7	17.0	19.0
4	m		18.0	0.7	17.0	19.0
5	m		18.0	0.8	16.5	19.5
6	m		18.0	0.9	16.5	19.5
7	m		18.5	0.8	17.0	20.0
8	m		18.5	0.8	17.0	20.0
9	m		18.5	0.8	17.0	20.0
10	m		18.5	0.8	17.0	20.0
11	m		18.5	0.8	17.0	20.0
12	m		18.5	0.8	17.0	20.0
13	m		19.0	0.8	17.5	20.5
14	m		19.0	0.7	18.0	20.0
15	m		19.5	0.7	18.5	20.5
16	m		19.5	0.7	18.5	20.5
17	m		20.0	0.8	18.5	21.5
18	m		20.0	0.8	18.5	21.5

continued

source 1 of 2 continued

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2	f		16.5	0.4	16.0	17.0
3	f		16.5	0.6	15.5	17.5
4	f		16.5	0.8	15.0	18.0
5	f		16.5	0.8	15.0	18.0
6	f		17.0	0.7	16.0	18.0
7	f		17.0	0.6	16.0	18.0
8	f		17.5	0.5	16.5	18.5
9	f		17.5	0.7	16.5	18.5
10	f		17.0	0.7	16.0	18.0
11	f		17.0	0.8	15.5	18.5
12	f		17.5	0.7	16.5	18.5
13	f		17.5	0.6	16.5	18.5
14	f		17.5	0.6	16.5	18.5
15	f		18.0	0.7	17.0	19.0
16	f		18.0	0.8	16.5	19.5
17	f		18.0	0.8	16.5	19.5
18	f		18.0	0.7	17.0	19.0

Section 1.2

Static Anthropometry: Head

Head length 9

source 2 of 2

Steenbekkers 1993

Country Netherlands
Ages 2-12

age	sex	n	mean (cm)	sd	3rd%ile	97th%ile
2	m	81	17.7	0.6	16.7	18.9
3	m	97	18.0	0.7	16.5	19.1
4	m	85	18.2	0.7	16.8	19.3
5	m	86	18.5	0.7	17.5	20.1
6	m	98	18.5	0.7	17.1	20.0
7	m	106	18.7	0.6	17.6	19.8
8	m	96	18.8	0.6	17.6	20.0
9	m	122	18.9	0.6	17.4	20.1
10	m	134	19.0	0.6	18.0	20.3
11	m	143	19.2	0.7	18.1	20.4
12	m	78	19.0	0.7	17.8	20.1
2	f	92	17.2	0.7	15.8	18.4
3	f	86	17.6	0.7	15.7	18.8
4	f	79	17.9	0.6	17.0	19.0
5	f	94	18.2	0.6	16.7	19.6
6	f	92	18.4	0.6	17.4	19.4
7	f	93	18.4	0.6	17.3	19.6
8	f	95	18.4	0.6	17.2	19.6
9	f	122	18.6	0.6	17.4	19.6
10	f	136	18.9	0.7	17.8	20.4
11	f	151	18.9	0.7	17.6	20.1
12	f	79	19.0	0.7	17.6	20.1

Section 1.2

Static Anthropometry: Head

Head circumference 10

DEFINITION

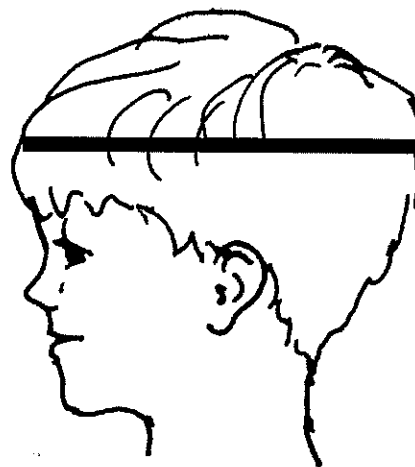
The subject stands erect, arms hanging at sides. The circumference of the head (centimetres) is measured at the level of the plane passing above the glabella (the most anterior, ie forward protrusion of the forehead) and through the opisthocranium (the most posterior, ie rearward protrusion from glabella) on the back of the head.

APPLICATION AND SUMMARY OF THE DATA

Three sources of data have been included to allow comparison between different countries. Of the two sources, BSI (1990) is probably more appropriate for use with the current UK population; Steenbekkers is the most recent data on European children and Dutch children are amongst the tallest in Europe. See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and choose between different sources. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different positions or postures (eg pushing the head through an aperture).

SEE ALSO

Maximum head diameter (chin to back of head)



NUMBER OF SOURCES: 3

source	reference	country	age
1	BSI 1990	UK	0-16
2	Snyder 1977	US	0-19
3	Steenbekkers 1993	NL	0-12

Section 1.2

Static Anthropometry: Head

Head circumference 10

source 1 of 3

BSI 1990

Country United Kingdom
Ages 0-16

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
0-3mo	mf	21	37.26	2.51	n/a	n/a
3-6mo	mf	13	42.46	1.55	n/a	n/a
6-9mo	mf	7	45.06	2.57	n/a	n/a
9-12mo	mf	10	47.38	1.42	n/a	n/a
12-15mo	mf	14	46.54	2.11	n/a	n/a
15-18mo	mf	6	47.40	1.54	n/a	n/a
18-21mo	mf	12	49.26	1.70	n/a	n/a
21-24mo	mf	10	48.27	2.42	n/a	n/a
2-2.5	mf	20	49.47	1.35	n/a	n/a
2.5-3	mf	15	50.17	1.29	n/a	n/a
3	mf	50	50.48	1.41	47.9	53.1
4	mf	49	50.67	1.85	47.8	52.9
5	m	251	51.74	1.46	49.3	54.0
6	m	346	52.05	1.56	49.5	54.5
7	m	327	52.32	1.46	50.0	54.6
8	m	330	52.76	1.47	50.3	55.1
9	m	328	53.06	1.82	50.4	55.5
10	m	354	53.56	1.53	51.0	56.0
11	m	301	53.79	1.88	51.1	56.5
12	m	335	54.01	1.68	51.5	56.5
13	m	299	54.68	2.10	52.0	57.5
14	m	269	55.18	2.23	52.5	58.0
15	m	277	55.72	1.85	52.8	58.5
16	m	84	56.10	1.74	53.7	58.4

continued

source 1 of 3 continued

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
5	f	35	50.82	1.69	47.3	53.1
6	f	35	51.64	1.39	48.7	53.6
7	f	36	52.35	1.44	49.4	54.1
8	f	35	52.43	1.68	50.0	55.2
9	f	36	52.67	1.59	49.8	55.0
10	f	36	53.35	1.53	50.2	55.7
11	f	33	53.74	1.54	50.8	56.2
12	f	34	54.01	1.49	51.3	56.2
13	f	36	54.36	5.03	47.4	57.3
14	f	37	54.62	1.56	52.5	57.2
15	f	40	54.96	1.58	52.2	57.5
16	f	22	55.55	1.91	53.0	58.7

Section 1.2

Static Anthropometry: Head

Head circumference 10

source 2 of 3

Snyder 1977Country United States
Ages 0-19

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
0-2mo	mf	30	38.50	1.90	35.40	41.20
3-5mo	mf	44	41.70	1.40	39.60	44.00
6-8mo	mf	28	43.90	1.30	42.10	45.80
9-11mo	mf	27	45.50	1.40	43.10	47.50
12-15mo	mf	29	46.60	1.40	44.10	48.50
16-19mo	mf	27	46.80	1.80	43.40	49.80
20-23mo	mf	31	47.80	1.90	44.60	50.80
2-3.5	mf	211	49.50	1.70	46.50	52.20
3.5-4.5	mf	226	50.20	1.40	47.70	52.70
4.5-5.5	mf	262	50.70	1.50	48.20	53.40
5.5-6.5	mf	219	51.10	1.60	48.50	53.70
6.5-7.5	mf	224	51.50	1.60	48.70	53.90
7.5-8.5	mf	188	52.20	1.60	49.50	54.80
8.5-9.5	mf	250	52.30	1.60	49.40	54.50
9.5-10.5	mf	249	52.80	1.60	49.80	55.20
10.5-11.5	mf	280	53.20	1.70	50.30	56.20
11.5-12.5	mf	285	53.50	1.70	50.70	56.20
12.5-13.5	mf	311	54.00	1.70	51.10	57.00
13.5-14.5	mf	271	54.50	1.80	51.70	57.60
14.5-15.5	mf	261	54.90	1.80	52.10	57.90
15.5-16.5	mf	196	55.40	2.10	52.30	58.70
16.5-17.5	mf	220	55.60	1.90	52.20	58.50
17.5-19	mf	154	56.00	2.10	52.70	55.80

source 3 of 3

Steenbekkers 1993Country Netherlands
Ages 0-12

age	sex	n	mean (cm)	sd	3rd%ile	97th%ile
0-2mo	m	16	40.2	1.1	38.6	42.1
3-5mo	m	21	42.4	1.9	39.0	45.6
6-8mo	m	22	45.2	1.1	42.5	47.3
9-11mo	m	13	46.2	0.9	45.0	48.2
12-14mo	m	15	47.9	1.4	45.4	49.9
2	m	81	50.8	1.3	48.8	53.4
3	m	97	51.5	1.4	48.7	53.9
4	m	85	51.8	1.2	49.4	53.8
5	m	86	52.4	1.3	50.3	54.9
6	m	98	52.9	1.4	50.3	55.8
7	m	106	53.1	1.2	51.0	55.4
8	m	96	53.4	1.4	51.0	55.9
9	m	122	54.0	1.3	51.5	56.8
10	m	134	54.2	1.4	51.4	57.1
11	m	143	54.8	1.5	52.0	58.0
12	m	78	54.6	1.9	51.5	59.0
0-2mo	f	9	38.5	1.6	35.8	41.0
3-5mo	f	20	40.5	1.3	38.7	43.5
6-8mo	f	14	44.2	1.0	42.4	46.3
9-11mo	f	16	45.8	1.2	44.0	48.0
12-14mo	f	23	46.4	1.1	44.0	48.2
2	f	92	49.3	1.5	46.5	51.6
3	f	86	50.4	1.5	46.6	53.5
4	f	79	51.0	1.3	48.8	53.8
5	f	94	51.6	1.4	48.6	54.9
6	f	92	52.2	1.3	49.7	54.4
7	f	93	52.4	1.4	49.7	54.7
8	f	95	52.4	1.4	49.2	55.2
9	f	122	52.9	1.4	49.8	55.7
10	f	136	53.9	1.5	51.7	56.9
11	f	151	53.8	1.6	50.8	57.2
12	f	79	53.9	1.5	51.6	56.3

DEFINITION

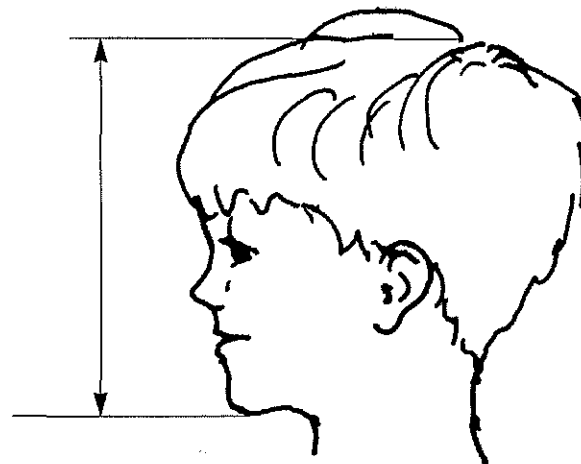
The subject sits erect with head oriented in the Frankfort Plane (looking straight ahead) and arms hanging at sides. The height of the head from the menton (bottom of the chin) to the vertex (the top of the head) is measured (centimetres).

APPLICATION AND SUMMARY OF THE DATA

Two sources of data have been included to allow comparison between different countries. Of the two sources, (Snyder 1977) is probably more appropriate for use with the current UK population. Steenbekkers is the most recent data on European children and Dutch children are amongst the tallest in Europe. See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and choose between different sources. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different positions or postures (eg pushing the head through an aperture).

SEE ALSO

Maximum head diameter (chin to back of head), face height, face height (bridge of nose - chin)

**NUMBER OF SOURCES: 2**

source	reference	country	age
1	Snyder 1977	UK	2-19
2	Steenbekkers 1993	NL	2-12

Section 1.2Static Anthropometry: Head

Head height 11

source 1 of 2

Snyder 1977

Country	United States					
Ages	2-19					
age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2-3.5	mf	73	17.30	1.00	15.70	17.30
3.5-4.5		70	17.90	0.90	16.50	17.70
4.5-5.5		93	17.90	0.80	16.60	17.80
5.5-6.5		62	18.40	1.00	16.50	18.40
6.5-7.5		63	18.70	1.00	17.10	18.70
7.5-8.5		60	18.80	1.00	17.20	18.90
8.5-9.5		79	19.00	0.90	17.50	19.00
9.5-10.5		91	19.50	0.90	18.00	19.50
10.5-11.5		98	19.90	1.00	18.40	19.80
11.5-12.5		93	20.00	1.00	18.40	19.90
12.5-13.5		107	20.30	1.00	18.30	20.20
13.5-14.5		99	20.60	1.00	19.10	20.40
14.5-15.5		95	20.80	1.20	19.10	20.70
15.5-16.5		56	21.30	1.20	19.40	21.20
16.5-17.5		80	21.20	1.10	19.20	21.00
17.5-19		45	21.40	1.40	19.00	21.30

source 2 of 2

Steenbekkers 1993

Country	Netherlands					
Ages	2-12					
age	sex	n	mean (cm)	sd	3rd%ile	97th%ile
2	m	81	17.6	1.1	15.7	19.8
3	m	97	18.5	1.1	16.5	20.6
4	m	85	19.0	1.1	16.4	21.1
5	m	86	19.8	1.1	18.2	22.0
6	m	98	19.9	1.1	17.9	22.0
7	m	106	20.4	1.1	18.3	22.3
8	m	96	20.5	1.0	18.5	22.4
9	m	122	20.8	1.1	18.9	22.8
10	m	134	21.2	1.0	19.4	22.9
11	m	143	21.5	1.0	19.5	23.3
12	m	78	21.6	1.0	19.9	23.8
2	f	92	17.2	1.2	15.4	19.5
3	f	86	17.8	1.1	15.7	19.9
4	f	79	18.6	1.1	16.4	20.4
5	f	94	19.3	1.0	17.4	20.8
6	f	92	19.3	1.0	17.5	21.3
7	f	93	19.6	1.0	17.2	21.7
8	f	95	20.0	0.9	18.0	21.6
9	f	122	20.1	1.0	18.1	21.8
10	f	136	20.6	1.0	18.7	22.1
11	f	151	20.8	1.0	18.8	22.7
12	f	79	20.9	1.1	19.0	23.1

Section 1.2

Static Anthropometry: Head

Maximum head diameter (chin to back of head) 12

DEFINITION

The subject stands erect with head in the Frankfort plane (looking straight ahead) and jaws closed. The rectilinear distance from the chin to the crown of the head is measured (centimetres).

APPLICATION AND SUMMARY OF THE DATA

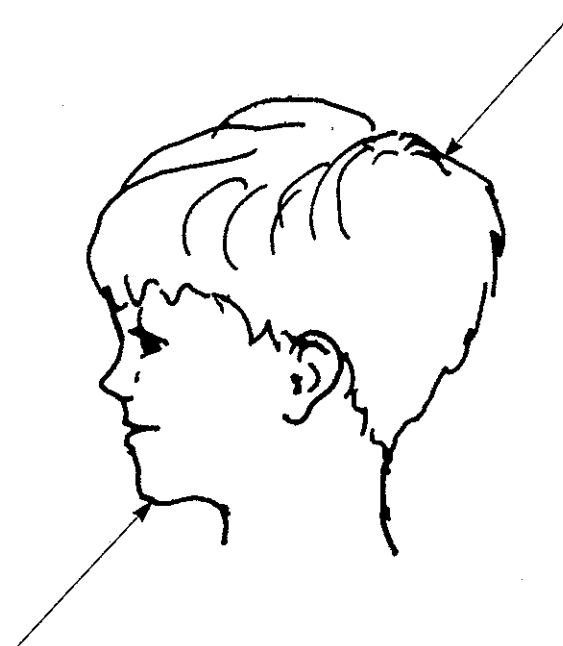
Two sources of data have been included to allow comparison between different countries. Of the two sources, Schneider (1986) is probably more appropriate for use with the current UK population. Steenbekkers is the most recent data on European children; Dutch children are amongst the tallest in Europe. See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and choose between different sources. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different positions or postures (eg pushing the head through an aperture).

SEE ALSO

Head length, head circumference, head height, head breadth

NUMBER OF SOURCES: 2

source	reference	country	age
1	Steenbekkers 1993	NL	2-12
2	Schneider 1985	US	0-4



Section 1.2

Static Anthropometry: Head

Maximum head diameter (chin to back of head)

12

source 1 of 2

Steenbekkers 1993

Country Netherlands
Ages 2-12

age	sex	n	mean (cm)	sd	3rd%ile	97th%ile
2	m	81	20.8	0.6	19.7	22.1
3	m	97	21.4	0.7	20.0	22.7
4	m	85	21.7	0.6	20.8	22.8
5	m	86	22.2	0.7	20.9	23.8
6	m	98	22.4	0.6	21.4	23.6
7	m	106	22.7	0.7	21.4	24.0
8	m	96	22.9	0.7	21.6	24.2
9	m	122	23.3	0.7	22.1	24.8
10	m	134	23.5	0.8	22.2	25.1
11	m	143	23.9	0.7	22.7	25.3
12	m	78	24.0	0.8	22.7	25.6
2	f	92	20.3	0.6	19.2	21.5
3	f	86	20.8	0.7	19.5	22.0
4	f	79	21.3	0.6	20.4	22.6
5	f	94	21.7	0.7	20.7	23.0
6	f	92	22.1	0.6	21.2	23.5
7	f	93	22.3	0.7	21.0	23.6
8	f	95	22.5	0.7	21.3	23.8
9	f	122	22.9	0.7	21.6	24.2
10	f	136	23.3	0.7	22.1	24.7
11	f	151	23.4	0.8	22.0	24.8
12	f	79	23.6	0.8	22.3	25.2

source 2 of 2

Schneider 1985

Country USA
Ages 0-4

age	sex	n	mean (cm)	sd	5th	95th
0-3mo	mf	30	16.1	0.6	14.8	17.0
4-6mo	mf	30	17.7	0.7	16.2	18.6
7-9mo	mf	30	18.0	0.7	16.3	19.1
10-12mo	mf	30	18.9	0.7	17.7	20.0
13-18mo	mf	30	19.3	0.7	18.2	20.5
19-24mo	mf	30	19.8	0.6	18.6	20.5
25-30mo	mf	30	20.3	0.8	18.8	21.6
31-36mo	mf	30	20.5	0.6	19.2	21.1
37-42mo	mf	30	20.9	0.7	20.0	21.9
43-48mo	mf	30	21.0	0.7	19.6	22.0

Section 1.2

Static Anthropometry: Head

Ear to ear (bitracion) breadth 13

DEFINITION

The subject sits erect with head oriented in the Frankfort Plane (looking straight ahead) and arms hanging at sides. The distance from the right to the left trigion ((the cartilaginous or fleshy projection in front of the entrance to the ear) is measured using sliding callipers (centimetres).

APPLICATION AND SUMMARY OF THE DATA

See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and the validity of USA data for the current UK population. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different positions or postures (eg pushing the head or face through an aperture).

SEE ALSO

Head breadth, face breadth (bizygomatic or cheekbones), face breadth (brow ridges), jaw breadth

NUMBER OF SOURCES: 1

source	reference	country	age
1	Snyder 1977	US	2-19



Section 1.2

Static Anthropometry: Head

Ear to ear (bitracion) breadth 13

source 1 of 1

Snyder 1977

Country United States
Ages 2-19

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2-3.5	mf	71	10.40	0.50	9.50	11.20
3.5-4.5		71	10.70	0.40	10.00	11.40
4.5-5.5		94	10.90	0.50	10.10	11.80
5.5-6.5		61	11.10	0.50	10.30	11.80
6.5-7.5		63	11.50	0.60	10.40	12.40
7.5-8.5		60	11.50	0.50	10.70	12.30
8.5-9.5		79	11.60	0.50	10.70	12.50
9.5-10.5		93	11.80	0.50	10.90	12.50
10.5-11.5		99	12.00	0.60	11.00	13.00
11.5-12.5		92	12.10	0.50	11.10	12.90
12.5-13.5		107	12.30	0.50	11.50	13.20
13.5-14.5		99	12.50	0.60	11.60	13.40
14.5-15.5		95	12.60	0.50	11.70	13.50
15.5-16.5		56	12.80	0.50	11.90	13.60
16.5-17.5		80	12.80	0.50	11.80	13.70
17.5-19		47	12.80	0.50	11.90	13.70

DEFINITION

The subject sits erect with head oriented in the Frankfort Plane (looking straight ahead) and arms hanging at sides. The maximum horizontal breadth of the face between the cheekbones (the zygomatic arches) is measured (centimetres).

APPLICATION AND SUMMARY OF THE DATA

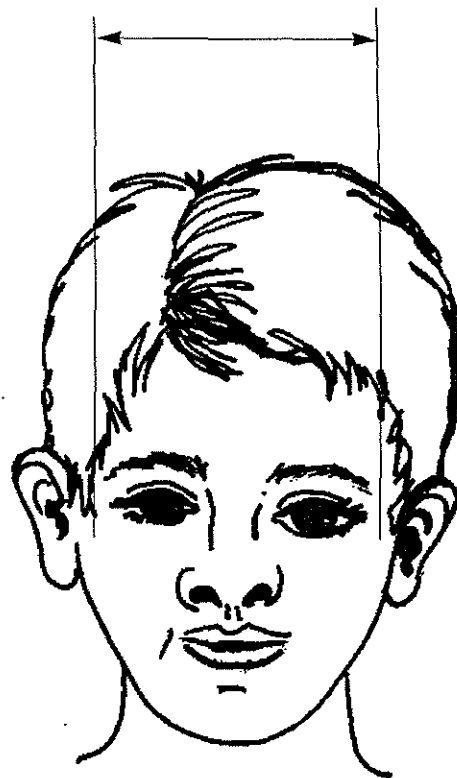
See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and the validity of USA data for the current UK population. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different positions or postures (eg pushing the head or face through an aperture).

SEE ALSO

Ear to ear (bitragion) breadth, head breadth, face breadth (brow ridges), jaw breadth

NUMBER OF SOURCES: 1

source	reference	country	age
1	Snyder 1977	US	2-19



Section 1.2 Static Anthropometry: Face**Face breadth, bizygomatic (cheekbones) 14**

source 1 of 1

Snyder 1977**Country** United States
Ages 2-19

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2-3.5	mf	77	10.80	0.50	9.90	11.70
3.5-4.5		71	11.20	0.60	10.20	11.10
4.5-5.5		94	11.30	0.60	10.40	11.20
5.5-6.5		62	11.60	0.60	10.40	11.50
6.5-7.5		63	11.90	0.60	10.90	11.90
7.5-8.5		60	11.90	0.50	11.00	11.80
8.5-9.5		79	12.10	0.50	11.10	12.00
9.5-10.5		92	12.20	0.50	11.30	12.10
10.5-11.5		98	12.40	0.60	11.30	12.40
11.5-12.5		94	12.60	0.60	11.70	12.40
12.5-13.5		107	12.70	0.60	11.80	12.70
13.5-14.5		98	13.00	0.60	11.80	13.00
14.5-15.5		95	13.10	0.50	12.30	13.00
15.5-16.5		56	13.40	0.60	12.40	13.30
16.5-17.5		80	13.40	0.60	12.40	13.30
17.5-19		46	13.41	0.60	12.40	13.60

DEFINITION

The subject sits erect with head oriented in the Frankfort Plane (looking straight ahead) and arms hanging at sides. The horizontal distance across the bony ends of the brow ridges is measured (centimetres).

APPLICATION AND SUMMARY OF THE DATA

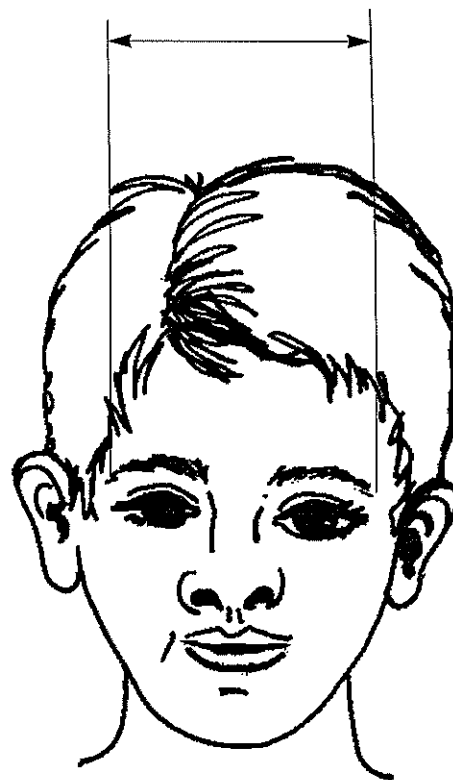
See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and the validity of USA data for the current UK population. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different positions or postures (eg pushing the head or face through an aperture).

SEE ALSO

Head breadth, face breadth (bizygomatic or cheekbones), jaw breadth, ear to ear (bitragon) breadth

NUMBER OF SOURCES: 1

source	reference	country	age
1	Snyder 1977	US	2-19



Section 1.2 Static Anthropometry: Face

Face breadth, frontal (brow ridges) 15

source 1 of 1

Snyder 1977

Country United States
Ages 2-19

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2-3.5	mf	77	8.30	0.60	7.30	9.20
3.5-4.5		71	8.50	0.80	6.90	9.50
4.5-5.5		94	8.60	0.80	7.00	9.70
5.5-6.5		62	8.80	0.70	7.50	9.70
6.5-7.5		63	9.10	0.70	7.80	10.20
7.5-8.5		60	9.00	0.60	7.50	9.90
8.5-9.5		79	9.30	0.70	7.90	10.40
9.5-10.5		62	9.30	0.70	7.70	10.30
10.5-11.5		99	9.40	0.80	7.90	10.70
11.5-12.5		94	9.50	0.70	8.30	10.50
12.5-13.5		107	9.70	0.60	8.50	10.60
13.5-14.5		98	9.80	0.60	8.70	10.70
14.5-15.5		95	10.00	0.60	8.90	11.00 ⁺
15.5-16.5		56	10.20	0.60	9.10	11.30
16.5-17.5		80	10.30	0.60	9.20	11.20
17.5-19		47	10.40	0.70	9.30	11.20

DEFINITION

The subject is placed or held in seated position. The maximum breadth (centimetres) at the lowest and widest points on the jaw bone (mandible) is measured (between the left and right gonion).

APPLICATION AND SUMMARY OF THE DATA

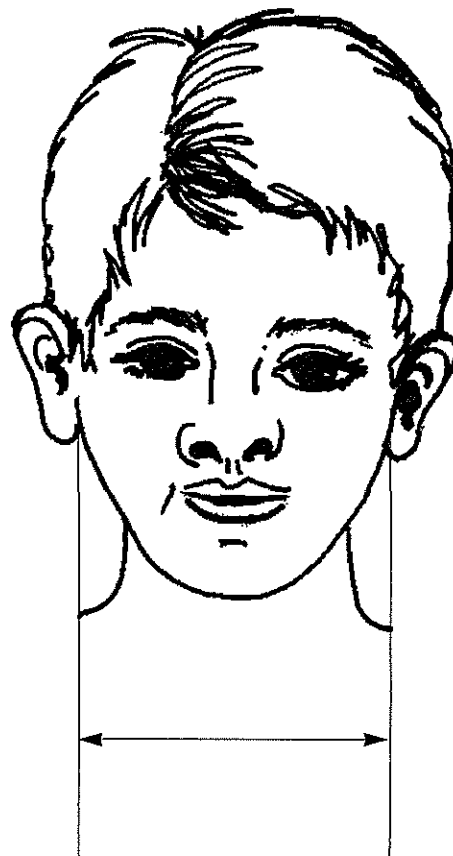
See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and the validity of USA data for the current UK population. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different positions or postures (eg pushing the head or face through an aperture).

SEE ALSO

Head breadth, ear to ear (bitracion) breadth, face breadth (bizygomatic or cheekbones), face breadth (brow ridges), neck breadth,

NUMBER OF SOURCES: 1

source	reference	country	age
1	Schneider 1985	US	0-4



Section 1.2 Static Anthropometry: Face

Jaw breadth 16

source 1 of 1

Schneider 1985

Country USA
Ages 0-4

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
0-3mo	mf	30	6.9	0.5	5.7	7.5
4-6	mf	30	7.6	0.6	5.8	8.4
7-9	mf	30	7.5	0.6	6.2	8.2
10-12	mf	30	7.6	0.5	6.7	8.2
13-18	mf	30	8.1	0.6	6.0	8.9
19-24	mf	30	7.7	0.5	6.6	8.1
25-30	mf	30	8.2	0.4	7.5	8.6
31-36	mf	30	8.1	0.5	7.0	8.7
37-42	mf	30	8.0	0.7	6.5	9.0
43-48	mf	30	8.4	0.4	7.6	9.0

DEFINITION

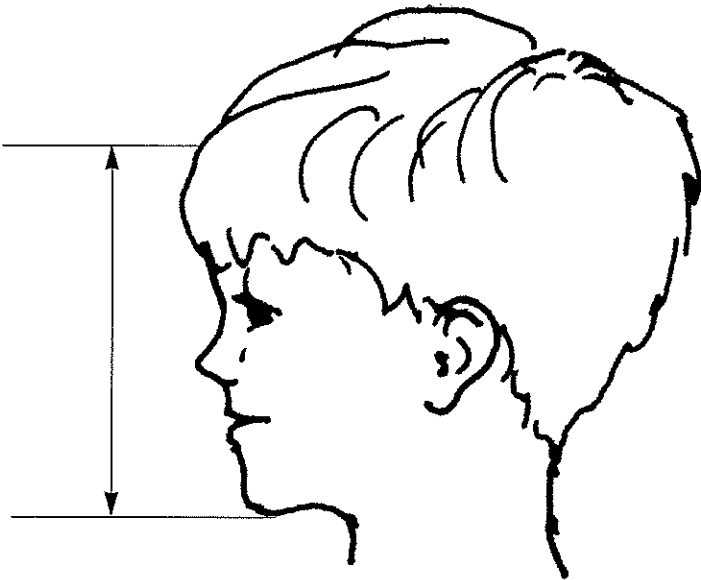
The subject sits erect with head oriented in the Frankfort Plane (looking straight ahead) and arms hanging at sides. The vertical distance of the face from the menton (the bottom of the chin) to the crinion (the top of the brow) is measured (centimetres).

APPLICATION AND SUMMARY OF THE DATA

See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and the validity of USA data for the current UK population. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different positions or postures (eg pushing the head or face through an aperture).

SEE ALSO

Head height, face height (bridge of nose - chin),



NUMBER OF SOURCES: 1

source	reference	country	age
1	Snyder 1977	US	2-19

Section 1.2

Static Anthropometry: Face

Face height 17

source 1 of 1

Snyder 1977

Country United States
Ages 2-19

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2-3.5	mf	76	8.10	0.50	7.30	8.90
3.5-4.5		70	8.50	0.50	7.70	9.20
4.5-5.5		93	8.70	0.50	7.90	9.60
5.5-6.5		62	8.90	0.50	8.00	9.60
6.5-7.5		63	9.20	0.60	8.30	10.20
7.5-8.5		60	9.30	0.50	8.40	10.10
8.5-9.5		79	9.70	0.60	8.70	10.60
9.5-10.5		93	9.80	0.50	9.00	10.70
10.5-11.5		99	10.10	0.60	9.00	11.10
11.5-12.5		94	10.20	0.60	9.30	11.10
12.5-13.5		107	10.50	0.60	9.50	11.60
13.5-14.5		98	10.80	0.60	9.80	11.80
14.5-15.5		95	10.90	0.70	9.80	12.10
15.5-16.5		56	11.20	0.60	9.90	12.00
16.5-17.5		80	11.00	0.70	10.00	12.20
17.5-19		47	11.40	0.90	9.90	12.80

DEFINITION

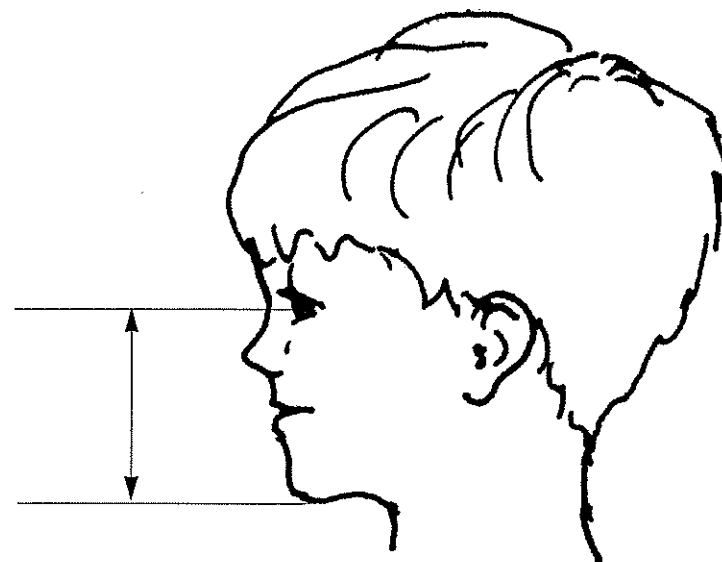
The subject sits erect with head oriented in the Frankfort Plane (looking straight ahead) and arms hanging at sides. The vertical distance of the lower face from the menton (the bottom of the chin) to the sellion (the depression at the bridge of the nose) is measured (centimetres).

APPLICATION AND SUMMARY OF THE DATA

See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and the validity of USA data for the current UK population. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different positions or postures (eg pushing the head or face through an aperture).

SEE ALSO

Face height, head height, nose length

**NUMBER OF SOURCES: 1**

source	reference	country	age
1	Snyder 1977	US	2-19

Section 1.2

Static Anthropometry: Face

Face height (bridge of nose to chin) to

source 1 of 1

Snyder 1977

Country United States
Ages 2-19

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2-3.5	mf	76	8.10	0.50	7.30	8.90
3.5-4.5		70	8.50	0.50	7.70	9.20
4.5-5.5		93	8.70	0.50	7.90	9.60
5.5-6.5		62	8.90	0.50	8.00	9.60
6.5-7.5		63	9.20	0.60	8.30	10.20
7.5-8.5		60	9.30	0.50	8.40	10.10
8.5-9.5		79	9.70	0.60	8.70	10.60
9.5-10.5		93	9.80	0.50	9.00	10.70
10.5-11.5		99	10.10	0.60	9.00	11.10
11.5-12.5		94	10.20	0.60	9.30	11.10
12.5-13.5		107	10.50	0.60	9.50	11.60
13.5-14.5		98	10.80	0.60	9.80	11.80
14.5-15.5		95	10.90	0.70	9.80	12.10
15.5-16.5		56	11.20	0.60	9.90	12.00
16.5-17.5		80	11.00	0.70	10.00	12.20
17.5-19		47	11.40	0.90	9.90	12.80

DEFINITION

The subject stands erect with their head oriented in the Frankfort Plane (looking straight ahead) and with arms hanging at sides. The vertical distance from the floor to the external canthus (outer corner) of the eye is measured (centimetres).

APPLICATION AND SUMMARY OF THE DATA

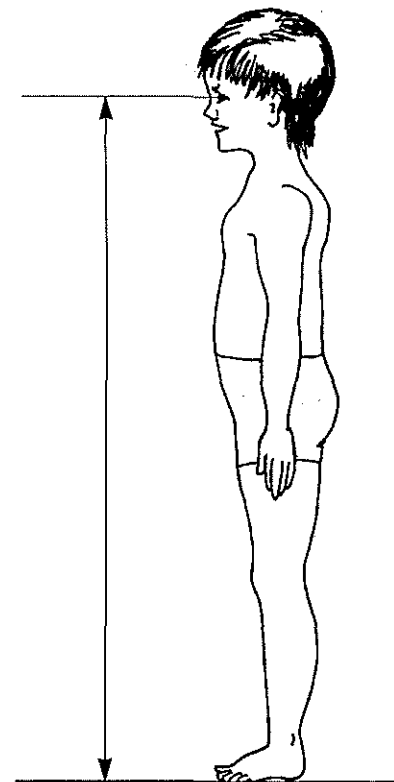
Two sources of data have been included to allow comparison between different countries. Of the two sources, Pheasant (1986) is probably more appropriate for use with the current UK population. Steenbekkers is the most recent data on European children and Dutch children are amongst the tallest in Europe. See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and choose between different sources. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different positions or postures (eg stretching or twisting the head or neck to reach maximum stature).

SEE ALSO

Eye height (seated)

NUMBER OF SOURCES: 2

source	reference	country	age
1	Pheasant 1988	UK	2-18
2	Steenbekkers 1989	NL	1-5.5



source 1 of 2

Pheasant 1988

Country United Kingdom
Ages 2-18

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2	m		84.0	4.9	76.0	92.0
3	m		89.0	4.8	81.0	97.0
4	m		94.0	4.7	86.5	101.5
5	m		99.5	5.3	91.0	108.0
6	m		105.0	6.0	95.0	115.0
7	m		111.5	5.7	102.0	121.0
8	m		116.5	5.9	107.0	126.0
9	m		111.0	6.4	100.5	121.5
10	m		127.5	5.8	118.0	137.0
11	m		131.5	6.2	121.5	141.5
12	m		137.5	7.8	124.5	150.5
13	m		143.5	9.0	128.5	158.5
14	m		151.0	9.1	136.0	166.0
15	m		157.0	8.4	143.0	171.0
16	m		161.0	6.7	150.0	172.0
17	m		163.5	6.5	153.0	174.0
18	m		165.0	5.9	155.5	174.5

continued

source 1 of 2 continued

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2	f		80.5	4.8	72.5	88.5
3	f		87.5	5.5	78.5	96.5
4	f		94.5	6.2	84.5	104.5
5	f		99.0	6.4	88.5	109.5
6	f		104.5	6.7	93.5	115.5
7	f		110.5	6.6	99.5	121.5
8	f		116.5	5.8	107.0	126.0
9	f		121.5	6.7	110.5	132.5
10	f		127.5	7.2	115.5	139.5
11	f		132.5	7.8	119.5	145.5
12	f		138.5	8.0	125.5	151.5
13	f		143.5	7.4	131.5	155.5
14	f		147.5	6.6	136.5	158.5
15	f		149.5	6.2	139.5	159.5
16	f		151.0	6.0	141.0	161.0
17	f		151.5	5.8	142.0	161.0
18	f		152.0	5.5	143.0	161.0

Section 1.2

Static Anthropometry: Face

Eye height (from floor) 19

source 2 of 2

50

Steenbekkers 1989

Country Netherlands
Ages 1-5.5

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
1-1.5	mf	33	70.10	3.80	64.30	75.20
1.5-2	mf	80	74.50	2.90	70.40	79.40
2-2.5	mf	62	78.90	3.70	73.50	85.00
2.5-3	mf	59	83.10	3.20	77.50	88.50
3-3.5	mf	75	87.50	4.00	81.30	93.70
3.5-4	mf	58	91.30	3.10	84.90	97.00
4-4.5	mf	46	96.30	4.50	89.60	103.90
4.5-5	mf	28	98.90	4.90	92.90	108.20
5-5.5	mf	13	101.50	4.70	91.80	108.50

Section 1.2

Static Anthropometry: Face

Eye height (seated) 20

DEFINITION

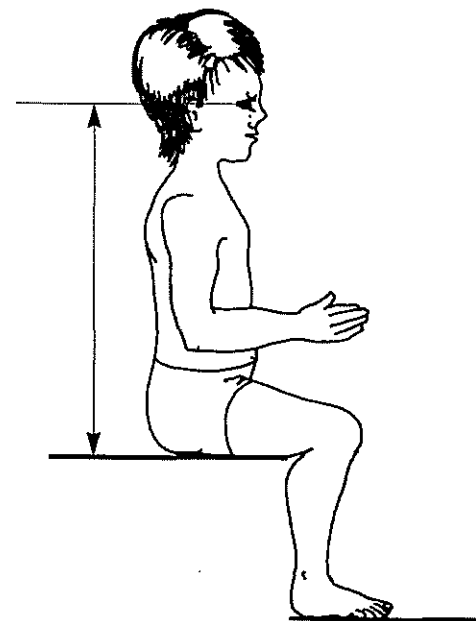
Subject sits erect with head oriented in the Frankfort Plane, arms hanging at sides. The vertical distance from the sitting surface to the external canthus (outer corner) of the eye is measured (centimetres).

APPLICATION AND SUMMARY OF THE DATA

Two sources of data have been included to allow comparison between different countries. Of the two sources, Pheasant (1986) is probably more appropriate for use with the current UK population. Steenbekkers is the most recent data on European children and Dutch children are amongst the tallest in Europe. See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and choose between different sources. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different positions or postures (eg stretching or twisting the head or neck to reach maximum stature).

SEE ALSO

Eye height (from floor)



NUMBER OF SOURCES: 2

source	reference	country	age
1	Pheasant 1988	UK	2-18
2	Steenbekkers 1993	NL	2-12

source 1 of 2

Pheasant 1988

Country United Kingdom
Ages 2-18

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2	m		44.5	2.0	41.0	48.0
3	m		46.5	2.4	42.5	61.0
4	m		48.5	2.8	44.0	53.0
5	m		50.5	2.9	45.5	55.5
6	m		52.5	3.1	47.5	57.5
7	m		55.0	2.8	50.5	59.5
8	m		57.0	3.1	52.0	62.0
9	m		58.5	3.3	53.0	64.0
10	m		60.0	2.9	55.0	65.0
11	m		62.0	2.8	57.5	66.5
12	m		65.0	3.7	59.0	71.0
13	m		68.0	4.7	60.5	75.5
14	m		72.0	4.8	64.0	80.0
15	m		75.5	4.7	68.0	83.0
16	m		78.5	3.5	72.5	84.5
17	m		79.5	3.1	74.5	84.5
18	m		80.0	3.2	74.5	85.5

continued

source 1 of 2 continued

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2	f		41.0	2.4	37.0	45.0
3	f		44.5	2.8	40.0	49.0
4	f		48.0	3.2	42.5	53.5
5	f		50.0	3.1	45.0	55.0
6	f		52.5	3.2	47.0	58.0
7	f		55.5	3.2	50.0	61.0
8	f		58.0	3.2	52.5	63.5
9	f		59.5	3.3	54.0	65.0
10	f		61.5	3.5	55.5	67.5
11	f		63.5	3.9	57.0	70.0
12	f		66.5	4.0	60.0	73.0
13	f		69.5	3.9	63.0	76.0
14	f		72.0	3.7	66.0	78.0
15	f		73.5	3.3	68.0	79.0
16	f		74.0	3.2	68.5	79.5
17	f		74.0	3.0	69.0	79.0
18	f		74.5	3.0	69.5	79.5

Section 1.2

Static Anthropometry: Face

Eye height (seated) 20

source 2 of 2

Steenbekkers 1993Country Netherlands
Ages 2-12

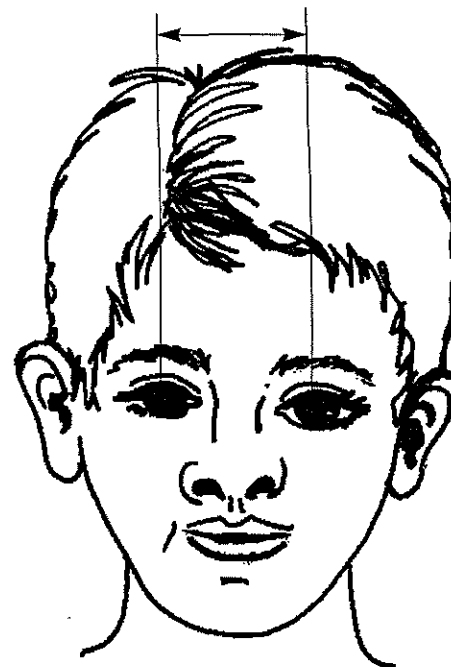
age	sex	n	mean (cm)	sd	3rd%ile	97th%ile
2	m	81	45.1	2.5	40.8	50.0
3	m	97	47.6	2.3	43.6	52.0
4	m	85	49.7	2.9	44.0	54.7
5	m	86	53.1	2.3	49.6	57.6
6	m	98	55.3	2.8	50.3	61.2
7	m	106	57.8	2.9	52.9	63.6
8	m	96	59.4	2.6	54.5	63.6
9	m	122	62.9	2.7	58.0	68.5
10	m	134	64.3	3.7	56.9	72.0
11	m	143	66.4	3.6	59.4	73.4
12	m	78	68.7	3.9	61.6	76.3
2	f	92	44.6	2.3	40.8	49.0
3	f	86	46.7	2.7	42.4	52.0
4	f	79	49.6	2.2	46.2	54.2
5	f	94	52.6	2.9	46.6	56.9
6	f	92	55.0	2.6	50.2	60.9
7	f	93	57.9	2.7	52.5	62.1
8	f	95	60.1	2.9	53.6	65.6
9	f	122	61.8	3.3	55.8	67.4
10	f	136	65.0	3.4	58.6	71.7
11	f	151	66.8	3.8	60.0	74.8
12	f	79	69.3	3.9	62.1	75.7

DEFINITION

The horizontal distance between the centres of the pupils of the eyes with the subject looking straight ahead (centimetres).

APPLICATION AND SUMMARY OF THE DATA

See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and the validity of German data for the current UK population.

**NUMBER OF SOURCES: 1**

source	reference	country	age
1	DIN 1981	D	3-17

Section 1.2

Static Anthropometry: Face

Eye separation (interpupillary distance) 21

source 1 of 1

DIN 1981

Country Germany
Ages 3-17

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
3	m		4.5		4.0	5.0
4	m		4.6		4.1	5.5
5	m		4.9		4.4	5.6
6	m		5.0		4.5	5.6
7	m		5.1		4.7	5.7
8	m		5.2		4.7	5.7
9	m		5.2		4.8	5.8
10	m		5.3		4.8	5.8
11	m		5.4		4.9	5.8
12	m		5.4		4.9	6.1
13	m		5.7		5.0	6.3
14	m		6.1		5.1	6.8
15	m		6.1		5.2	6.8
16-17	m		6.2		5.5	6.8
3	f		4.5		4.0	5.0
4	f		4.6		4.1	5.5
5	f		4.9		4.4	5.6
6	f		5.0		4.5	5.6
7	f		5.1		4.7	5.7
8	f		5.2		4.7	5.7
9	f		5.2		4.8	5.8
10	f		5.3		4.8	5.8
11	f		5.4		4.6	6.0
12	f		5.4		4.6	6.1
13	f		5.5		4.6	6.1
14	f		5.5		4.7	6.6
15	f		5.8		4.9	6.7
16-17	f		6.1		4.9	6.8

Section 1.2

Static Anthropometry: Face

Mouth breadth 22

DEFINITION

The subject sits erect with the head oriented in the Frankfort Plane (looking straight ahead) and arms hanging at sides. With the mouth relaxed the horizontal distance between the angles of the mouth at the point where the mucous membrane joins the skin is measured (centimetres).

APPLICATION AND SUMMARY OF THE DATA

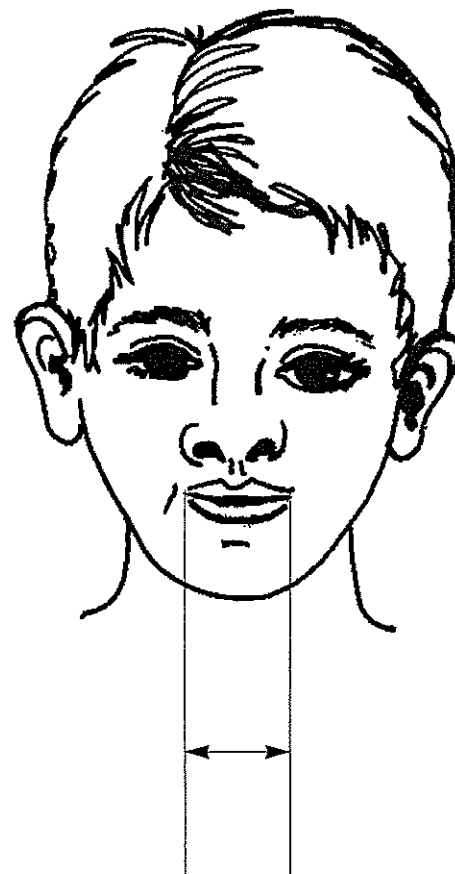
See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and the validity of USA data for the current UK population.

SEE ALSO

Mouth opening (between incisors)

NUMBER OF SOURCES: 1

source	reference	country	age
1	Snyder 1977	US	2-19



Section 1.2

Static Anthropometry: Face

Mouth breadth 22

source 1 of 1

Snyder 1977

Country United States
Ages 2-19

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2-3.5	mf	75	3.30	0.40	2.70	3.80
3.5-4.5		71	3.40	0.40	2.80	3.90
4.5-5.5		94	3.60	0.40	3.00	4.10
5.5-6.5		62	3.70	0.40	3.00	4.30
6.5-7.5		63	3.80	0.40	3.10	4.40
7.5-8.5		60	3.90	0.40	3.30	4.40
8.5-9.5		79	4.00	0.40	3.40	4.70
9.5-10.5		93	4.00	0.40	3.30	4.70
10.5-11.5		99	4.10	0.50	3.40	4.90
11.5-12.5		94	4.20	0.40	3.60	4.90
12.5-13.5		107	4.20	0.40	3.50	4.90
13.5-14.5		99	4.40	0.50	3.60	5.20
14.5-15.5		95	4.50	0.40	3.80	5.00
15.5-16.5		56	4.60	0.50	3.80	5.40
16.5-17.5		80	4.60	0.40	3.80	5.10
17.5-19		47	4.70	0.40	4.00	5.40

DEFINITION

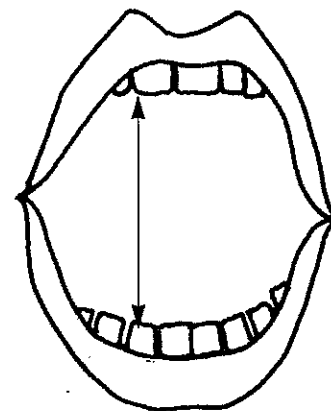
The maximum vertical distance (millimetres) measured between the incisors (front teeth) with the jaws open as wide as possible.

APPLICATION AND SUMMARY OF THE DATA

Two sources of data have been included to allow comparison between different countries. See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and the validity of USA data for the current UK population.

SEE ALSO

Mouth breadth

**NUMBER OF SOURCES: 2**

source	reference	country	age
1	Krogman 1971	US	3-6
2	Bakke 1990	Den	3-6

Section 1.2

Static Anthropometry: Face

Mouth opening (between incisors) 23

source 1 of 2

Krogman 1971

Country USA
Ages 3-6
sample 1803

The maximum opening of the mouth was measured by asking the child to open the jaws as widely as possible. The maximum distance between the incisal margins of the upper and lower front teeth was measured with sliding calipers. The report presents the results according to race and geographical location. The results presented here are from a 'negro sample measured in California' and which represent the maximum results. The results include 5.6mm added for the thickness of the caliper arms.

age	sex	n	mean (mm)	sd	min	max
3	m	49	36.0	5.39	22	47
4	m	67	37.3	5.47	22	52
5	m	56	39.9	4.02	27	47
6	m	40	43.2	4.67	32	52
3	f	41	35.6	4.51	32	42
4	f	56	37.5	5.60	22	47
5	f	51	39.5	4.86	27	47
6	f	44	42.9	6.15	32	52

source 2 of 2

Bakke 1990

Country Denmark
Ages 3-6
Sample 37

The maximum jaw opening was measured with a ruler. The report presents the results according to age ranges only.

age	sex	n	mean (mm)	sd
5-10	mf	17	50.9	5.9
11-20	m	10	59.6	6.9
11-20	f	10	51.4	6.2

DEFINITION

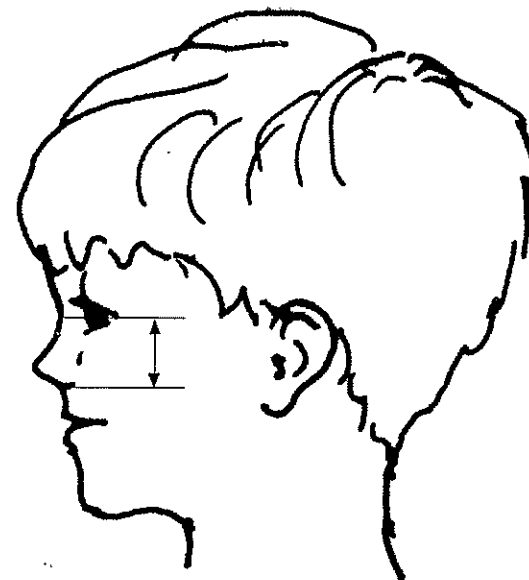
The subject sits erect with the head oriented in the Frankfort Plane (looking straight ahead) and arms hanging at sides. The vertical distance from the point where the nose joins the face (the subnasal) to the depression at the top of the nose (the sellion) is measured (centimetres).

APPLICATION AND SUMMARY OF THE DATA

See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and the validity of USA data for the current UK population.

SEE ALSO

Face height (bridge of nose - chin)

**NUMBER OF SOURCES: 1**

source	reference	country	age
1	Snyder 1977	US	2-19

source 1 of 1

Snyder 1977

Country United States
Ages 2-19

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2-3.5	mf	77	2.90	0.30	2.30	3.30
3.5-4.5		71	3.20	0.30	2.70	3.70
4.5-5.5		94	3.40	0.30	2.70	3.80
5.5-6.5		61	3.50	0.40	2.80	4.00
6.5-7.5		63	3.70	0.40	3.20	4.40
7.5-8.5		60	3.70	0.30	3.00	4.20
8.5-9.5		79	4.00	0.30	3.40	4.50
9.5-10.5		93	4.10	0.30	3.60	4.60
10.5-11.5		98	4.20	0.40	3.60	4.90
11.5-12.5		94	4.30	0.40	3.70	4.80
12.5-13.5		106	4.40	0.30	3.90	4.90
13.5-14.5		98	4.70	0.40	3.90	5.30
14.5-15.5		95	4.80	0.40	3.90	5.50
15.5-16.5		56	4.80	0.50	4.10	5.50
16.5-17.5		80	4.70	0.40	4.00	5.40
17.5-19		46	5.00	0.40	4.20	5.50

DEFINITION

The subject sits erect with head oriented in the Frankfort Plane (looking straight ahead) and arms hanging at sides. The breadth at the mid-point of the neck perpendicular to the long axis of the neck is measured (centimetres).

APPLICATION AND SUMMARY OF THE DATA

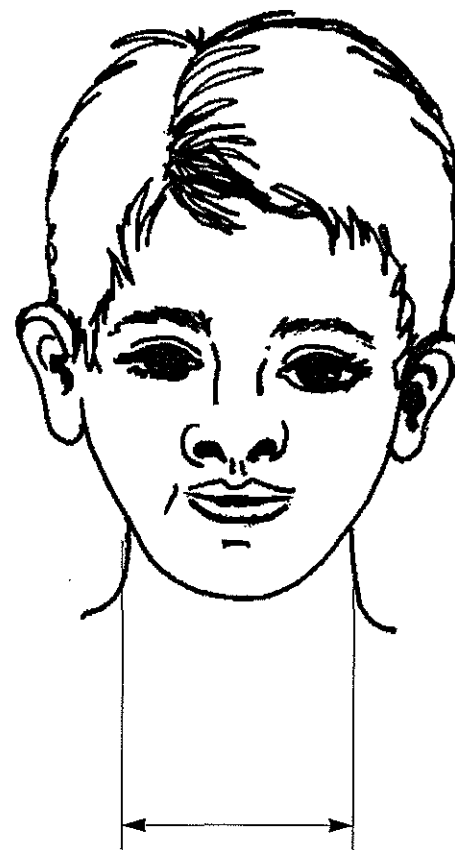
See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and the validity of USA data for the current UK population.

SEE ALSO

Jaw breadth, face breadth (brow ridges)

NUMBER OF SOURCES: 1

source	reference	country	age
1	Snyder 1977	US	2-19



Section 1.2

Static Anthropometry: Neck

Neck breadth 25

source 1 of 1

Snyder 1977

Country United States
Ages 2-19

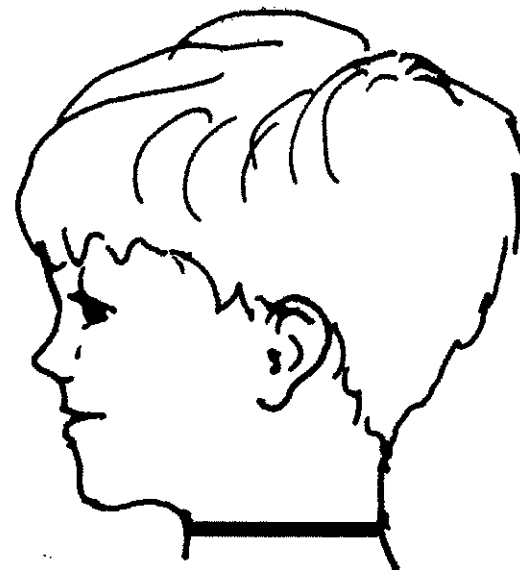
age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2-3.5	mf	66	7.10	0.60	8.10	8.00
3.5-4.5		76	7.50	0.50	8.20	8.30
4.5-5.5		91	7.70	0.60	7.90	8.80
5.5-6.5		79	7.90	0.70	8.10	8.90
6.5-7.5		86	7.90	0.70	7.80	9.20
7.5-8.5		68	8.30	0.60	7.70	9.30
8.5-9.5		91	8.30	0.70	7.40	9.20
9.5-10.5		84	8.40	0.70	7.30	9.60
10.5-11.5		85	8.70	0.80	7.30	9.80
11.5-12.5		97	8.80	0.80	7.20	10.00
12.5-13.5		104	9.10	0.80	7.10	10.20
13.5-14.5		88	9.40	0.90	6.70	10.80
14.5-15.5		80	9.40	0.80	6.60	10.60
15.5-16.5		77	9.70	1.20	6.60	11.50
16.5-17.5		67	9.90	1.10	6.60	11.70
17.5-19		62	10.20	1.20	6.10	12.10

DEFINITION

The subject sits erect with head oriented in the Frankfort Plane (looking straight ahead) and arms hanging at sides. The level of the circumference (in centimetres) of the neck is measured at a number of different levels. See individual sources.

APPLICATION AND SUMMARY OF THE DATA

Two sources of data have been included to allow comparison between different countries. Of the two sources, BSI is probably more appropriate for use with the current UK population. See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and choose between different sources. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different positions or postures (eg twisting the head and neck).

**NUMBER OF SOURCES: 2**

source	reference	country	age
1	BSI 1990	UK	0-16
2	Snyder 1977	US	2-19

source 1 of 2

BSI 1990

Country United Kingdom
Ages 0-16

In infants aged 0-2 years neck circumference is measured at the level of the larynx. In children aged 2 to 4 years neck circumference is measured at the base of the neck (around the 7th vertical vertebrae - the large bony protrusion at the base of the back of the neck). In girls age 5 and over neck circumference was measured immediately below the larynx and 1.5cm above the 7th cervical vertebrae. In boys age 5 and over neck circumference was measured in a lower position, halfway between the bottom of the larynx and the top of the breastbone and over the 7th cervical vertebrae.

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
0-3mo	mf	163	21.11	1.85	18.0	23.9
3-6mo	mf	90	23.16	1.57	21.0	25.8
6-9mo	mf	82	23.34	1.49	20.5	25.6
9-12mo	mf	81	23.36	1.30	21.3	25.6
12-15mo	mf	98	23.60	1.34	21.8	26.2
15-18mo	mf	91	23.60	1.09	21.6	25.2
18-21mo	mf	87	23.91	1.15	22.0	25.8
21-24mo	mf	95	23.83	1.10	21.8	25.7
2-2.5	mf	163	24.79	1.32	22.8	27.1
2.5-3	mf	140	25.55	1.24	23.6	27.2
3	mf	342	26.45	1.45	24.0	28.8
4	mf	369	27.26	1.35	25.0	29.5

continued

source 1 of 2 continued

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
5	m	251	28.19	1.67	25.5	30.5
6	m	346	28.44	1.60	26.0	31.0
7	m	327	29.23	1.90	26.0	32.0
8	m	330	29.93	1.89	26.9	33.3
9	m	328	30.61	2.16	27.5	34.0
10	m	354	31.14	1.96	28.1	34.5
11	m	301	31.84	2.13	28.3	35.7
12	m	335	32.60	2.20	29.0	36.4
13	m	299	34.19	2.65	29.8	38.7
14	m	269	35.92	2.78	31.0	40.2
15	m	277	37.64	2.72	33.0	42.0
16	m	84	39.01	2.58	35.0	43.9
5	f	35	25.05	1.33	22.7	27.2
6	f	35	25.23	1.01	23.3	26.7
7	f	36	26.57	1.73	23.9	29.1
8	f	35	26.77	1.40	24.5	28.9
9	f	36	27.18	1.51	23.9	29.4
10	f	36	28.22	1.72	25.6	30.8
11	f	33	28.98	1.63	26.2	31.7
12	f	34	29.55	1.97	26.0	32.7
13	f	36	30.44	1.46	27.6	33.1
14	f	37	31.30	1.48	28.6	33.8
15	f	40	31.42	1.41	28.9	33.2
16	f	22	32.36	1.40	29.8	34.6

Section 1.2

Static Anthropometry: Neck

Neck circumference 26

source 2 of 2

Snyder 1977

Country United States
Ages 2-19

The circumference of the neck is measured at the mid-point.

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2-3.5	mf	66	23.80	1.20	21.50	25.50
3.5-4.5		78	24.30	1.40	21.80	26.30
4.5-5.5		93	25.00	1.40	22.80	27.10
5.5-6.5		80	25.70	1.40	23.40	27.90
6.5-7.5		84	26.10	1.50	23.80	27.90
7.5-8.5		68	27.10	1.80	24.30	29.70
8.5-9.5		91	27.70	1.70	25.40	30.40
9.5-10.5		85	27.90	1.90	24.70	31.40
10.5-11.5		83	28.30	1.80	25.90	30.80
11.5-12.5		97	29.40	1.70	26.90	32.10
12.5-13.5		108	30.00	1.70	27.70	33.10
13.5-14.5		90	31.30	2.10	28.10	34.80
14.5-15.5		81	31.80	2.00	28.50	35.40
15.5-16.5		79	32.90	3.00	28.60	38.50
16.5-17.5		67	33.20	2.80	29.60	37.70
17.5-19		63	34.50	3.30	29.70	40.20

Section 1.3

Static Anthropometry: Torso

Shoulder height (from floor) 27

DEFINITION

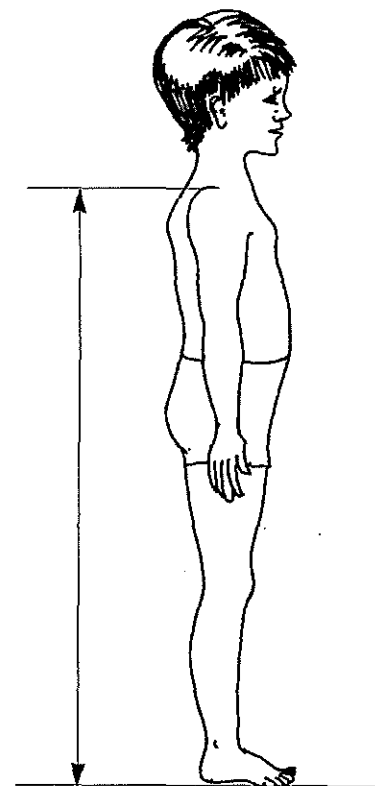
The subject stands erect with head in the Frankfort Plane (looking straight ahead). The vertical distance measured from the floor to the acromion (the bony process at the end of the clavicle or collar bone) (centimetres).

APPLICATION AND SUMMARY OF THE DATA

Two sources of data have been included to allow comparison between different countries. Of the two sources, Pheasant (1986) is probably more appropriate for use with the current UK population. Steenbekkers is the most recent data on European children and Dutch children are amongst the tallest in Europe. See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and choose between different sources. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different positions or postures (eg stretching or twisting the shoulders to reach maximum stature).

SEE ALSO

Shoulder height (supine), shoulder height (seated), chest height at armpit



NUMBER OF SOURCES: 2

source	reference	country	age
1	Pheasant 1988	UK	2-18
2	Steenbekkers 1993	NL	2-12

Section 1.3

Static Anthropometry: Torso

Shoulder height (from floor) 27

source 1 of 2

Pheasant 1988

Country United Kingdom
Ages 2-18

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2	m		73.5	3.7	97.5	79.5
3	m		78.0	3.6	72.0	84.0
4	m		82.5	3.5	76.5	88.5
5	m		87.5	3.9	81.0	94.0
6	m		92.0	4.5	84.5	99.5
7	m		97.5	5.4	88.5	106.5
8	m		102.0	5.4	93.0	111.0
9	m		106.5	6.0	96.5	116.5
10	m		112.0	5.7	102.5	121.5
11	m		116.0	6.0	106.0	126.0
12	m		121.5	7.2	109.5	133.5
13	m		126.5	8.1	113.0	140.0
14	m		133.5	8.0	120.5	146.5
15	m		138.5	7.3	126.5	150.5
16	m		141.5	6.2	131.5	151.5
17	m		143.5	6.2	133.5	153.5
18	m		144.5	5.4	135.5	153.5

continued

source 1 of 2 continued

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2	f		69.5	3.8	63.0	76.0
3	f		76.0	4.3	69.0	83.0
4	f		82.5	4.8	74.5	90.5
5	f		86.5	4.8	78.5	94.5
6	f		91.0	5.2	82.5	99.5
7	f		96.0	5.4	87.0	105.0
8	f		101.5	5.3	93.0	110.0
9	f		106.0	6.3	95.5	116.5
10	f		112.0	6.5	101.5	122.5
11	f		116.5	6.9	105.0	128.0
12	f		121.5	6.9	110.0	133.0
13	f		125.5	6.8	114.5	136.5
14	f		129.5	6.4	119.0	140.0
15	f		131.0	5.8	121.5	140.5
16	f		131.5	5.5	122.5	140.5
17	f		132.0	5.2	123.5	140.5
18	f		132.0	5.2	123.5	140.5

Datasheet 27

Section 1.3

Static Anthropometry: Torso

Shoulder height (from floor) 27

source 2 of 2

Steenbekkers 1993

Country Netherlands
Ages 2-12

age	sex	n	mean (cm)	sd	3rd%ile	97h%ile
2	m	81	71.9	4.0	64.5	78.8
3	m	97	79.0	4.0	72.1	87.7
4	m	85	83.4	4.1	76.6	91.5
5	m	86	91.0	4.2	82.8	98.7
6	m	98	95.8	4.1	86.1	103.6
7	m	106	101.4	4.7	91.7	109.6
8	m	96	106.6	4.3	97.5	115.0
9	m	122	113.1	5.0	104.2	123.9
10	m	134	117.5	5.9	106.5	128.8
11	m	143	121.7	6.4	110.5	133.7
12	m	78	126.8	7.4	112.5	139.0
2	f	92	71.4	4.0	65.4	80.5
3	f	86	77.9	4.1	70.1	85.9
4	f	79	83.8	3.8	77.7	90.7
5	f	94	90.5	4.4	82.4	100.4
6	f	92	96.5	4.8	87.7	107.0
7	f	93	102.1	5.2	90.8	110.6
8	f	95	106.9	4.9	98.0	115.7
9	f	122	111.6	5.9	100.4	120.4
10	f	136	118.6	6.1	108.3	131.0
11	f	151	122.7	6.1	111.6	135.7
12	f	79	127.3	6.6	116.7	139.3

DEFINITION

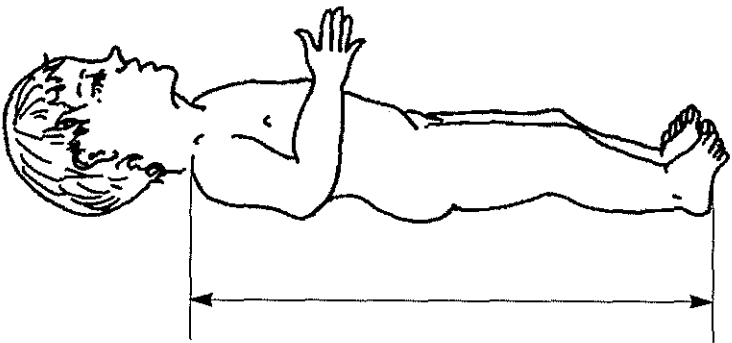
The subject lies on their back and the distance from the sole of the foot to the acromion (the bony process at the end of the clavicle or collar bone) is measured (centimetres).

APPLICATION AND SUMMARY OF THE DATA

Steenbekkers is the most recent data on European children and Dutch children are amongst the tallest in Europe. See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and the validity of Dutch data for the current UK population. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different positions or postures (eg stretching or twisting the shoulders to reach maximum stature).

SEE ALSO

Shoulder height (from floor), shoulder height (seated)



NUMBER OF SOURCES: 1

source	reference	country	age
1	Steenbekkers 1993	NL	0-14mo

Section 1.3

Static Anthropometry: Torso

Shoulder height (supine) 28

source 1 of 1

Steenbekkers 1993

Country Netherlands
Ages 0-14 months

age	sex	n	mean (cm)	sd	3rd%ile	97th%ile
0-2mo	m	16	45.0	3.1	39.4	49.5
3-5	m	21	49.4	3.7	40.9	55.5
6-8	m	22	54.0	3.0	46.5	59.3
9-11	m	13	58.0	2.9	52.9	62.6
12-14	m	15	60.7	2.9	56.3	66.9
0-2mo	f	9	43.1	3.3	37.6	48.3
3-5	f	20	47.3	2.7	42.5	54.1
6-8	f	14	51.6	2.6	46.6	56.5
9-11	f	16	56.4	3.4	50.8	61.8
12-14	f	23	60.2	2.9	55.2	67.0

DEFINITION

The subject sits with knees and hips at 90 degrees and arms at sides. The vertical distance from the sitting surface to the bony process at the end of the clavicle or collar bone (the acromion) is measured (centimetres).

APPLICATION AND SUMMARY OF THE DATA

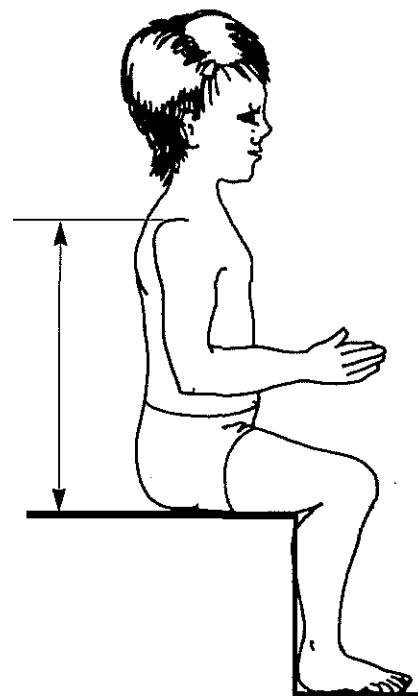
Two sources of data have been included to allow comparison between different countries. Of the two sources, Pheasant (1986) is probably more appropriate for use with the current UK population. Steenbekkers is the most recent data on European children and Dutch children are amongst the tallest in Europe. See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and choose between different sources. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different positions or postures (eg stretching or twisting the shoulders to reach maximum stature).

SEE ALSO

Shoulder height (from floor), shoulder height (supine), sitting height, crown to rump (supine)

NUMBER OF SOURCES: 2

source	reference	country	age
1	Pheasant 1988	UK	2-18
2	Steenbekkers 1993	NL	2-12



Source 1 of 2

Pheasant 1988

Country United Kingdom
Ages 2-18

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2	m		34.0	2.2	30.5	37.5
3	m		35.0	2.3	31.0	50.5
4	m		36.0	2.4	32.0	40.0
5	m		38.0	2.5	34.0	42.0
6	m		39.0	2.9	34.0	44.0
7	m		40.5	2.7	36.0	45.0
8	m		42.5	2.7	38.0	47.0
9	m		44.0	2.9	39.0	49.0
10	m		45.5	2.8	41.0	50.0
11	m		47.0	2.6	42.5	51.5
12	m		49.0	3.0	44.0	54.0
13	m		51.0	3.7	45.0	57.0
14	m		53.5	3.9	47.0	60.0
15	m		55.5	3.6	49.5	61.5
16	m		57.0	2.9	52.0	62.0
17	m		58.5	2.9	53.5	63.5
18	m		60.0	3.0	55.0	65.0

continued

Source 1 of 2 continued

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2	f		31.0	2.0	27.5	34.5
3	f		33.5	2.3	29.5	37.5
4	f		36.0	2.6	31.5	40.5
5	f		37.0	2.6	32.5	41.5
6	f		38.0	2.8	33.5	42.5
7	f		39.5	2.6	35.0	44.0
8	f		41.0	2.5	37.0	45.0
9	f		43.0	2.8	38.5	47.5
10	f		45.0	3.0	40.0	50.0
11	f		47.0	3.3	41.5	52.5
12	f		49.0	3.2	43.5	54.5
13	f		51.0	3.4	45.5	56.5
14	f		52.5	3.2	47.0	58.0
15	f		53.5	2.7	49.0	58.0
16	f		54.5	2.7	50.0	59.0
17	f		55.5	2.5	51.5	59.5
18	f		56.0	2.8	51.5	60.5

Section 1.3

Static Anthropometry: Torso

Shoulder height (seated) 29

Source 2 of 2

Steenbekkers 1993

Country Netherlands
Ages 2-12

age	sex	n	mean (cm)	sd	3rd%ile	97th%ile
2	m	81	33.7	2.0	29.7	37.9
3	m	97	35.5	1.8	32.4	39.1
4	m	85	36.2	2.2	32.4	40.5
5	m	86	38.3	2.0	35.3	42.6
6	m	98	40.4	2.2	36.0	44.7
7	m	106	42.2	2.4	37.6	46.7
8	m	96	43.5	2.0	40.3	47.1
9	m	122	45.8	2.5	40.8	50.0
10	m	134	47.3	2.8	40.2	52.2
11	m	143	48.6	2.8	43.3	53.6
12	m	78	50.7	3.3	44.2	57.4
2	f	92	33.2	2.2	30.2	37.7
3	f	86	34.8	2.0	30.6	38.5
4	f	79	36.3	1.7	33.5	40.2
5	f	94	38.2	2.5	34.0	42.6
6	f	92	40.3	2.2	36.8	45.3
7	f	93	42.4	2.3	38.0	46.4
8	f	95	44.2	2.5	39.4	48.4
9	f	122	45.3	2.6	40.0	50.3
10	f	136	48.0	2.8	42.9	53.6
11	f	151	49.4	2.9	44.2	55.2
12	f	79	51.1	3.1	45.5	57.1

DEFINITION

The subject stands erect, upper arms at sides and elbows flexed 90 degrees. The maximum horizontal breadth across the shoulders is measured (centimetres).

APPLICATION AND SUMMARY OF THE DATA

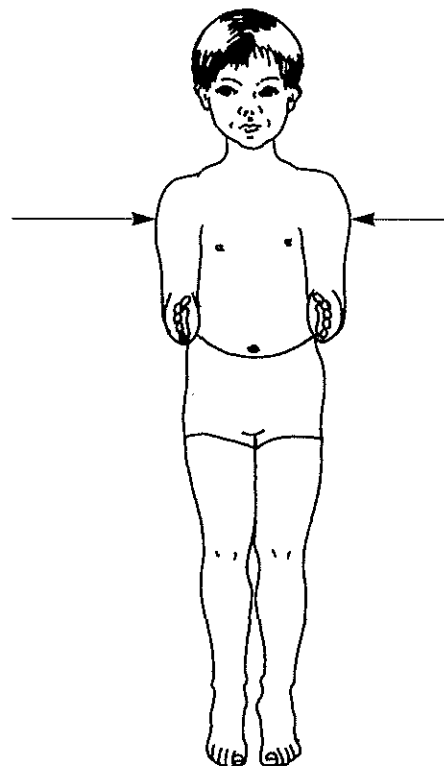
Two sources of data have been included to allow comparison between different countries. Of the two sources, Pheasant (1986) is probably more appropriate for use with the current UK population. Steenbekkers is the most recent data on European children and Dutch children are amongst the tallest in Europe. See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and choose between different sources. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different positions or postures (eg stretching, twisting or squashing the shoulders).

SEE ALSO

Shoulder breadth (biacromial), elbow breadth

NUMBER OF SOURCES: 2

source	reference	country	age
1	Pheasant 1988	UK	0-18
2	Steenbekkers 1993	NL	0-12



Section 1.3

Static Anthropometry: Torso

Shoulder breadth (bideltoid) 30

source 1 of 2

Pheasant 1988

Country United Kingdom
Ages 0-18

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
0	mf		15.0	0.8	13.5	16.0
0-6mo	mf		18.0	2.1	14.0	21.5
6-12mo	mf		21.0	1.4	18.5	23.0
12-18mo	mf		20.5	1.4	18.5	23.0
18-24mo	mf		23.0	1.4	20.5	25.0
2	m		24.5	1.7	21.5	27.5
3	m		25.5	1.6	23.0	26.5
4	m		26.5	1.5	24.0	29.0
5	m		27.5	1.7	24.5	30.5
6	m		28.5	2.3	24.5	32.5
7	m		30.0	2.2	26.5	33.5
8	m		31.0	2.1	27.5	34.5
9	m		32.0	2.3	28.0	36.0
10	m		33.5	2.7	29.0	38.0
11	m		34.5	2.6	30.0	39.0
12	m		35.5	2.5	31.5	39.5
13	m		37.5	2.9	32.5	42.5
14	m		39.5	2.9	34.5	44.5
15	m		41.5	3.0	35.4	46.5
16	m		43.0	2.9	38.0	48.0
17	m		44.5	2.8	40.0	49.0
18	m		45.5	2.3	41.5	49.5

continued

source 1 of 2 continued

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2	f		23.5	1.4	21.0	26.0
3	f		25.0	1.5	22.5	27.5
4	f		26.5	1.6	24.0	29.0
5	f		27.0	1.6	24.5	29.5
6	f		28.5	2.0	25.0	32.0
7	f		29.5	2.4	25.5	33.5
8	f		31.0	2.4	27.0	35.0
9	f		32.0	2.0	28.5	35.5
10	f		33.0	3.1	28.0	38.0
11	f		34.0	3.4	28.5	39.5
12	f		35.5	2.9	30.5	40.5
13	f		37.0	2.6	32.5	41.5
14	f		38.5	2.5	34.5	42.5
15	f		39.0	2.3	35.0	43.0
16	f		39.5	2.1	36.0	43.0
17	f		39.5	2.1	36.0	43.0
18	f		39.5	2.1	36.0	43.0

Datasheet 30

Section 1.3

Static Anthropometry: Torso

Shoulder breadth (bideltoid) 30

source 2 of 2

Steenbekkers 1993Country Netherlands
Ages 0-12

age	sex	n	mean (cm)	sd	3rd%ile	97th%ile
0-2mo	m	16	17.3	1.4	13.9	19.2
3-5mo	m	21	18.7	1.1	16.9	20.6
6-8mo	m	22	19.6	0.9	18.3	21.0
9-11mo	m	13	20.9	0.9	19.5	22.4
12-14mo	m	15	21.6	1.0	20.2	23.7
2	m	81	24.3	1.6	21.6	27.1
3	m	97	25.6	1.1	23.7	27.8
4	m	85	26.8	1.3	24.5	28.8
5	m	86	28.2	1.4	25.9	31.0
6	m	98	29.1	1.3	26.6	31.5
7	m	106	30.4	1.6	28.1	33.4
8	m	96	31.6	1.7	28.0	35.4
9	m	122	32.8	1.6	30.0	36.3
10	m	134	34.2	1.9	30.7	37.9
11	m	143	35.1	2.1	31.3	39.7
12	m	78	36.2	2.1	33.0	39.7

continued

source 2 of 2 continued

age	sex	n	mean (cm)	sd	3rd%ile	97th%ile
0-2mo	f	9	16.0	1.3	13.8	18.2
3-5mo	f	20	17.4	0.9	16.3	19.0
6-8mo	f	14	19.4	1.4	17.2	22.1
9-11mo	f	16	19.8	1.7	16.7	22.6
12-14mo	f	23	21.4	1.3	19.1	23.9
2	f	92	24.0	1.3	21.6	26.8
3	f	86	25.0	1.2	22.2	27.1
4	f	79	26.7	1.3	24.6	29.5
5	f	84	27.8	1.5	25.1	30.6
6	f	92	29.2	1.3	26.9	32.0
7	f	93	30.7	1.9	27.3	34.8
8	f	95	31.5	1.7	28.4	34.7
9	f	122	32.5	2.0	29.3	36.6
10	f	136	34.5	2.1	31.1	38.9
11	f	151	35.2	1.9	32.1	39.1
12	f	79	36.1	2.3	32.3	40.9

DEFINITION

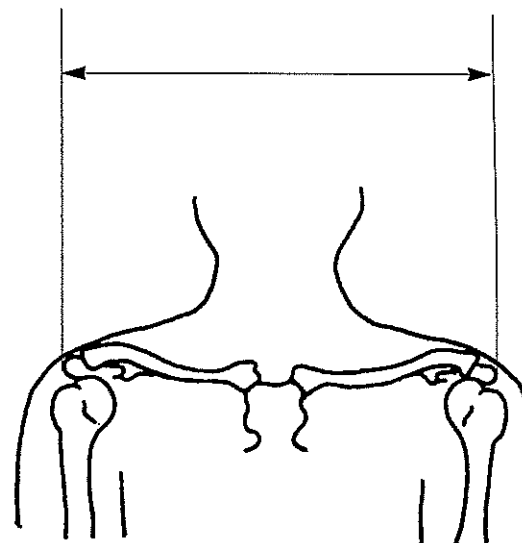
The subject stands erect, upper arms at sides and elbows flexed 90 degrees. The horizontal distance between the most lateral (outside) edges of the right and left acromion landmarks (the bony protrusions at the end of the clavicle or collar bone) is measured (centimetres).

APPLICATION AND SUMMARY OF THE DATA

See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and the validity of data presented here for the current UK population. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different positions or postures (eg stretching, twisting or squashing the shoulders).

SEE ALSO

Shoulder breadth (bideltoid), elbow breadth

**NUMBER OF SOURCES: 1**

source	reference	country	age
1	Pheasant 1988	UK	2-18

Source 1 of 1

Leasant 1988

Country United Kingdom
ages 2-18

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
	m		21.5	1.5	19.0	24.0
	m		22.5	1.4	20.0	28.0
	m		23.5	1.3	21.5	25.5
	m		25.0	1.5	22.5	27.5
	m		26.5	1.8	23.5	29.5
	m		27.5	1.5	25.0	30.0
3	m		28.5	1.3	26.5	30.5
9	m		29.5	1.5	27.0	32.0
10	m		30.5	1.8	27.5	33.5
11	m		31.5	2.1	28.0	35.0
12	m		32.5	2.1	29.0	36.0
13	m		33.5	2.4	29.5	37.5
14	m		35.5	2.2	32.0	39.0
15	m		37.0	2.3	33.0	41.0
16	m		38.0	2.3	34.0	42.0
17	m		38.5	2.1	35.0	42.0
18	m		39.5	1.7	36.5	42.5

continued

source 1 of 1 continued

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2	f		21.0	1.2	19.0	23.0
3	f		22.5	1.3	20.5	24.5
4	f		24.0	1.4	21.5	26.5
5	f		25.0	1.2	23.0	27.0
6	f		26.0	1.3	24.0	28.0
7	f		27.0	1.5	24.5	29.5
8	f		28.0	1.6	25.5	30.5
9	f		29.5	1.9	26.5	32.5
10	f		30.5	1.9	27.5	33.5
11	f		31.5	2.1	28.0	35.0
12	f		32.5	2.1	29.0	36.0
13	f		33.5	2.1	30.0	37.0
14	f		34.5	1.9	31.5	37.5
15	f		35.0	1.8	32.0	38.0
16	f		35.5	1.6	33.0	38.0
17	f		36.0	1.6	33.5	38.5
18	f		36.0	1.6	33.5	38.5

Section 1.3

Static Anthropometry: Chest

Chest height at armpit 32

DEFINITION

The subject stands erect, with feet together, weight evenly distributed, arms initially raised then lowered when instrument is in place. The vertical distance from the standing surface to the right axilla (armpit) is measured (centimetres).

APPLICATION AND SUMMARY OF THE DATA

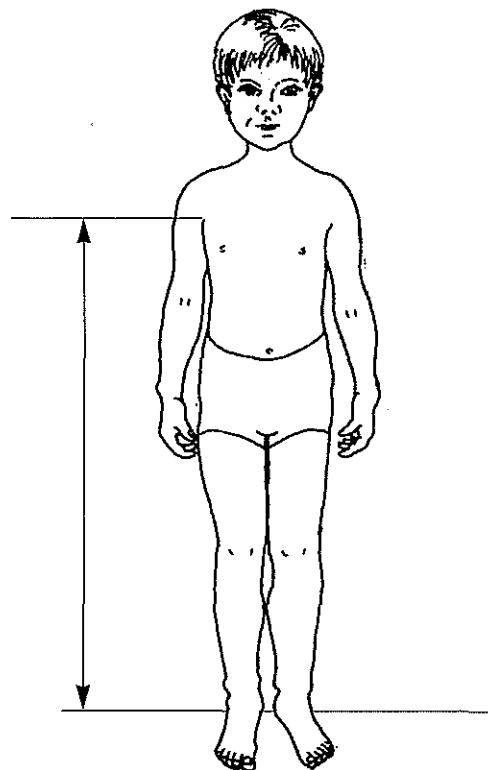
See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and the validity of USA data for the current UK population. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different positions or postures (eg stretching or twisting the top half of the body to raise the chest).

SEE ALSO

Shoulder height (from floor), waist height at navel, chest breadth at armpit

NUMBER OF SOURCES: 1

source	reference	country	age
1	Snyder	1977	US 2-19



Section 1.3

Static Anthropometry: Chest

Chest height at armpit 32

source 1 of 1

Snyder 1977

Country United States
Ages 2-19

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2-3.5	mf	67	65.20	3.70	59.90	70.20
3.5-4.5		78	72.00	3.90	66.30	79.00
4.5-5.5		93	78.20	4.50	70.50	86.70
5.5-6.5		78	83.80	4.60	76.00	92.50
6.5-7.5		86	88.90	4.70	81.10	96.60
7.5-8.5		67	94.10	5.00	87.00	102.10
8.5-9.5		90	100.40	5.50	92.40	109.60
9.5-10.5		84	102.90	5.20	93.20	112.30
10.5-11.5		86	107.90	5.00	98.90	116.70
11.5-12.5		96	112.70	5.70	104.00	122.40
12.5-13.5		108	117.70	6.00	106.90	126.80
13.5-14.5		90	122.80	6.70	112.30	132.50
14.5-15.5		80	125.20	6.90	113.10	136.40
15.5-16.5		79	127.70	7.40	115.70	140.40
16.5-17.5		67	127.90	7.50	116.00	140.00
17.5-19		63	130.70	8.30	116.00	143.20

Section 1.3

Static Anthropometry: Chest

Chest breadth at armpit 33

DEFINITION

The subject stands erect, with feet together, weight evenly distributed, arms initially raised then lowered when instrument is in place. The horizontal breadth of the chest at the level of the axilla (armpit) is measured (centimetres).

APPLICATION AND SUMMARY OF THE DATA

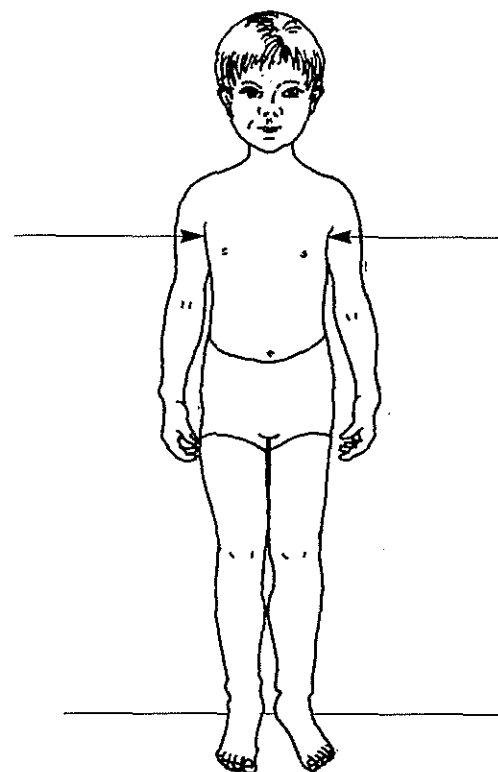
See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and the validity of USA data for the current UK population. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different positions or postures (eg stretching or twisting the chest or the effect of breathing).

SEE ALSO

Chest breadth at nipples, chest height at armpit

NUMBER OF SOURCES: 1

source	reference	country	age
1	Snyder 1977	US	2-19



source 1 of 1

Snyder 1977

Country United States
Ages 2-19

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2-3.5	mf	65	16.10	1.20	13.80	17.80
3.5-4.5		77	16.70	1.10	14.50	18.30
4.5-5.5		92	17.30	1.00	15.60	19.00
5.5-6.5		79	17.90	1.40	15.80	20.40
6.5-7.5		87	18.70	1.50	16.10	21.10
7.5-8.5		68	19.80	1.80	17.50	23.10
8.5-9.5		91	20.80	1.90	17.80	24.00
9.5-10.5		85	21.10	2.10	18.00	24.60
10.5-11.5		86	21.60	2.20	18.20	24.90
11.5-12.5		97	22.70	2.20	19.50	26.50
12.5-13.5		107	23.70	2.00	20.50	26.80
13.5-14.5		90	24.90	2.00	21.40	27.90
14.5-15.5		81	25.80	1.90	22.60	28.70 ⁺
15.5-16.5		79	26.70	2.10	23.20	30.00
16.5-17.5		67	27.30	2.10	23.90	30.60
17.5-19		63	27.90	2.30	24.50	31.30

DEFINITION

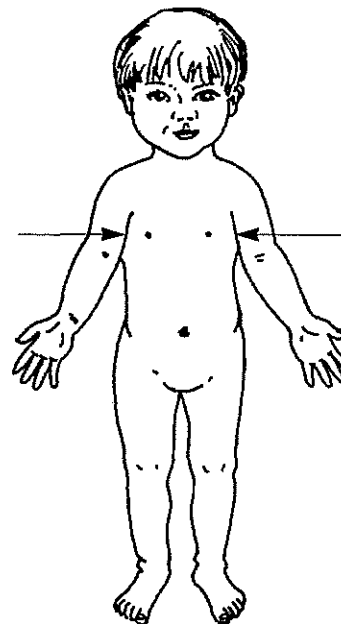
The breadth of the chest at the level of the nipples is measured (centimetres).

APPLICATION AND SUMMARY OF THE DATA

See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and the validity of USA data for the current UK population. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different positions or postures (eg stretching or twisting the chest or the effect of breathing).

SEE ALSO

Chest breadth at armpit

**NUMBER OF SOURCES: 1**

source	reference	country	age
1	Snyder 1977	US	0-2

source 1 of 1

Snyder 1977

Country United States
Ages 0-2

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
0-2mo	mf	31	12.20	1.30	10.00	14.70
3-5mo		44	13.80	0.80	12.20	15.10
6-8mo		31	14.70	1.10	12.50	16.20
9-11mo		27	15.90	1.20	13.50	17.50
12-15mo		31	15.80	0.90	14.20	17.30
16-19mo		29	15.80	1.30	13.40	17.70
20-23mo		31	16.30	1.20	14.40	18.50

Section 1.3

Static Anthropometry: Chest

Chest depth 35

DEFINITION

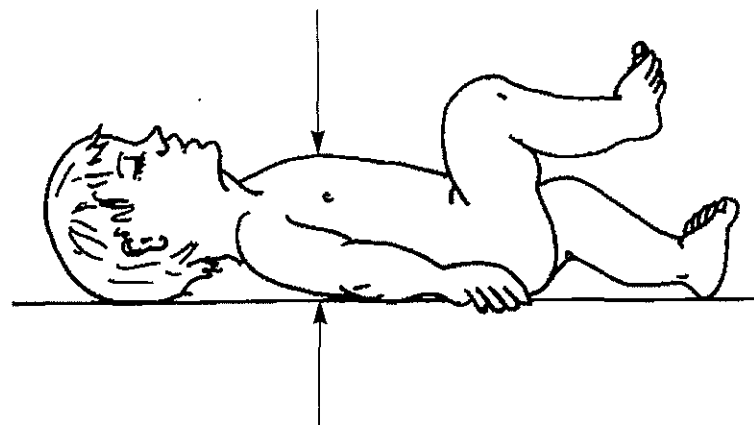
The subject stands erect. The maximum distance (centimetres) between the front and back of the chest at the level of the nipples is measured. Infants (aged 0-2) are measured supine (lying on their back) and the distance between the horizontal surface and the front of the chest measured.

APPLICATION AND SUMMARY OF THE DATA

Three sources of data have been included to allow comparison between different countries. For use with the current UK population, Pheasant (1986) is probably more appropriate for children over two years and Snyder (1975) for the under two's. Steenbekkers is the most recent data on European children and Dutch children are amongst the tallest in Europe. See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and choose between different sources. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different positions or postures (eg stretching or twisting the chest or the effect of breathing).

SEE ALSO

Abdominal depth, hip depth



NUMBER OF SOURCES: 3

source	reference	country	age
1	Pheasant 1988	UK	2-18
2	Steenbekkers 1993	NL	0-12
3	Snyder 1975	US	0-13

source 1 of 3

Pheasant 1988

Country United Kingdom
Ages 2-18

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2	m		12.0	1.2	10.0	14.0
3	m		12.5	1.2	10.5	14.5
4	m		13.0	1.2	11.0	15.0
5	m		13.5	1.4	11.0	16.0
6	m		14.0	1.9	11.0	17.0
7	m		14.5	2.0	11.0	18.0
8	m		15.0	2.0	11.5	18.5
9	m		15.5	2.2	12.0	19.0
10	m		16.5	2.6	12.0	21.0
11	m		17.0	2.4	13.0	21.0
12	m		17.5	2.4	13.5	21.5
13	m		18.5	2.9	13.5	23.5
14	m		19.5	2.9	14.5	24.5
15	m		20.5	3.0	15.5	25.5
16	m		21.2	2.9	16.5	26.5
17	m		22.5	2.7	18.0	27.0
18	m		22.5	2.1	19.0	26.0

continued

source 1 of 3 continued

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2	f		11.5	1.0	10.0	13.0
3	f		12.0	1.2	10.5	14.0
4	f		13.0	1.3	11.0	15.0
5	f		13.5	1.4	11.0	15.5
6	f		14.0	1.8	11.0	17.0
7	f		14.5	2.1	11.0	18.0
8	f		15.0	2.0	12.0	18.0
9	f		15.5	2.4	11.5	19.5
10	f		16.5	3.1	11.5	21.5
11	f		17.5	3.8	11.5	24.0
12	f		19.0	3.3	13.5	24.0
13	f		20.0	2.9	15.0	24.5
14	f		21.0	2.7	16.5	25.5
15	f		21.5	2.6	17.5	26.0
16	f		22.5	2.5	18.0	26.5
17	f		23.0	2.4	19.0	27.0
18	f		23.5	2.4	19.5	27.5

Section 1.3

Static Anthropometry: Chest

Chest depth 35

source 2 of 3

Steenbekkers 1993

Country Netherlands
Ages 0-12

age	sex	n	mean (cm)	sd	3rd%ile	97th%ile
0-2mo	m	16	10.1	1.4	7.3	12.0
3-5mo	m	21	10.1	1.1	7.9	12.4
6-8mo	m	22	10.2	1.3	8.1	13.3
9-11mo	m	13	10.6	1.6	8.0	13.3
12-14mo	m	15	11.4	1.0	9.8	13.3
2	m	81	13.0	0.7	11.5	14.3
3	m	97	13.6	0.9	11.9	15.5
4	m	85	14.0	0.9	12.7	15.7
5	m	86	14.7	0.9	12.9	16.2
6	m	98	15.1	0.9	13.6	16.7
7	m	106	15.5	1.1	13.7	17.5
8	m	96	15.8	1.2	14.0	18.3
9	m	122	16.6	1.2	14.4	19.0
10	m	134	17.2	1.5	14.8	20.4
11	m	143	17.6	1.6	15.2	21.3
12	m	78	18.0	1.6	15.8	22.1

continued

source 2 of 3 continued

age	sex	n	mean (cm)	sd	3rd%ile	97th%ile
0-2mo	f	9	9.0	1.3	6.1	10.7
3-5mo	f	20	9.5	1.0	7.9	11.9
6-8mo	f	14	9.8	1.1	7.9	11.9
9-11mo	f	16	10.8	0.9	8.8	12.3
12-14mo	f	23	11.0	1.1	9.1	13.5
2	f	92	12.8	0.8	11.5	14.5
3	f	86	13.2	0.8	11.8	15.3
4	f	79	13.9	0.8	12.6	15.5
5	f	94	14.5	1.0	12.6	16.6
6	f	92	15.0	1.0	12.8	17.2
7	f	93	15.6	1.2	13.5	17.6
8	f	95	15.9	1.1	14.1	18.6
9	f	122	16.4	1.4	13.9	20.0
10	f	136	17.7	1.8	15.1	21.8
11	f	151	18.2	1.7	15.5	21.8
12	f	79	19.2	2.0	15.7	23.3

Section 1.3

Static Anthropometry: Chest

Chest depth 35

source 3 of 3

Snyder 1975

Country USA
Ages 0-13

age	sex	n	mean (cm)	s.d	5th%ile	95th%ile
0-3mo	m	72	9.3	0.9	7.5	10.7
4-6mo	m	43	9.9	0.9	8.3	11.2
7-9mo	m	18	10.4	0.9	8.9	12.1
10-12mo	m	18	11.0	0.6	9.2	11.9
13-18mo	m	27	10.9	1.0	8.0	12.1
19-24mo	m	37	11.6	1.0	9.9	13.0
2-2.5	m	32	11.7	0.7	10.4	12.7
2.5-3	m	48	12.0	1.2	10.4	14.3
3-3.5	m	124	12.4	0.9	11.1	13.9
3.5-4	m	120	12.5	0.9	10.9	14.1
4-4.5	m	168	12.8	0.9	11.1	14.4
4.5-5	m	154	13.0	1.0	11.1	14.8
5.5-6	m	121	13.2	0.8	11.8	14.5
6-6.5	m	93	13.3	1.1	11.6	15.2
6.5-7	m	77	13.6	0.9	11.9	14.9
7	m	78	14.1	1.1	12.4	15.7
8	m	132	14.3	1.3	12.0	16.4
9	m	133	14.8	1.3	12.9	17.1
10	m	103	15.2	1.3	13.0	17.4
11	m	100	16.2	1.6	13.9	18.3
12	m	51	16.8	1.6	14.4	19.4
13	m	21	17.2	1.7	15.5	19.4

continued

source 3 of 3 continued

age	sex	n	mean (cm)	s.d	5th%ile	95th%ile
0-3mo	f	62	9.0	0.9	7.5	10.5
4-6mo	f	52	9.9	0.9	7.9	11.1
7-9mo	f	28	10.5	0.7	9.3	11.9
10-12mo	f	20	10.4	1.1	7.9	13.0
13-18mo	f	21	10.9	0.8	9.6	12.0
19-24mo	f	27	11.3	1.0	8.5	12.4
2-2.5	f	30	11.6	0.9	9.7	13.0
2.5-3	f	53	11.8	0.8	10.1	12.9
3-3.5	f	139	12.1	0.9	10.5	13.6
3.5-4	f	169	12.2	0.8	10.7	13.4
4-4.5	f	184	12.5	0.9	10.8	13.8
4.5-5	f	174	12.7	1.1	10.9	14.4
5.5-6	f	117	12.8	0.9	10.9	14.3
6-6.5	f	81	13.2	1.0	11.5	14.6
6.5-7	f	99	13.4	0.9	11.7	15.0
7	f	92	13.5	1.0	11.8	15.2
8	f	140	13.7	1.4	11.7	16.4
9	f	140	14.4	1.4	12.4	17.4
10	f	136	14.7	1.5	12.2	17.5
11	f	93	15.7	2.0	13.2	19.7
12	f	47	16.2	1.7	13.3	19.6
13	f	27	17.9	2.2	14.1	22.3

Section 1.3

Static Anthropometry: Chest

Chest circumference at armpit 36

DEFINITION

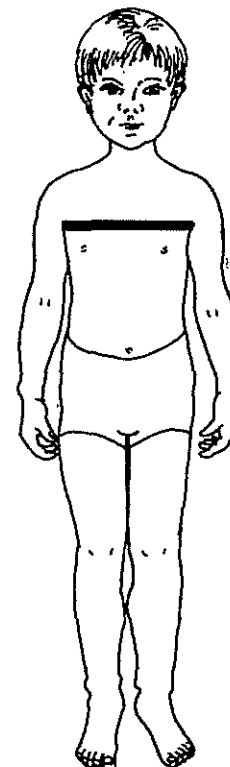
The subject stands erect, with feet together, weight evenly distributed, arms initially raised then lowered when tape is in place. The horizontal circumference of the chest during normal breathing at the level of the axilla (armpit) is measured (centimetres).

APPLICATION AND SUMMARY OF THE DATA

See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and the validity of USA data for the current UK population. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different positions or postures (eg stretching or twisting the chest or the effect of breathing).

SEE ALSO

Chest circumference at nipples, waist circumference (maximum in infants), waist circumference (natural), waist circumference at navel



NUMBER OF SOURCES: 1

source	reference	country	age
1	Snyder 1977	US	2-19

source 1 of 1

Snyder 1977

Country United States
Ages 2-19

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2-3.5	mf	211	50.70	2.70	46.10	54.90
3.5-4.5		226	52.70	2.70	48.60	57.00
4.5-5.5		263	55.00	3.00	50.40	59.70
5.5-6.5		219	57.30	3.40	52.20	63.60
6.5-7.5		225	60.20	4.50	53.90	67.90
7.5-8.5		188	62.50	5.20	55.20	71.20
8.5-9.5		251	65.40	5.10	58.70	74.70
9.5-10.5		253	67.60	5.70	60.30	78.70
10.5-11.5		280	70.80	6.60	62.20	83.10
11.5-12.5		286	72.60	5.90	64.60	84.40
12.5-13.5		313	76.10	5.70	67.90	86.00
13.5-14.5		270	79.40	6.20	70.00	90.30
14.5-15.5		263	82.50	6.20	73.60	93.10
15.5-16.5		198	85.90	7.40	75.50	99.80
16.5-17.5		221	87.20	7.50	77.00	99.90
17.5-19		156	89.60	8.00	76.70	102.30

DEFINITION

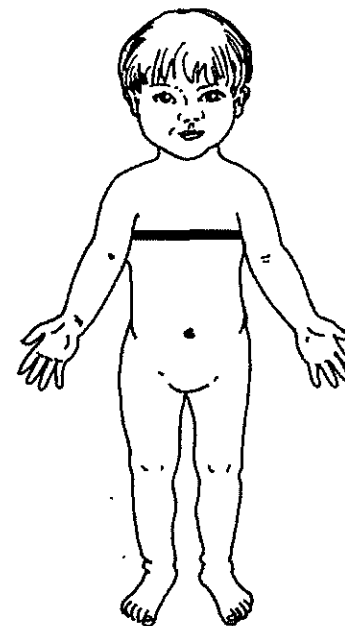
The circumference of the chest (centimetres) at the level of the nipples during normal breathing is measured.

APPLICATION AND SUMMARY OF THE DATA

Two sources of data have been included to allow comparison between different countries. Of the sources, BSI (1990) is probably more appropriate for use with the current UK population. See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and choose between different sources. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different positions or postures (eg stretching or twisting the chest or the effect of breathing).

SEE ALSO

Chest circumference at armpit, waist circumference (maximum in infants), waist circumference (natural), waist circumference at navel

**NUMBER OF SOURCES: 2**

source	reference	country	age
1	BSI 1990	UK	0-16
2	Snyder 1977	US	0-2

Section 1.3

Static Anthropometry: Chest

Chest circumference at nipples 37

source 1 of 2

BSI 1990

Country United Kingdom
Ages 0-16

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
0-3mo	mf	163	37.68	3.57	31.8	43.3
3-6mo	mf	90	43.38	2.37	31.9	47.1
6-9mo	mf	82	45.74	2.40	42.0	49.5
9-12mo	mf	81	47.06	1.72	44.1	50.1
12-15mo	mf	99	48.55	2.06	44.6	52.1
15-18mo	mf	91	49.55	2.20	46.1	52.8
18-21mo	mf	87	50.44	2.18	46.9	53.7
21-24mo	mf	97	50.95	2.36	46.8	54.6
2-2.5	mf	164	50.45	2.46	46.2	54.4
2.5-3	mf	140	51.81	2.46	48.0	56.2
3	mf	342	53.54	2.90	49.0	58.2
4	mf	369	55.06	3.01	50.7	60.2
5	m	251	56.28	2.80	52.1	61.4
6	m	346	57.85	2.95	53.5	63.4
7	m	327	60.41	3.62	55.1	65.5
8	m	330	61.90	3.81	56.1	68.7
9	m	328	64.82	4.62	58.5	73.9
10	m	354	66.57	4.71	60.5	75.5
11	m	301	68.76	5.21	61.5	78.5
12	m	335	71.51	5.37	64.0	81.6
13	m	299	75.00	6.55	66.2	87.0
14	m	269	78.50	6.73	67.1	89.9
15	m	277	82.40	6.46	72.0	93.0
16	m	84	84.68	6.00	74.2	93.9

continued

source 1 of 2 continued

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
5	f	366	56.25	3.38	51.2	61.5
6	f	358	57.80	3.59	53.1	63.9
7	f	349	60.45	4.69	54.6	68.0
8	f	384	62.79	4.80	56.4	70.8
9	f	368	65.15	5.13	58.3	75.2
10	f	348	67.58	5.93	60.5	80.5
11	f	332	71.31	6.98	62.2	84.2
12	f	373	74.70	6.73	64.8	86.2
13	f	376	79.79	6.82	69.1	91.5
14	f	389	83.37	6.22	74.0	93.5
15	f	394	84.84	5.74	76.2	94.7
16	f	250	86.79	5.98	77.8	96.5

Section 1.3

Static Anthropometry: Chest

Chest circumference at nipples 37

source 2 of 2

Snyder 1977

Country United States
Ages 0-2

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
0-2mo	mf	31	37.10	2.50	32.40	41.40
3-5		44	40.40	2.40	36.50	44.10
6-8		30	43.40	1.80	40.00	46.30
9-11		27	45.10	2.30	40.30	47.80
12-15		30	46.30	2.30	41.90	49.70
16-19		29	46.80	2.20	42.30	50.10
20-23		31	47.70	2.20	43.60	50.90

Section 1.3

Static Anthropometry: Abdomen

Waist height at navel 38

DEFINITION

Subject stands erect, with feet together, weight evenly distributed. The vertical distance from the standing surface to the umbilicus (navel) is measured (centimetres).

APPLICATION AND SUMMARY OF THE DATA

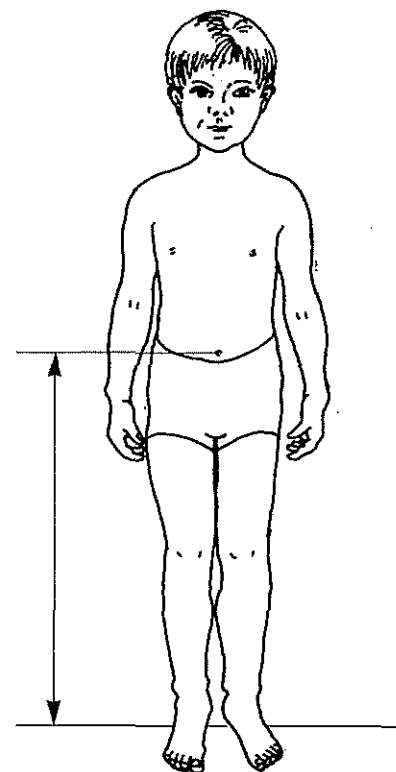
See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and the validity of USA data for the current UK population. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different positions or postures (eg stretching or twisting the body).

SEE ALSO

Chest height at armpit, waist breadth at navel

NUMBER OF SOURCES: 1

source	reference	country	age
1	Snyder 1977	US	2-19



source 1 of 1

Snyder 1977

Country United States
Ages 2-19

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2-3.5	mf	67	49.30	3.30	44.20	54.00
3.5-4.5		78	55.40	3.20	50.90	61.20
4.5-5.5		93	60.60	3.50	55.00	66.80
5.5-6.5		80	65.20	3.80	59.00	72.10
6.5-7.5		86	69.20	3.80	62.90	75.40
7.5-8.5		68	73.90	4.00	67.50	80.10
8.5-9.5		91	79.20	4.50	71.50	86.90
9.5-10.5		84	81.80	4.50	73.90	89.50
10.5-11.5		86	85.60	4.10	79.40	92.80
11.5-12.5		97	89.50	4.80	82.50	98.10
12.5-13.5		108	93.60	4.70	86.20	100.80
13.5-14.5		90	97.60	5.80	87.80	106.60
14.5-15.5		81	99.80	5.40	91.10	108.40 ⁺
15.5-16.5		79	101.30	6.00	92.20	111.20
16.5-17.5		67	101.80	6.10	91.30	111.40
17.5-19		62	103.70	6.90	93.20	113.40

Section 1.3

Static Anthropometry: Abdomen

Waist breadth (in infants) 39

DEFINITION

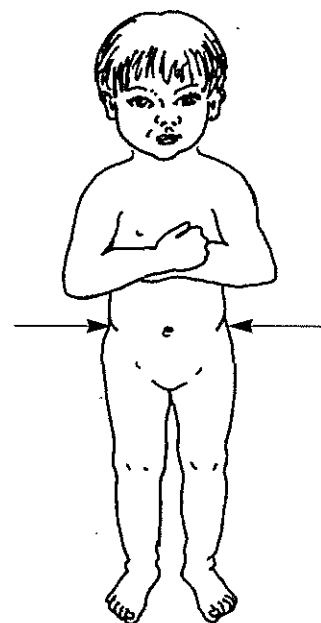
The breadth of the waist just below the level of the iliac crest (the top of the hip bone) and above the level of the greater trochanter (the top of the thigh bone) is measured (centimetres).

APPLICATION AND SUMMARY OF THE DATA

See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and the validity of USA data for the current UK population. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different positions or postures (eg stretching or twisting the body or the effect of breathing).

SEE ALSO

Waist breadth at navel



NUMBER OF SOURCES: 1

source	reference	country	age
1	Snyder 1977	US	0-2

Section 1.3**Static Anthropometry: Abdomen****Waist breadth (in infants) 39**

source 1 of 1

Snyder 1977**Country** United States
Ages 0-2

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
0-2mo	mf	31	11.60	1.40	9.50	14.20
3-5mo		45	12.60	1.30	10.60	14.70
6-8mo		31	13.50	1.00	11.80	15.20
9-11mo		27	14.10	1.10	11.70	15.60
12-15mo		30	14.30	1.10	12.80	15.30
16-19mo		28	14.60	1.20	13.10	16.30
20-23mo		30	14.90	0.80	13.20	16.00

Section 1.3

Static Anthropometry: Abdomen

Waist breadth at navel 40

DEFINITION

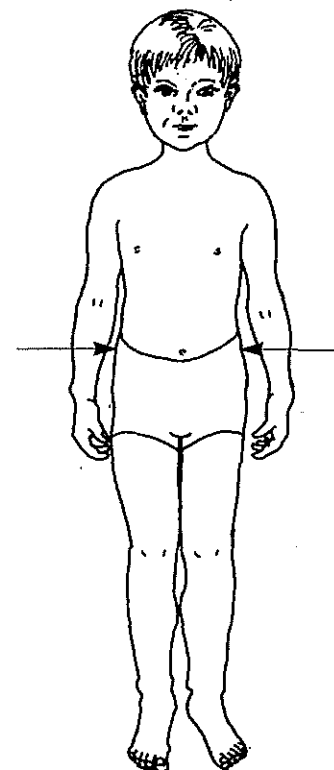
Subject stands erect, with feet together, weight evenly distributed and arms hanging at sides. The horizontal breadth of the torso at the level of the umbilicus (navel) is measured (centimetres).

APPLICATION AND SUMMARY OF THE DATA

See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and the validity of USA data for the current UK population. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different positions or postures (eg stretching or twisting the body or the effect of breathing).

SEE ALSO

Waist breadth (in infants), waist height at navel



NUMBER OF SOURCES: 1

source	reference	country	age
1	Snyder 1977	US	2-19

Section 1.3

Static Anthropometry: Abdomen

Waist breadth at navel 40

source 1 of 1

Snyder 1977

Country United States
Ages 2-19

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2-3.5	mf	65	16.10	1.00	14.30	17.90
3.5-4.5		77	17.00	1.10	14.80	18.70
4.5-5.5		93	17.80	1.20	15.80	19.50
5.5-6.5		78	18.30	1.60	15.90	21.00
6.5-7.5		87	19.00	2.00	15.50	22.80
7.5-8.5		68	20.40	1.80	18.50	22.50
8.5-9.5		90	21.30	2.20	18.20	25.10
9.5-10.5		85	21.90	2.80	18.10	26.30
10.5-11.5		86	22.40	2.70	18.60	26.80
11.5-12.5		97	23.40	2.50	19.80	28.10
12.5-13.5		108	24.50	2.70	20.80	29.60
13.5-14.5		899	25.80	2.40	21.30	29.60
14.5-15.5		81	25.90	2.20	21.70	29.00
15.5-16.5		79	27.10	2.20	23.60	30.80
16.5-17.5		67	27.50	2.30	23.50	31.30
17.5-19		63	28.00	3.10	23.50	32.90

DEFINITION

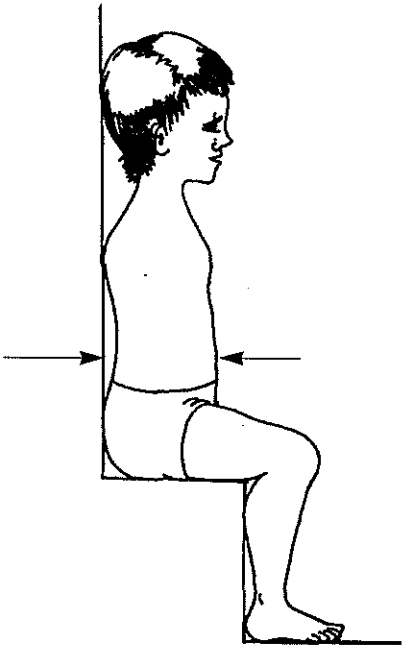
The subject stands erect against a vertical reference plane. The maximum horizontal distance from the vertical reference plane to the front of the abdomen is measured (centimetres).

APPLICATION AND SUMMARY OF THE DATA

See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and the validity of the data presented here for the current UK population. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different positions or postures (eg stretching or twisting the body or the effect of breathing).

SEE ALSO

Chest depth, hip depth



NUMBER OF SOURCES: 1

source	reference	country	age
1	Pheasant 1988	UK	2-18

source 1 of 1

Pheasant 1988

Country United Kingdom
Ages 2-18

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2	m		14.5	1.0	13.0	16.0
3	m		15.0	1.0	13.5	14.5
4	m		15.5	1.0	14.0	17.0
5	m		15.5	1.2	13.5	17.5
6	m		16.0	1.6	13.5	18.5
7	m		16.5	1.9	13.5	19.5
8	m		17.0	2.0	13.5	20.5
9	m		18.0	2.1	14.5	21.5
10	m		18.5	2.5	14.5	22.5
11	m		19.0	2.3	15.0	23.0
12	m		20.0	2.2	16.5	23.5
13	m		20.5	2.4	16.5	24.5
14	m		21.5	2.3	17.5	25.5
15	m		22.0	2.4	18.0	26.0
16	m		22.5	2.4	18.5	26.5
17	m		23.5	2.5	19.5	27.5
18	m		24.0	2.1	20.5	27.5

continued

source 1 of 1 continued

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2	f		14.5	0.7	13.5	15.5
3	f		15.0	1.0	13.5	16.5
4	f		15.5	1.3	13.5	17.5
5	f		16.0	1.4	13.5	18.5
6	f		16.5	1.8	13.5	19.5
7	f		17.0	2.3	13.0	21.0
8	f		18.0	2.4	14.0	22.0
9	f		18.5	2.6	14.0	23.0
10	f		19.0	2.7	14.5	23.5
11	f		19.5	2.9	14.5	24.5
12	f		20.0	2.7	15.5	24.5
13	f		21.0	2.4	17.0	25.0
14	f		21.5	2.3	17.5	25.5
15	f		22.0	2.2	18.5	25.5
16	f		22.0	2.1	18.5	25.5
17	f		22.0	2.1	18.5	25.5
18	f		22.0	2.0	18.5	25.5

DEFINITION

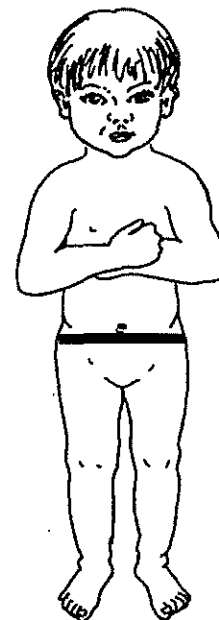
Infants are measured supine (lying on their back). The circumference of the torso just below the level of the iliac crest (the top of the hip bone) and above the level of the greater trochanter (the top of the thigh bone) is measured (centimetres).

APPLICATION AND SUMMARY OF THE DATA

See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and the validity of USA data for the current UK population. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different positions or postures (eg stretching or twisting the body or the effect of breathing).

SEE ALSO

Waist circumference (natural), waist circumference at navel, chest circumference at armpit, chest circumference at nipples, hip circumference

**NUMBER OF SOURCES: 1**

source	reference	country	age
1	Snyder 1977	US	0-2

Section 1.3

Static Anthropometry: Abdomen

Waist circumference (maximum in infants) 42

source 1 of 1

Snyder 1977

Country United States
Ages 0-2

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
0-2mo	mf	31	34.40	4.00	27.00	40.50
3-5		42	37.90	3.30	31.90	44.20
6-8		29	40.30	2.50	35.90	44.00
9-11		26	40.40	2.70	36.30	44.00
12-15		29	41.60	2.60	37.00	45.40
16-19		28	43.10	3.10	38.70	48.30
20-23		31	43.90	2.90	38.40	48.40

DEFINITION

Subject stands erect, with feet together, weight evenly distributed and arms hanging at sides. The circumference of the torso at the natural waist is measured (centimetres).

APPLICATION AND SUMMARY OF THE DATA

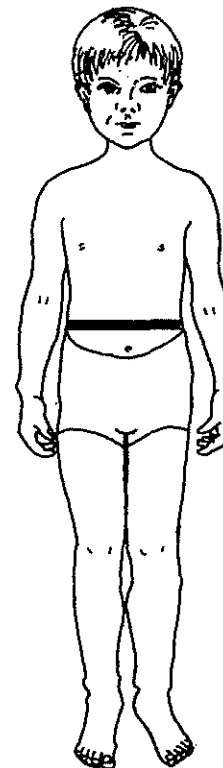
Two sources of data have been included to allow comparison between different countries. Of the two sources, BSI is probably more appropriate for use with the current UK population. See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and choose between different sources. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different positions or postures (eg stretching or twisting the body or the effect of breathing).

SEE ALSO

Waist circumference (maximum in infants), waist circumference at navel, chest circumference at armpit, chest circumference at nipples, hip circumference

NUMBER OF SOURCES: 2

source	reference	country	age
1	BSI 1990	UK	0-16
2	Snyder 1977	US	2-19



Section 1.3 Static Anthropometry: Abdomen

Waist circumference (natural) 43

source 1 of 2

BSI 1990

Country United Kingdom
Ages 0-16

Waist circumference is measured halfway between the 10th rib and the top of the iliac crest (top of the hip bones).

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
0-3mo	mf	163	35.61	3.67	29.7	41.4
3-6mo	mf	90	40.42	2.73	36.5	45.0
6-9mo	mf	82	42.39	2.85	38.2	46.5
9-12mo	mf	81	42.71	2.57	38.4	46.8
12-15mo	mf	99	43.35	2.42	40.0	47.2
15-18mo	mf	90	44.12	2.06	39.6	48.5
18-21mo	mf	87	44.41	2.69	39.2	48.4
21-24mo	mf	98	45.05	2.84	40.7	49.1
2-2.5	mf	164	47.65	2.87	42.6	52.4
2.5-3	mf	140	48.98	2.88	44.5	53.5
3	mf	342	50.38	3.11	45.8	56.0
4	mf	369	51.51	3.35	46.4	57.1

5	m	251	52.27	3.23	47.4	58.0
6	m	346	52.79	3.66	47.0	59.0
7	m	327	54.57	4.01	48.4	61.4
8	m	330	55.65	4.81	49.3	63.8
9	m	328	58.11	5.63	51.5	70.1
10	m	354	59.59	5.70	52.0	69.9
11	m	301	61.49	6.23	53.0	73.3
12	m	335	63.88	6.11	56.0	75.4
13	m	299	66.37	7.41	57.1	80.1
14	m	269	68.59	6.54	59.4	80.8
15	m	277	70.82	7.15	61.6	84.4
16	m	84	71.85	6.84	64.1	83.4

continued

source 1 of 2 *continued*

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
5	f	366	51.37	3.68	45.9	57.0
6	f	358	52.30	3.71	47.4	58.4
7	f	349	54.47	4.71	48.2	62.3
8	f	384	55.47	4.66	49.3	64.3
9	f	368	56.91	4.91	50.4	65.8
10	f	348	58.04	5.50	50.8	69.2
11	f	332	59.96	5.81	52.6	69.7
12	f	373	61.46	4.88	54.2	70.3
13	f	376	63.57	5.50	56.0	74.1
14	f	389	64.59	4.81	58.0	73.0
15	f	394	64.92	5.00	58.0	73.0
16	f	250	66.10	5.50	59.0	75.7

Section 1.3 Static Anthropometry: Abdomen

Waist circumference (natural) 43

source 2 of 2

Snyder 1977

Country United States
Ages 2-19

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2-3.5	mf	65	47.00	3.10	41.50	51.40
3.5-4.5		67	48.40	2.80	43.60	53.10
4.5-5.5		88	50.90	2.80	46.00	55.90
5.5-6.5		79	51.60	3.50	45.80	56.90
6.5-7.5		87	53.30	4.10	46.30	60.30
7.5-8.5		68	56.30	5.90	50.10	65.90
8.5-9.5		90	58.40	6.20	49.80	68.40
9.5-10.5		84	60.30	7.80	50.60	74.50
10.5-11.5		86	60.30	7.00	51.30	71.10
11.5-12.5		93	63.60	7.10	54.50	76.50
12.5-13.5		97	65.30	7.10	56.50	79.30
13.5-14.5		80	68.10	7.00	57.70	81.40
14.5-15.5		81	68.30	6.10	59.50	78.50
15.5-16.5		78	70.40	7.70	59.20	83.20
16.5-17.5		66	71.00	8.40	58.50	84.30
17.5-19		63	74.30	9.40	60.30	87.50

DEFINITION

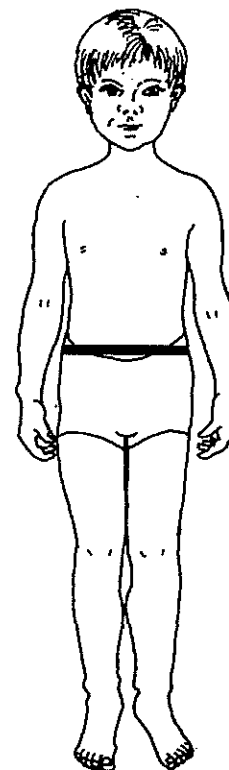
Subject stands erect, with feet together, weight evenly distributed at sides. The horizontal circumference of the waist during normal breathing at the level of the umbilicus (navel) is measured (centimetres).

APPLICATION AND SUMMARY OF THE DATA

See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and the validity of USA data for the current UK population. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different positions or postures (eg stretching or twisting the body or the effect of breathing).

SEE ALSO

Waist circumference (maximum in infants), waist circumference (natural), chest circumference at armpit, chest circumference at nipples, hip circumference

**NUMBER OF SOURCES: 1**

source	reference	country	age
1	Snyder 1977	US	2-19

Section 1.3

Static Anthropometry: Abdomen

Waist circumference at navel 44

source 1 of 1

Snyder 1977

Country United States
Ages 2-19

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2-3.5	mf	210	48.10	3.20	43.10	52.90
3.5-4.5		226	49.30	2.90	44.70	54.10
4.5-5.5		262	51.10	3.60	45.70	57.20
5.5-6.5		219	52.00	3.70	45.90	58.70
6.5-7.5		224	54.90	5.70	48.00	66.70
7.5-8.5		189	56.80	6.10	49.90	67.90
8.5-9.5		251	58.80	6.50	51.20	71.10
9.5-10.5		253	60.90	7.00	52.80	75.90
10.5-11.5		279	63.40	7.90	53.80	79.60
11.5-12.5		286	64.80	7.10	55.60	78.20
12.5-13.5		312	67.10	6.90	57.50	80.00
13.5-14.5		270	69.20	6.90	60.20	81.90
14.5-15.5		263	71.00	7.00	61.80	83.30
15.5-16.5		196	73.20	7.30	64.20	86.20
16.5-17.5		219	74.20	7.80	64.10	90.30
17.5-19		155	75.90	7.70	65.50	90.50

Section 1.3

Static Anthropometry: Hips

Hip height at trochanter 45

DEFINITION

The subject stands erect with feet together and weight evenly distributed. The vertical distance from the standing surface to the right trochanter (the bony process at the top of the femur or thigh bone) is measured (centimetres).

APPLICATION AND SUMMARY OF THE DATA

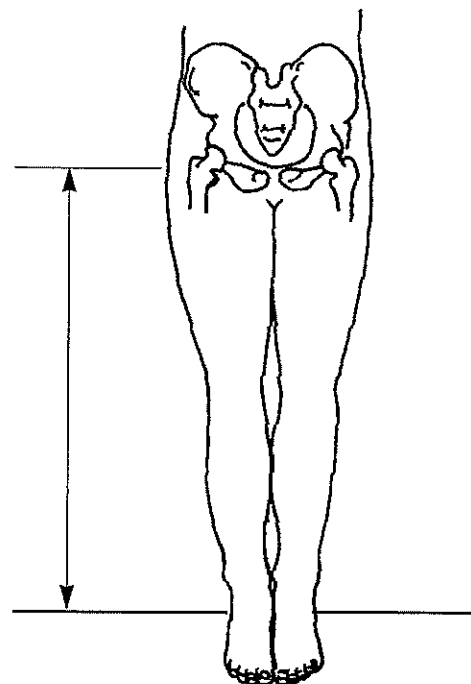
See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and the validity of the data presented here for the current UK population. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different positions or postures (eg stretching or twisting the hips).

SEE ALSO

Buttock height at maximum depth, buttock height at gluteal furrow

NUMBER OF SOURCES: 1

source	reference	country	age
1	Pheasant 1988	UK	2-18



Section 1.3

Static Anthropometry: Hips

Hip height at trochanter 45

source 1 of 1

Pheasant 1988

Country United Kingdom
Ages 2-18

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2	m		42.0	3.7	36.0	48.0
3	m		46.0	3.5	40.0	52.0
4	m		50.0	3.3	44.5	55.5
5	m		55.0	3.6	49.0	61.0
6	m		59.5	4.5	52.0	67.0
7	m		63.5	3.9	57.0	70.0
8	m		66.5	3.5	60.5	72.5
9	m		70.0	4.0	63.5	76.5
10	m		73.5	4.6	66.0	81.0
11	m		76.5	5.0	68.5	84.5
12	m		80.5	5.3	72.0	89.0
13	m		83.5	5.7	74.0	93.0
14	m		87.0	4.6	79.5	94.5
15	m		89.5	4.4	82.5	96.5
16	m		91.0	4.9	83.0	99.0
17	m		92.5	5.0	84.5	100.5
18	m		93.5	4.3	86.5	100.5

continued

source 1 of 1 continued

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2	f		41.5	3.0	36.5	46.5
3	f		46.0	3.3	40.5	51.5
4	f		50.5	3.6	44.5	56.5
5	f		54.0	3.1	49.0	59.0
6	f		47.5	3.2	42.0	53.0
7	f		61.5	3.5	55.5	97.5
8	f		65.0	3.8	58.5	71.5
9	f		69.0	4.8	61.0	77.0
10	f		73.0	5.0	65.0	81.0
11	f		75.0	4.8	67.0	83.0
12	f		78.0	4.7	70.5	85.5
13	f		80.5	5.0	72.5	88.5
14	f		81.0	4.5	73.5	88.5
15	f		81.5	4.2	74.5	88.5
16	f		82.0	4.0	75.5	88.5
17	f		82.0	3.9	75.5	88.5
18	f		82.0	4.0	75.5	88.5

Section 1.3

Static Anthropometry: Hips

Hip breadth (maximum in infants) 46

DEFINITION

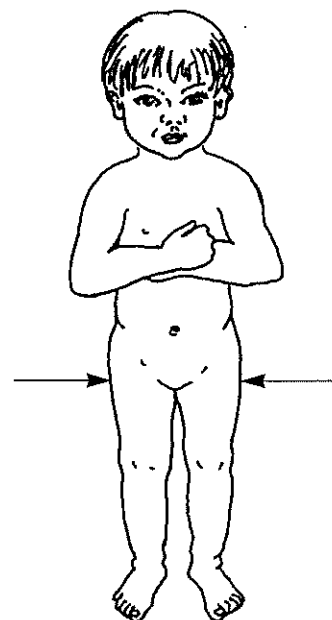
The subject lies on their back with their legs fully extended. The maximum breadth across the hips is measured (centimetres).

APPLICATION AND SUMMARY OF THE DATA

Two sources of data have been included to allow comparison between different countries. Of the sources, Pheasant (1986) is probably more appropriate for use with the current UK population. Steenbekkers is the most recent data on European children and Dutch children are amongst the tallest in Europe. See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and choose between different sources. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different positions or postures.

SEE ALSO

Hip breadth at trochanter, hip breadth (maximum when seated), hip depth



NUMBER OF SOURCES: 2

source	reference	country	age
1	Pheasant 1988	UK	0-2
2	Steenbekkers 1993	NL	0-14mo

Section 1.3

Static Anthropometry: Hips

Hip breadth (maximum in infants) 46

source 1 of 2

Pheasant 1988

Country United Kingdom
Ages 0-2

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
0	mf		12.0	0.8	10.5	13.0
0-6mo			14.0	2.2	10.0	17.5
6-12			16.5	1.5	14.0	19.0
12-18			16.5	1.4	14.0	18.5
18-24			17.5	1.5	15.0	20.0

source 2 of 2

Steenbekkers 1993

Country Netherlands
Ages 0-14 months

age	sex	n	mean (cm)	sd	3rd%ile	97th%ile
0-2mo	m	16	13.0	1.3	10.7	14.7
3-5	m	21	14.2	1.3	12.6	17.3
6-8	m	22	15.2	1.4	13.3	18.4
9-11	m	13	15.8	0.9	14.3	17.0
12-14	m	15	16.3	1.5	14.2	18.9
0-2	f	9	12.4	1.7	11.0	15.7
3-5	f	20	13.8	1.4	11.1	16.9
6-8	f	14	15.4	1.8	13.2	18.7
9-11	f	16	15.2	1.7	12.9	18.1
12-14	f	23	15.9	1.4	13.6	18.2

Section 1.3

Static Anthropometry: Hips

Hip breadth at trochanter 47

DEFINITION

The subject stands erect, with feet together, weight evenly distributed. The horizontal distance between the right and left greater trochanter landmarks (the bony protrusions at the top of the hip bone) is measured (centimetres).

APPLICATION AND SUMMARY OF THE DATA

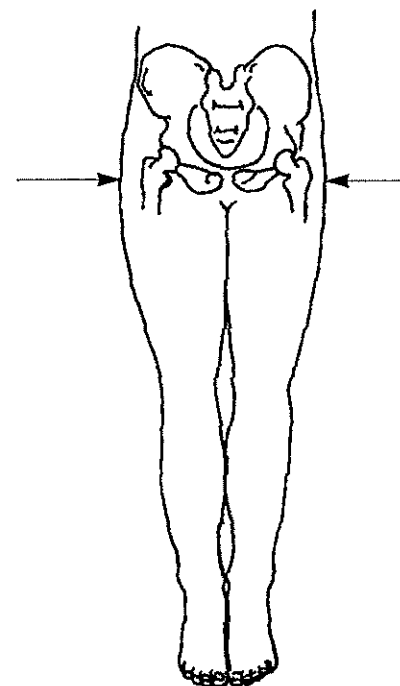
Two sources of data have been included to allow comparison between different countries. Of the sources, Snyder (1977) is probably more appropriate for use with the current UK population. Steenbekkers is the most recent data on European children and Dutch children are amongst the tallest in Europe. See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and choose between different sources. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different positions or postures, or the compression of soft tissue such as during sitting

SEE ALSO

Hip breadth (maximum in infants), hip breadth (maximum when seated)

NUMBER OF SOURCES: 2

source	reference	country	age
1	Snyder 1977	US	2-19
2	Steenbekkers 1993	NL	2-12



Section 1.3

Static Anthropometry: Hips

Hip breadth at trochanter 47

source 1 of 2

Snyder 1977

Country United States
Ages 2-19

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2-3.5	mf	66	17.00	1.00	16.50	20.00
2.5-3.5		66	17.00	1.00	16.50	20.00
2.5-3.5		66	17.00	1.00	16.50	20.00
3.5-4.5		79	18.70	1.10	16.90	20.30
4.5-5.5		76	19.60	1.00	17.60	21.10
5.5-6.5		77	20.20	1.10	18.60	22.20
6.5-7.5		74	21.40	1.50	19.00	24.00
7.5-8.5		64	22.40	1.60	20.50	24.70
8.5-9.5		80	23.50	1.80	20.80	26.40
9.5-10.5		74	24.20	1.70	22.00	27.50
10.5-11.5		96	25.80	2.20	22.90	29.80
11.5-12.5		95	26.60	2.30	23.00	30.60
12.5-13.5		100	28.30	2.50	24.40	33.00
13.5-14.5		82	29.70	2.00	26.30	33.00
14.5-15.5		87	30.90	2.30	27.10	34.40
15.5-16.5		63	32.20	2.00	28.60	36.10
16.5-17.5		74	32.40	2.10	29.60	36.60
17.5-19		46	32.80	1.70	30.60	36.30

source 2 of 2

Steenbekkers 1993

Country Netherlands
Ages 2-12

age	sex	n	mean (cm)	sd	3rd%ile	97th%ile
2	m	81	18.1	1.1	16.3	20.2
3		97	19.1	1.1	17.2	21.0
4		85	20.0	1.1	18.0	21.8
5		86	20.9	1.2	19.0	23.8
6		98	21.5	1.1	19.5	24.1
7		106	22.7	1.3	20.6	25.5
8		96	23.3	1.4	21.2	26.1
9		122	24.5	1.6	21.9	27.9
10		134	25.6	1.8	22.9	29.5
11		143	26.6	2.1	23.7	31.1
12		78	27.2	1.9	24.1	31.8
2	f	92	18.1	1.1	16.0	20.4
3		86	18.7	0.9	16.9	20.8
4		79	20.1	1.1	18.4	22.4
5		94	20.9	1.4	18.5	24.2
6		92	21.9	1.2	20.0	24.7
7		93	23.0	1.7	19.9	26.2
8		95	23.7	1.5	20.9	26.9
9		122	24.6	1.8	21.3	28.2
10		136	26.5	2.2	23.3	31.3
11		151	27.2	2.2	23.8	31.3
12		79	28.4	2.4	24.5	34.4

Section 1.3

Static Anthropometry: Hips

Hip breadth (maximum when seated) 48

DEFINITION

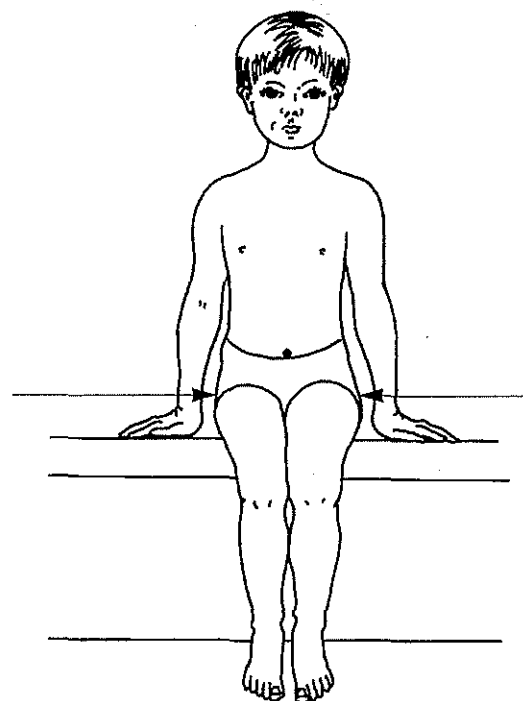
Subject sits erect with knees together and at 90 degrees. The maximum breadth across the hips when seated is measured (centimetres).

APPLICATION AND SUMMARY OF THE DATA

Two sources of data have been included to allow comparison between different countries. Of the sources, Pheasant (1986) is probably more appropriate for use with the current UK population. Steenbekkers is the most recent data on European children and Dutch children are amongst the tallest in Europe. See sections 2.4 of the introduction to the databank for guidance on how to apply data and choose between different sources. Static anthropometric measurements do not account for stretching or twisting the body or different seating positions and postures.

SEE ALSO

Hip breadth at trochanter, hip breadth (maximum in infants), thigh breadth (maximum when seated), thigh depth, knee breadth (seated).



NUMBER OF SOURCES: 2

source	reference	country	age
1	Pheasant 1988	UK	2-18
2	Steenbekkers 1993	NL	2-12

Section 1.3

Static Anthropometry: Hips

Hip breadth (maximum when seated) 48

source 1 of 2

Pheasant 1988

Country United Kingdom
Ages 2-18

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2	m		19.0	1.3	17.0	21.0
3	m		19.5	1.3	17.5	25.0
4	m		20.0	1.3	18.0	22.0
5	m		21.0	1.5	18.5	23.5
6	m		21.5	2.1	18.0	25.0
7	m		22.5	2.1	19.0	26.0
8	m		23.5	2.0	20.0	27.0
9	m		24.5	2.4	20.5	28.5
10	m		26.0	2.8	21.5	30.5
11	m		26.5	2.7	22.0	31.0
12	m		27.5	2.6	23.0	32.0
13	m		29.0	2.8	24.5	33.5
14	m		30.5	2.8	26.0	35.0
15	m		32.0	2.6	27.5	36.5
16	m		33.0	2.3	29.0	37.0
17	m		33.5	2.4	29.5	37.5
18	m		34.0	2.5	30.0	38.0

continued

source 1 of 2 continued

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2	f		18.5	1.1	16.5	20.5
3	f		19.5	1.3	17.5	21.5
4	f		20.5	1.5	18.0	23.0
5	f		21.0	1.6	18.5	23.5
6	f		22.0	1.9	19.0	25.0
7	f		23.5	2.3	19.5	27.5
8	f		24.5	2.3	20.5	28.5
9	f		25.5	2.7	21.0	30.0
10	f		26.5	3.0	21.5	31.5
11	f		28.0	3.4	22.5	33.5
12	f		29.5	3.5	23.5	35.5
13	f		31.5	3.0	26.5	36.5
14	f		33.0	2.6	26.5	37.5
15	f		33.5	2.5	29.5	37.5
16	f		34.5	2.5	30.5	38.5
17	f		34.5	2.8	30.0	39.0
18	f		34.5	2.7	30.0	39.0

Section 1.3

Static Anthropometry: Hips

Hip breadth (maximum when seated) 48

source 2 of 2

Steenbekkers 1993

Country Netherlands
Ages 2-12

age	sex	n	mean (cm)	sd	3rd%ile	97th%ile
2	m	81	19.1	1.4	16.8	21.7
3	m	97	20.1	1.3	17.8	23.1
4	m	85	21.4	1.4	18.5	24.0
5	m	86	22.4	1.6	20.2	26.4
6	m	98	22.8	1.4	20.1	25.4
7	m	106	23.9	1.7	21.3	27.9
8	m	96	26.0	1.8	21.8	28.0
9	m	122	26.0	2.1	22.7	31.1
10	m	134	27.1	2.3	23.9	32.4
11	m	143	28.2	2.5	24.8	34.2
12	m	78	28.6	2.3	24.7	32.8
2	f	92	19.2	1.4	16.9	22.4
3	f	86	19.8	1.2	17.5	22.4
4	f	79	21.6	1.4	19.3	24.2
5	f	94	22.2	1.8	19.4	26.1
6	f	92	23.3	1.7	20.4	26.5
7	f	93	24.6	2.1	20.7	28.6
8	f	95	25.3	1.9	21.4	28.6
9	f	122	26.1	2.3	22.4	30.6
10	f	136	28.3	2.8	24.4	34.7
11	f	151	28.9	2.7	24.3	34.1
12	f	79	30.4	3.1	25.1	38.1

DEFINITION

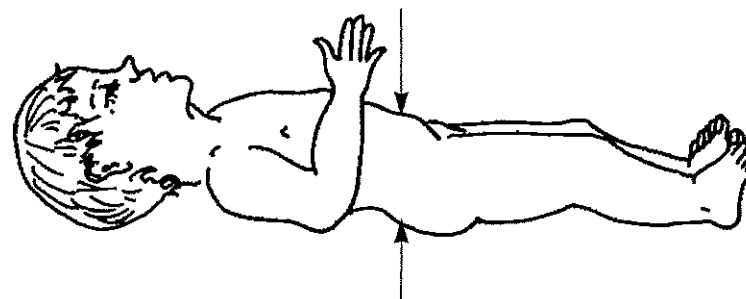
The subject lies supine (on back) with legs fully outstretched. The depth of the hips (front to back) is measured just below the iliac crests (top of the hip bones) and at the level of the maximum hip breadth (centimetres).

APPLICATION AND SUMMARY OF THE DATA

See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and the validity of USA data for the current UK population. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different positions or postures.

SEE ALSO

Abdominal depth, chest depth, hip breadth (maximum in infants), thigh depth (clearance when seated), upper thigh depth

**NUMBER OF SOURCES: 1**

source	reference	country	age
1	Snyder 1975	US	0-2

Section 1.3

Static Anthropometry: Hips

Hip depth 49

source 1 of 1

Snyder 1975

Country USA
Ages 0-2

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
0-2mo	m	62	7.3	1.0	5.3	8.9
3-4	m	26	8.8	1.3	6.0	11.5
5-6	m	25	8.9	1.0	4.4	10.4
7-8	m	9	9.1	1.2	7.7	11.1
9-10	m	13	9.8	1.3	7.9	13.3
11-12	m	8	9.1	0.9	7.9	10.7
13-14	m	6	9.8	1.3	7.4	10.9
15-16	m	4	10.0	1.7	7.6	11.7
17-18	m	10	9.3	1.2	7.4	11.4
19-20	m	4	10.4	1.3	9.2	12.3
21-22	m	7	10.3	1.1	8.3	11.5
23-24	m	6	10.5	1.0	9.5	12.4
0-2	f	51	7.3	1.3	5.1	9.4
3-4	f	28	8.6	0.9	7.1	10.3
5-6	f	30	9.5	1.2	7.2	11.6
7-8	f	13	9.5	1.3	7.6	11.3
9-10	f	14	9.0	1.2	6.3	11.0
11-12	f	9	8.8	1.4	7.5	12.1
13-14	f	6	9.7	1.1	7.5	10.8
15-16	f	2	10.5	1.9	9.1	11.9
17-18	f	4	10.6	0.7	9.6	11.5
19-20	f	5	9.2	1.4	8.2	11.7
21-22	f	4	8.9	1.9	7.1	10.7
23-24	f	4	9.7	0.7	9.2	10.9

Section 1.3

Static Anthropometry: Hips

Hip circumference 50

DEFINITION

The subject stand erect, with feet together, weight evenly distributed. Hip circumference is measured either at the level of the trochanter (top of the thigh bone) (source 1) or at the maximum horizontal circumference at the level of the greatest posterior protrusion of the buttocks, as viewed from the side (source 2). Infants are measured supine (lying on their back) (centimetres).

APPLICATION AND SUMMARY OF THE DATA

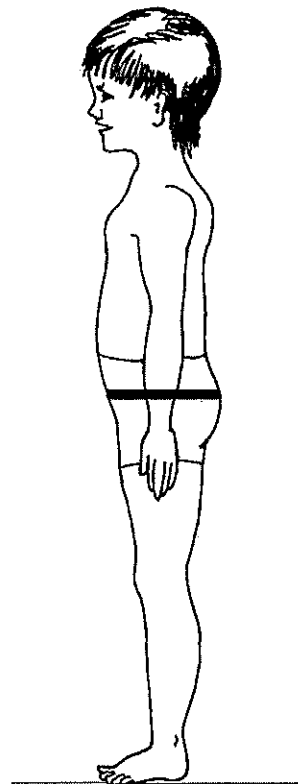
Two sources of data have been included to allow comparison between different countries. Of the sources, BSI (1990) is probably more appropriate for use with the current UK population. See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and choose between different sources. Static anthropometric measurements do not account for stretching or twisting the body or different seating positions and postures.

SEE ALSO

Waist circumference at navel, waist circumference (maximum in infants), waist circumference (natural), buttock height at maximum depth.

NUMBER OF SOURCES: 2

source	reference	country	age
1	BSI 1990	UK	0-16
2	Snyder 1977	US	0-19



source 1 of 2

BSI 1990

CountryUnited Kingdom
Ages0-16

Hip circumference is measured at the level of the trochanter (the top of the thigh bone); circumference is maximum circumference in infants measured supine (lying on their back), approximately level with the trochanter.

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
0-3mo	mf	162	34.50	4.34	27.9	41.9
3-6mo	mf	90	42.88	3.20	37.3	48.6
6-9mo	mf	82	45.40	3.41	40.1	51.4
9-12mo	mf	81	46.79	2.66	42.8	51.1
12-15mo	mf	99	47.84	2.66	43.0	52.2
15-18mo	mf	90	49.14	2.72	44.7	53.3
18-21mo	mf	86	50.02	3.46	43.9	55.1
21-24mo	mf	98	50.29	3.46	44.4	55.9
2-2.5	mf	163	50.24	3.12	44.8	55.2
2.5-3	mf	140	52.48	3.11	48.0	57.4
3	mf	342	54.82	3.54	49.5	61.0
4	mf	369	56.97	3.74	51.5	63.3
5	m	251	57.52	3.70	51.8	63.7
6	m	346	58.95	3.67	53.7	65.0
7	m	327	62.62	4.49	56.0	70.5
8	m	330	64.96	4.83	58.5	74.0
9	m	328	68.11	5.48	60.7	79.4
10	m	354	70.59	5.32	63.8	80.0
11	m	301	73.22	6.25	65.0	85.0
12	m	335	75.95	6.08	67.0	86.4
13	m	299	79.60	6.59	70.0	90.6
14	m	269	83.23	7.02	73.0	94.5
15	m	277	86.12	6.47	75.9	97.0
16	m	84	88.15	5.37	77.5	97.9

continued

source 1 of 2 continued

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
5	f	366	60.16	4.14	54.0	68.1
6	f	355	62.35	4.29	56.4	69.6
7	f	349	65.89	5.24	59.2	75.7
8	f	383	68.62	5.28	60.9	77.3
9	f	368	71.59	5.54	63.8	80.4
10	f	348	74.29	5.96	65.8	84.8
11	f	332	77.81	6.71	68.1	90.1
12	f	373	81.08	6.72	70.6	92.7
13	f	376	86.39	7.17	74.5	99.1
14	f	389	89.99	6.13	80.4	100.2
15	f	394	91.27	5.66	82.0	100.2
16	f	250	93.50	5.95	84.7	103.6

Section 1.3

Static Anthropometry: Hips

Hip circumference 50

source 2 of 2

Snyder 1977

Country United States
Ages 0-19

Hip circumference is measured at the level of the greatest posterior protrusion of the buttocks, as viewed from the side. Infants are measured supine (lying on their back).

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
0-2mo	mf	30	36.80	5.00	28.60	45.00
3-5mo		44	40.50	4.40	33.20	47.60
6-8mo		28	45.70	2.90	41.20	51.20
9-11mo		26	44.80	3.30	39.80	51.70
12-15mo		26	46.40	3.30	40.60	49.70
16-19mo		26	47.70	4.00	40.90	53.00
20-23mo		30	47.60	3.90	41.50	53.00
2-3.5		200	51.70	3.20	46.90	57.00
3.5-4.5		225	53.50	3.50	48.20	59.40
4.5-5.5		260	56.10	3.50	51.20	62.20
5.5-6.52		17	58.30	4.00	52.00	65.70
6.5-7.5		222	61.90	5.20	55.20	71.70
7.5-8.5		188	65.00	5.60	57.70	76.20
8.5-9.5		248	67.70	5.90	59.40	79.80
9.5-10.5		247	70.80	6.70	61.70	82.80
10.5-11.5		276	74.30	7.70	64.20	90.60
11.5-12.5		283	76.60	7.20	66.20	90.10
12.5-13.5		310	81.00	7.30	70.00	93.30
13.5-14.5		270	84.30	7.10	72.90	96.50
14.5-15.5		262	88.10	7.10	75.60	99.00
15.5-16.5		198	90.50	6.30	80.90	101.50
16.5-17.5		220	91.80	6.40	82.90	104.60
17.5-19		156	93.00	6.00	84.20	103.40

Section 1.3

Static Anthropometry: Hips

Buttock height at maximum depth 51

DEFINITION

The subject stands erect with feet together, weight evenly distributed and arms hanging at sides. The vertical distance from the standing surface to the maximum posterior (rearward) protrusion of the buttocks is measured (centimetres).

APPLICATION AND SUMMARY OF THE DATA

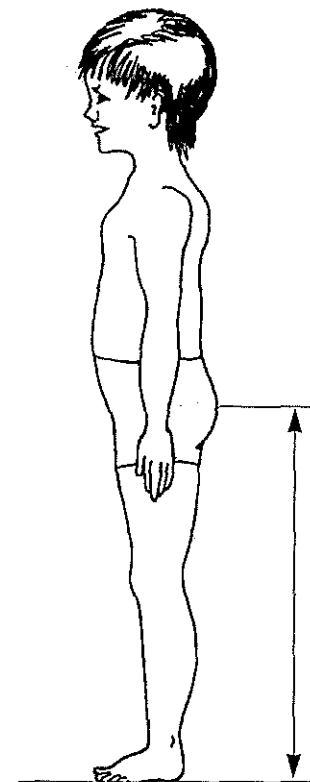
See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and the validity of USA data for the current UK population. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different positions and postures.

SEE ALSO

Hip height at trochanter, buttock height at gluteal furrow

NUMBER OF SOURCES: 1

source	reference	country	age
1	Snyder	1977	US2-19



Section 1.3

Static Anthropometry: Hips

Buttock height at maximum depth 51

source 1 of 1

Snyder 1977

Country United States
Ages 2-19

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2-3.5	mf	67	40.40	2.90	36.20	45.20
3.5-4.5		78	46.20	3.20	41.50	52.00
4.5-5.5		93	50.50	3.20	45.60	56.90
5.5-6.5		80	54.80	3.40	49.60	61.50
6.5-7.5		86	58.50	3.70	51.80	64.70
7.5-8.5		68	32.60	3.70	56.70	68.10
8.5-9.5		91	67.30	4.00	60.90	73.80
9.5-10.5		85	69.20	4.00	62.40	75.40
10.5-11.5		86	72.60	3.40	66.70	77.80
11.5-12.5		97	76.30	4.80	68.80	84.90
12.5-13.5		108	79.30	4.50	72.10	85.90
13.5-14.5		90	82.50	5.60	73.40	92.20
14.5-15.5		81	84.40	5.50	74.80	94.50
15.5-16.5		79	85.20	6.00	76.30	94.10
16.5-17.5		67	85.10	6.10	75.50	94.00
17.5-19		63	87.40	7.10	75.30	99.00

Section 1.3

Static Anthropometry: Hips

Buttock height at gluteal furrow 52

DEFINITION

The subject stands erect with feet together and weight evenly distributed. The vertical distance is measured from the standing surface to the lowest point at which the buttock curve and the back of the right thigh join (centimetres).

APPLICATION AND SUMMARY OF THE DATA

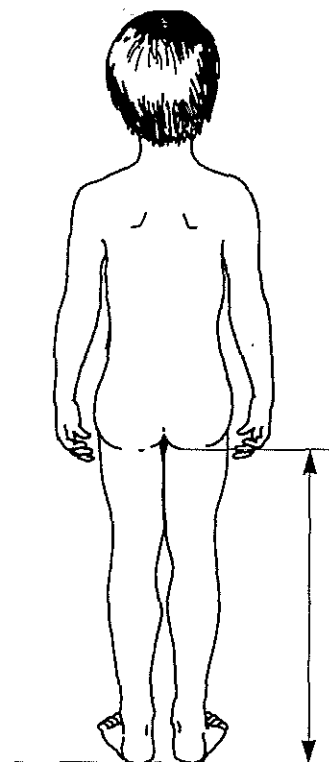
See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and the validity of USA data for the current UK population. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different positions and postures.

SEE ALSO

Buttock height at maximum depth, hip height at trochanter

NUMBER OF SOURCES: 1

source	reference	country	age
1	Snyder 1977	US	2-19



Section 1.3

Static Anthropometry: Hips

Buttock height at gluteal furrow 52

source 1 of 1

Snyder 1977

Country United States
Ages 2-19

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2-3.5	mf	67	37.50	2.90	32.10	42.10
3.5-4.5		79	41.70	3.10	37.10	47.40
4.5-5.5		76	46.10	3.00	40.60	50.20
5.5-6.5		76	50.70	3.10	45.40	55.40
6.5-7.5		76	54.70	3.30	48.70	59.90
7.5-8.5		64	58.20	3.30	52.10	63.30
8.5-9.5		79	61.50	3.80	55.50	66.80
9.5-10.5		75	64.90	4.00	58.70	71.10
10.5-11.5		97	67.60	4.00	60.00	74.20
11.5-12.5		95	71.30	4.70	63.70	79.60
12.5-13.5		100	73.60	4.60	67.20	81.00
13.5-14.5		81	75.50	5.00	67.60	83.70
14.5-15.5		88	76.50	4.60	69.90	83.30
15.5-16.5		63	78.20	5.90	68.20	87.50
16.5-17.5		74	78.00	5.70	67.60	85.86
17.5-19		46	78.70	6.50	69.90	89.40

DEFINITION

The distance from the acromion (the bony process at the outer edge of the clavicle or collar bone) to the fingertip with the elbow and wrist straight/extended (centimetres).

APPLICATION AND SUMMARY OF THE DATA

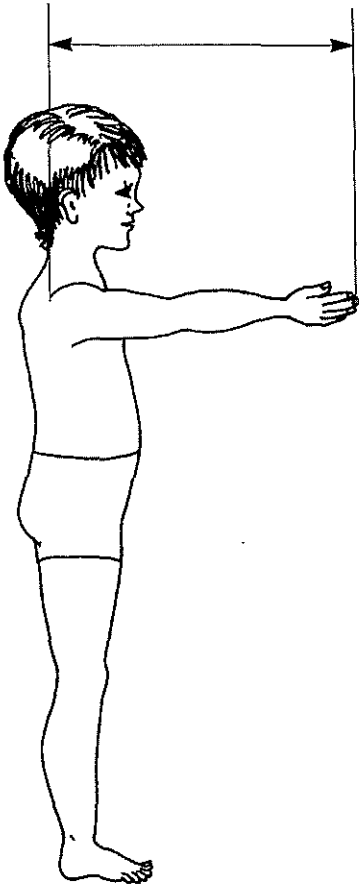
See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and the validity of these data for the current UK population. Static anthropometric measurements do not account for stretching, twisting or forcing the body to maximise reach.

SEE ALSO

Arm length to grip, upper arm length (shoulder to elbow), forward reach to grip (standing), forward reach to grip (stretching and seated), forward reach to fingertip (stretching and seated, legs outstretched), forward reach to grip (stretching and seated)

NUMBER OF SOURCES: 1

source	reference	country	age
1	Pheasant 1988	UK	2-18



Section 1.4

Static Anthropometry: Arms

Arm length to fingertip 53

source 1 of 1

Pheasant 1988

Country United Kingdom
Ages 2-18

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2	m		41.0	2.8	36.5	45.5
4	m		46.0	2.6	41.5	50.5
5	m		48.5	2.9	43.5	53.5
6	m		51.0	3.4	45.5	56.5
7	m		54.0	3.2	48.5	59.5
8	m		56.5	3.0	51.5	61.5
9	m		58.5	3.3	53.0	64.0
10	m		61.0	4.2	54.0	68.0
11	m		63.0	4.3	56.0	70.0
12	m		66.5	4.1	60.0	73.0
13	m		69.5	4.7	62.0	77.0
14	m		73.5	4.7	66.0	81.0
15	m		77.0	4.7	69.5	84.5
16	m		79.0	4.0	72.5	85.5
17	m		79.0	3.6	73.0	85.0
18	m		79.0	3.1	74.0	84.0

continued

source 1 of 1 continued

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2	f		38.0	2.7	33.5	42.5
3	f		41.5	3.1	36.5	46.5
4	f		45.0	3.5	39.0	51.0
5	f		47.0	3.5	41.0	53.0
6	f		49.5	3.8	43.0	56.0
7	f		52.5	3.4	47.0	58.0
8	f		55.5	3.5	49.5	61.5
9	f		57.5	4.5	50.0	65.0
10	f		59.0	4.4	52.0	66.0
11	f		63.0	4.6	55.5	70.5
12	f		66.0	5.2	57.5	74.5
13	f		68.0	4.7	60.5	75.5
14	f		70.0	3.6	64.0	76.0
15	f		70.5	3.3	65.0	76.0
16	f		71.0	2.9	66.0	76.0
17	f		71.0	2.9	66.0	76.0
18	f		71.0	2.9	66.0	76.0

Section 1.4

Static Anthropometry: Arms

Arm length to grip 54

DEFINITION

The distance from the acromion (the bony process at the outer edge of the clavicle or collar bone) to the centre of an object gripped in the hand, arm held out straight in front of the body and with the elbow and wrist straight (centimetres).

APPLICATION AND SUMMARY OF THE DATA

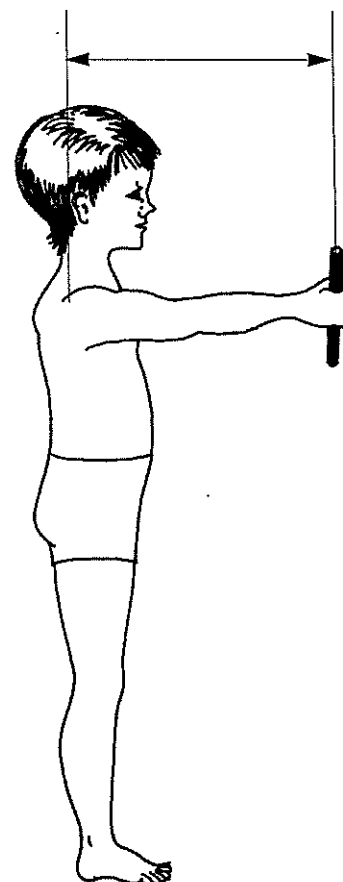
See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and the validity of these data for the current UK population. Static anthropometric measurements do not account for stretching, twisting or forcing the body to maximise reach.

SEE ALSO

Arm length to fingertip, upper arm length (shoulder to elbow), forward reach to grip (standing), forward reach to grip (seated), forward reach to grip (stretching and seated), forward reach to fingertip (stretching and seated, legs outstretched), sideways reach to grip (standing)

NUMBER OF SOURCES: 1

source	reference	country	age
1	Pheasant 1988	UK	2-18



source 1 of 1

Pheasant 1988

Country	United Kingdom					
Ages	2-18					
age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2	m		34.0	2.8	29.5	39.0
3	m		36.5	2.7	32.0	48.0
4	m		38.5	2.6	34.0	43.0
5	m		40.5	2.9	35.5	45.0
6	m		42.5	3.4	37.0	48.0
7	m		45.0	3.2	40.0	50.5
8	m		47.5	3.0	42.5	52.5
9	m		49.0	3.3	43.5	54.5
10	m		51.5	4.2	44.5	58.0
11	m		53.0	4.3	46.0	60.0
12	m		56.0	4.1	49.0	62.5
13	m		58.5	4.7	50.5	66.0
14	m		62.0	4.7	54.0	69.5*
15	m		65.0	4.7	57.0	72.5
16	m		67.0	4.0	60.5	73.5
17	m		66.5	3.6	60.5	72.5
18	m		66.5	3.1	61.5	71.5

continued

source 1 of 1 continued

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2	f		31.5	2.7	27.0	36.0
3	f		34.5	3.1	29.5	39.5
4	f		37.0	3.5	31.5	43.0
5	f		69.0	3.5	33.5	45.0
6	f		41.5	3.8	35.0	47.5
7	f		43.5	3.4	38.0	49.5
8	f		46.5	3.5	40.5	52.0
9	f		48.0	4.5	40.5	55.5
10	f		49.5	4.4	42.0	56.5
11	f		53.0	4.6	45.5	60.5
12	f		55.5	5.2	46.5	64.0
13	f		57.0	4.7	49.0	64.5
14	f		59.0	3.6	53.0	65.0
15	f		59.5	3.3	54.0	65.0
16	f		59.5	2.9	55.0	64.5
17	f		59.5	2.9	55.0	64.5
18	f		59.5	2.9	55.0	64.5

DEFINITION

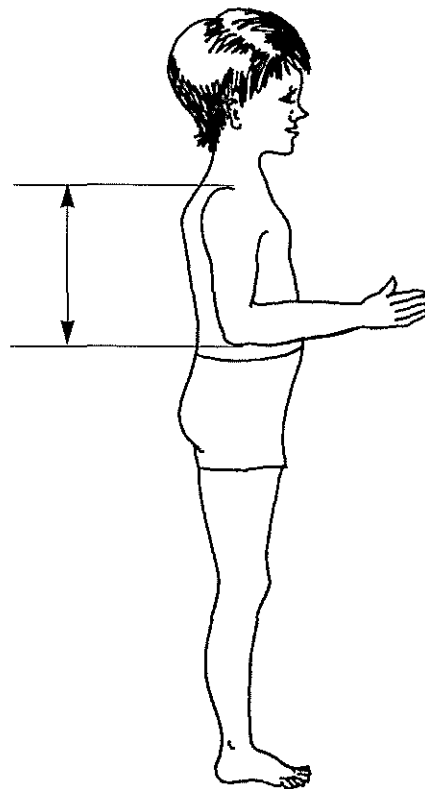
The subject stands erect, upper arms at sides and elbows flexed 90 degrees. The distance from the superior (top) surface of the right shoulder to the inferior (lower) surface of the forearm, just below the elbow is measured (centimetres).

APPLICATION AND SUMMARY OF THE DATA

See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and the validity of these data for the current UK population. Static anthropometric measurements do not account for stretching, twisting or forcing the body to maximise reach.

SEE ALSO

Arm length to grip, arm length to fingertip

**NUMBER OF SOURCES: 1**

source	reference	country	age
1	Pheasant 1988	UK	0-18

Section 1.4

Static Anthropometry: Arms

Upper arm length (shoulder to elbow) 55

source 1 of 1

Pheasant 1988

Country United Kingdom
Ages 0-18

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
0	mf		9.5	0.6	0.85	10.5
0-6 mo	mf		11.5	1.6	0.90	14.5
6-12 mo	mf		14.0	1.1	12.0	15.5
12-18 mo	mf		14.5	1.0	13.0	16.0
18-24 mo	mf		16.5	1.1	14.5	18.0
2	m		18.5	1.3	16.0	20.5
3	m		19.5	1.3	17.5	16.5
4	m		21.0	1.3	19.0	23.0
5	m		22.5	1.4	20.5	25.0
6	m		24.0	1.6	21.5	26.5
7	m		25.5	1.5	23.0	28.0
8	m		26.5	1.5	24.0	29.0
9	m		27.5	1.6	25.0	30.5
10	m		29.0	1.6	26.5	31.5
11	m		30.0	1.6	27.0	32.5
12	m		31.0	1.8	28.0	34.0
13	m		32.5	2.2	29.0	36.0
14	m		34.5	2.1	31.0	38.0
15	m		35.5	1.9	32.5	38.5
16	m		36.5	1.8	33.5	39.5
17	m		36.5	1.9	33.5	39.5
18	m		37.0	1.7	34.0	39.5

continued

source 1 of 1 continued

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2	f		17.5	1.0	16.0	19.0
3	f		19.5	1.2	17.5	21.5
4	f		21.0	1.4	18.5	23.5
5	f		22.0	1.3	20.0	24.5
6	f		23.5	1.3	21.5	25.5
7	f		25.0	1.5	22.5	27.5
8	f		26.0	1.4	24.0	28.5
9	f		27.5	1.7	24.5	30.0
10	f		29.0	1.8	26.0	32.0
11	f		30.0	2.0	26.5	33.0
12	f		31.5	2.0	28.0	34.5
13	f		32.5	1.8	29.5	35.5
14	f		33.5	1.7	30.5	36.0
15	f		33.5	1.7	30.5	36.5
16	f		33.5	1.7	31.0	36.5
17	f		33.5	1.8	30.5	36.5
18	f		33.5	1.6	31.0	36.0

DEFINITION

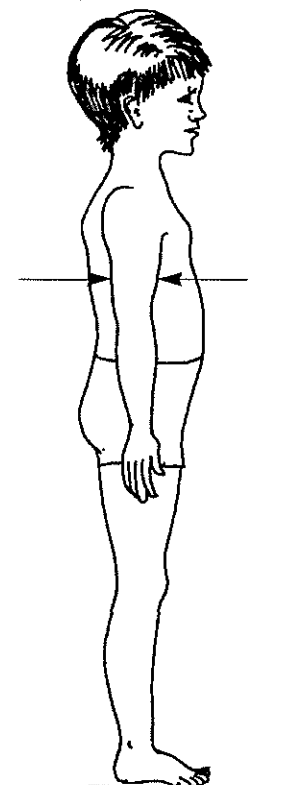
The subject stands erect, arms hanging at sides with palms in. The horizontal depth (anterior-posterior or front to back) of the right arm, midway between the shoulder and elbow, is measured with a sliding calliper (centimetres).

APPLICATION AND SUMMARY OF THE DATA

See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and the validity of USA data for the current UK population. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different postures or compression of soft tissue.

NUMBER OF SOURCES: 1

source	reference	country	age
1	Snyder 1977	US	2-19



source 1 of 1

Snyder 1977

Country United States
Ages 2-19

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2-3.5	mf	65	4.70	0.60	3.60	5.80
3.5-4.5		73	5.00	0.80	3.80	6.20
4.5-5.5		91	5.00	0.60	4.00	6.00
5.5-6.5		78	5.30	0.80	4.00	6.30
6.5-7.5		87	5.40	0.80	4.10	6.80
7.5-8.5		67	5.90	0.90	4.70	7.20
8.5-9.5		91	6.10	1.00	4.60	7.90
9.5-10.5		84	6.40	1.10	4.60	8.10
10.5-11.5		86	6.30	1.10	4.70	8.00
11.5-12.5		97	6.70	1.00	5.30	8.60
12.5-13.5		107	7.00	1.20	5.20	9.10
13.5-14.5		89	7.40	1.00	5.70	9.00
14.5-15.5		81	7.50	1.10	5.80	9.10 ^a
15.5-16.5		78	7.90	1.30	6.00	10.20
16.5-17.5		66	8.00	1.20	5.90	10.00
17.5-19		63	8.60	1.50	6.40	11.50

DEFINITION

The subject stands erect, arms hanging at sides. The circumference of the right arm, either midway between the shoulder and elbow and perpendicular to the long axis of the limb (source 2), or the maximum horizontal circumference of the upper arm when relaxed (sources 1 and 3) is measured (centimetres).

APPLICATION AND SUMMARY OF THE DATA

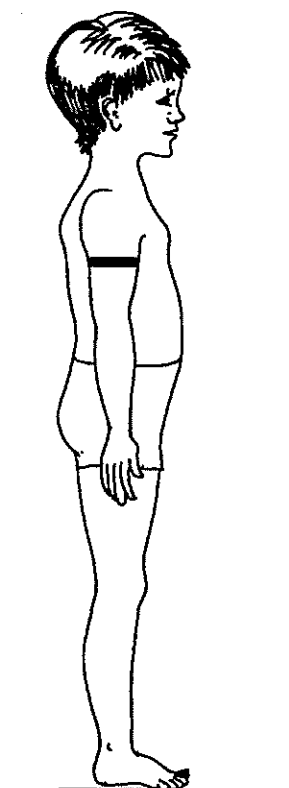
Three sources of data have been included to allow comparison between different countries. Of the sources, BSI (1990) is probably more appropriate for use with the under four's and Snyder with the older children of the current UK population. Steenbekkers is the most recent data on European children and Dutch children are amongst the tallest in Europe. See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and choose between different sources. Static anthropometric measurements do not account for stretching or twisting the body into different postures or compression of soft tissue.

SEE ALSO

Upper arm circumference at armpit, lower arm circumference

NUMBER OF SOURCES: 3

source	reference	country	age
1	BSI 1990	UK	0-4
2	Snyder 1977	US	0-19
3	Steenbekkers 1993	NL	0-12



source 1 of 3

BSI 1990

Country United Kingdom
Ages 0-4

Maximum horizontal circumference of the upper arm perpendicular to the long axis of the limb.

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
0-3mo	mf	162	11.98	1.42	9.5	14.0
3-6mo	mf	90	14.41	1.13	12.6	16.4
6-9mo	mf	82	15.15	1.26	13.4	17.2
9-12mo	mf	81	15.67	1.00	14.0	17.3
12-15mo	mf	99	16.03	1.12	13.9	17.7
15-18mo	mf	91	16.12	1.14	14.5	17.9
18-21mo	mf	88	16.63	1.18	14.5	18.4
21-24mo	mf	98	16.34	1.36	14.1	18.5
2-2.5	mf	20	16.64	0.96	n/a	n/a
2.5-3	mf	15	16.81	1.42	n/a	n/a
3	mf	50	17.35	1.49	14.4	19.7
4	mf	49	17.69	1.45	15.4	20.1

source 2 of 3

Snyder 1977

Country United States
Ages 0-19

Circumference of the upper arm midway between the shoulder and elbow and perpendicular to the long axis of the limb.

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
0-2mo	mf	31	11.80	1.50	9.60	13.30
3-5mo		44	13.00	1.20	10.30	14.60
6-8mo		30	14.00	1.00	12.10	15.70
9-11mo		27	14.80	1.00	12.90	16.10
12-15mo		32	14.50	1.10	12.70	16.40
16-19mo		29	14.70	1.30	12.70	16.60
20-23mo		31	15.00	1.00	12.90	16.30
2-3.5		212	15.80	1.30	13.60	17.80
3.5-4.5		227	16.20	1.30	14.20	18.40
4.5-5.5		263	16.70	1.40	14.80	19.00
5.5-6.5		219	17.20	1.50	14.90	19.70
6.5-7.5		224	18.10	2.00	15.60	21.80
7.5-8.5		189	18.90	2.20	15.60	22.80
8.5-9.5		251	19.60	2.20	16.40	23.50
9.5-10.5		253	20.40	2.60	17.10	24.80
10.5-11.5		281	21.30	2.90	17.70	26.60
11.5-12.5		287	21.90	2.60	18.20	27.00
12.5-13.5		312	23.00	2.70	19.30	28.10
13.5-14.5		271	24.10	2.60	19.80	28.60
14.5-15.5		264	25.10	2.90	20.60	30.20
15.5-16.5		198	26.20	3.00	21.10	31.60
16.5-17.5		221	26.60	3.30	21.90	32.70
17.5-19		156	27.50	3.40	22.10	32.90

Section 1.4

Static Anthropometry: Arms

Upper arm circumference 57

source 3 of 3

Steenbekkers 1993

Country Netherlands

Ages 0-12

Maximum horizontal circumference of the upper arm with the arm hanging relaxed.

age	sex	n	mean (cm)	sd	3rd%ile	97th%ile
0-2mo	m	16	13.1	1.5	10.8	16.0
3-5mo	m	21	14.7	1.4	11.5	17.3
6-8mo	m	22	15.7	0.6	14.6	16.9
9-11mo	m	13	16.1	1.1	14.6	18.8
12-14mo	m	15	16.6	1.5	14.3	19.3
2	m	81	16.8	1.3	14.7	19.2
3	m	97	17.4	1.2	15.2	19.5
4	m	85	17.3	1.2	15.2	19.5
5	m	86	17.8	1.2	15.8	20.7
6	m	98	18.1	1.3	15.9	21.0
7	m	106	18.6	1.5	16.5	22.2
8	m	96	19.3	1.7	16.5	22.9
9	m	122	20.0	1.9	17.5	24.7
10	m	134	20.8	2.1	17.5	26.2
11	m	143	21.4	2.3	17.5	26.7
12	m	78	21.8	2.3	17.8	27.0

continued

source 3 of 3 continued

age	sex	n	mean (cm)	sd	3rd%ile	97th%ile
0-2mo	f	9	12.2	1.2	10.8	13.7
3-5mo	f	20	13.6	0.9	11.7	15.5
6-8mo	f	14	15.4	1.1	13.5	17.0
9-11mo	f	16	15.4	1.2	13.9	17.5
12-14mo	f	23	16.1	0.9	14.6	18.3
2	f	92	16.5	1.1	14.5	19.0
3	f	86	16.8	1.1	14.5	19.0
4	f	79	17.5	1.2	15.1	19.8
5	f	94	17.8	1.5	15.4	20.9
6	f	92	18.5	1.3	16.3	21.4
7	f	93	19.1	1.9	15.6	23.3
8	f	95	19.6	1.7	16.2	22.8
9	f	122	20.0	2.0	16.5	24.2
10	f	136	21.6	2.1	18.3	26.0
11	f	151	21.8	2.0	18.2	25.8
12	f	79	22.1	2.2	18.7	27.3

DEFINITION

The subject stands erect with arms hanging at sides. The circumference of the arm at the level of the armpit is measured such that the plane of the circumference is horizontal when the arm hangs relaxed (centimetres).

APPLICATION AND SUMMARY OF THE DATA

See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and the validity of these data for the current UK population. Static anthropometric measurements do not account for stretching or twisting the body into different postures or compression of soft tissue.

SEE ALSO

Upper arm circumference, lower arm circumference

NUMBER OF SOURCES: 1

source	reference	country	age
1	BSI 1990	UK	5-16



Section 1.4

Static Anthropometry: Arms

Upper arm circumference at armpit 58

source 1 of 1

BSI 1990

Country United Kingdom
Ages 5-16

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
5	m	251	17.11	1.46	15.1	19.5
6	m	346	17.34	1.45	15.3	20.1
7	m	327	18.09	1.88	15.7	21.1
8	m	330	18.51	1.94	15.8	21.6
9	m	328	19.51	2.30	16.5	23.7
10	m	354	19.89	2.33	17.0	24.5
11	m	301	20.78	2.57	17.2	25.5
12	m	335	21.71	2.54	18.4	26.6
13	m	299	22.78	2.84	18.9	28.0
14	m	269	23.46	2.61	19.6	28.3
15	m	277	24.73	2.88	20.5	29.7
16	m	84	25.42	2.68	21.5	29.3
5	f	366	18.59	1.75	16.0	21.7
6	f	358	18.92	1.77	16.3	22.0
7	f	348	20.15	2.18	17.1	24.4
8	f	384	20.78	2.25	17.7	24.5
9	f	368	21.85	2.36	18.2	26.4
10	f	348	22.44	2.53	18.6	27.0
11	f	332	23.34	2.69	19.5	28.0
12	f	373	23.92	2.65	20.0	28.4
13	f	376	25.22	2.84	21.0	30.2
14	f	389	25.96	2.76	21.7	30.5
15	f	394	26.10	2.55	22.5	30.5
16	f	250	26.97	2.63	22.8	31.4

DEFINITION

The subject stands erect with the head in the Frankfort Plane (looking straight ahead), with the arms at the sides and elbows held at 90 degrees. The vertical distance from the floor to the inferior surface (underside) of the elbow is measured (centimetres).

APPLICATION AND SUMMARY OF THE DATA

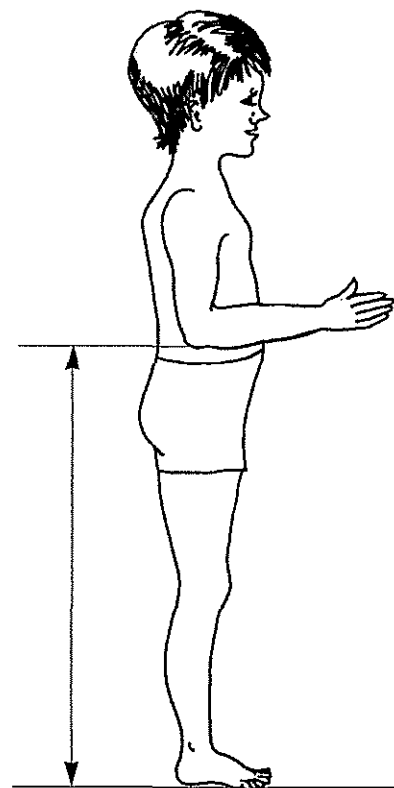
Two sources of data have been included to allow comparison between different countries. Of the sources, Pheasant (1986) is probably more appropriate for use with the current UK population. Steenbekkers is the most recent data on European children and Dutch children are amongst the tallest in Europe. See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and choose between different sources. Static anthropometric measurements do not account for stretching or twisting the body into different postures or positions.

SEE ALSO

Elbow height (supine), elbow height (seated)

NUMBER OF SOURCES: 2

source	reference	country	age
1	Pheasant 1988	UK	2-18
2	Steenbekkers 1989	NL	1-5.5



source 1 of 2

Pheasant 1988

Country United Kingdom
Ages 2-18

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2	m		55.5	3.6	49.5	61.5
3	m		59.5	3.5	53.5	65.5
4	m		63.5	3.4	58.0	69.0
5	m		67.0	3.9	60.5	73.5
6	m		70.5	4.4	63.5	77.5
7	m		74.5	4.0	68.0	81.0
8	m		78.0	4.5	70.5	85.5
9	m		82.0	5.0	74.0	90.0
10	m		86.0	5.5	77.0	95.0
11	m		89.0	5.7	79.5	98.5
12	m		93.0	5.5	84.0	102.0
13	m		97.0	6.1	87.0	107.0
14	m		101.5	6.0	91.5	111.5
15	m		105.5	5.6	96.5	114.5
16	m		107.5	4.9	99.5	115.5
17	m		109.0	5.0	101.0	117.0
18	m		110.5	4.4	101.0	117.5

continued

source 1 of 2 continued

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2	f		53.0	3.0	48.0	58.0
3	f		58.0	3.5	52.0	64.0
4	f		63.0	4.0	56.5	69.5
5	f		66.0	4.1	59.5	72.5
6	f		69.5	4.3	62.5	76.5
7	f		73.5	4.2	66.5	80.5
8	f		77.5	4.2	70.5	84.5
9	f		81.5	5.7	72.0	91.0
10	f		86.0	5.7	76.5	95.5
11	f		89.0	5.6	80.0	98.0
12	f		94.0	6.0	84.0	104.0
13	f		97.0	5.7	87.5	106.5
14	f		98.5	5.3	90.0	107.0
15	f		99.5	4.8	91.5	107.5
16	f		100.5	4.5	93.0	108.0
17	f		100.5	4.3	93.5	107.5
18	f		101.0	4.2	94.0	108.0

Section 1.4

Static Anthropometry: Elbows

Elbow height 59

*source 2 of 2

Steenbekkers 1989**Country** Netherlands
Ages 1-5.5

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
1-1.5	mf	33	45.10	2.40	41.10	48.90
1.5-2		80	48.30	2.30	44.30	52.40
2-2.5		62	51.40	2.50	48.00	55.90
2.5-3		59	54.70	2.70	50.50	59.20
3-3.5		75	57.30	2.70	53.30	62.10
3.5-4		58	59.90	2.50	55.90	64.50
4-4.5		46	63.40	3.30	58.80	69.10
4.5-5		28	64.90	2.80	60.80	69.60
5-5.5		13	66.70	2.90	61.00	73.20

DEFINITION

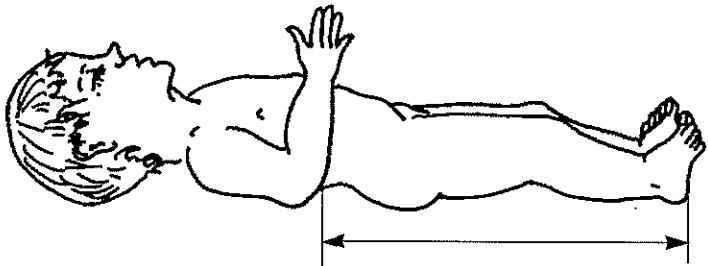
The subject lies on their back with their arms at sides and the elbows held at 90 degrees. The distance from the sole of the foot to the inferior surface (the underside) of the elbow is measured (centimetres).

APPLICATION AND SUMMARY OF THE DATA

See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and the validity of Dutch data for use with the current UK population. Steenbekkers is the most recent data on European children and Dutch children are amongst the tallest in Europe. Static anthropometric measurements do not account for stretching or twisting the body into different postures or positions.

SEE ALSO

Elbow height (from floor), elbow height (seated)



NUMBER OF SOURCES: 1

source	reference	country	age
1	Steenbekkers 1993	NL	0-14mo

source 1 of 1

Steenbekkers 1993

Country Netherlands
Ages 0-14mo

age	sex	n	mean (cm)	sd	3rd%ile	97th%ile
0-2mo	m	16	35.2	2.4	31.7	39.5
3-5	m	21	37.9	3.4	30.9	43.3
6-8	m	22	41.5	3.1	35.6	47.0
9-11	m	13	44.3	2.5	39.0	47.0
12-14	m	15	46.4	2.9	39.3	52.5
0-2mo	f	9	33.2	2.6	29.6	36.6
3-5	f	20	36.6	2.6	32.2	42.1
6-8	f	14	39.6	2.0	37.0	42.8
9-11	f	16	42.7	3.2	37.5	48.1
12-14	f	23	46.3	2.7	41.1	51.9

DEFINITION

The subject sits with knees and hips at 90 degrees and with arms at sides and the elbows held at 90 degrees. The vertical distance from the sitting surface to the inferior surface (the underside) of the elbow is measured (centimetres).

APPLICATION AND SUMMARY OF THE DATA

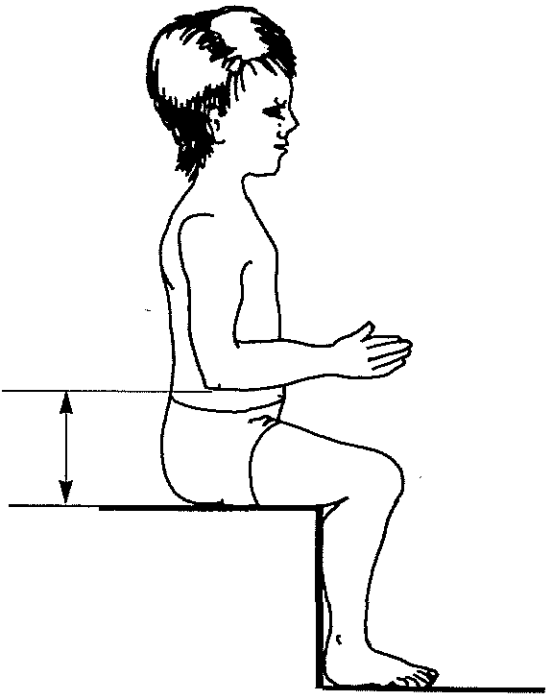
Two sources of data have been included to allow comparison between different countries. Of the sources, Pheasant (1986) is probably more appropriate for use with the current UK population. Steenbekkers is the most recent data on European children and Dutch children are amongst the tallest in Europe. See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and choose between different sources. Static anthropometric measurements do not account for stretching or twisting the body into different postures or positions.

SEE ALSO

Elbow height (supine), elbow height (from floor)

NUMBER OF SOURCES: 2

source	reference	country	age
1	Pheasant 1988	UK	2-18
2	Steenbekkers 1993	NL	2-12



source 1 of 2

Pheasant 1988

Country United Kingdom
Ages 2-18

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2	m		14.0	2.0	10.5	17.5
3	m		15.0	2.0	11.5	39.0
4	m		16.0	2.0	12.5	19.5
5	m		16.5	2.2	13.0	2.00
6	m		17.0	2.5	13.0	21.0
7	m		17.5	2.0	14.0	21.0
8	m		18.0	2.1	14.5	21.5
9	m		19.0	2.4	15.0	23.0
10	m		19.5	2.1	16.0	23.0
11	m		20.0	2.4	16.0	24.0
12	m		20.5	2.7	16.0	25.0
13	m		21.0	2.8	16.5	25.5
14	m		21.5	3.0	16.5	26.5
15	m		22.5	3.4	17.0	28.0
16	m		23.5	2.8	19.0	28.0
17	m		24.0	2.8	19.5	28.5
18	m		24.5	2.6	20.0	29.0

continued

source 1 of 2 continued

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2	f		13.0	1.5	10.5	15.5
3	f		14.0	1.7	11.0	17.0
4	f		15.0	1.9	12.0	18.0
5	f		15.5	1.9	12.5	18.5
6	f		16.0	2.1	12.5	19.5
7	f		17.0	1.9	14.0	2.00
8	f		17.5	1.9	14.5	20.5
9	f		18.0	2.5	14.0	22.0
10	f		19.0	2.5	15.0	23.0
11	f		20.0	2.6	15.5	24.5
12	f		20.5	3.1	15.5	25.5
13	f		21.0	3.4	15.5	26.5
14	f		22.0	3.3	16.5	27.5
15	f		22.5	2.8	18.0	27.0
16	f		23.0	2.6	18.5	27.5
17	f		23.0	2.5	19.0	27.0
18	f		23.0	2.6	18.5	27.5

Section 1.4

Static Anthropometry: Elbows

Elbow height (seated) 61

source 2 of 2

Steenbekkers 1993

Country Netherlands
Ages 2-12

age	sex	n	mean (cm)	sd	3rd%ile	97th%ile
2	m	81	15.4	1.6	12.6	17.9
3	m	97	15.3	1.6	12.3	18.0
4	m	85	15.6	1.9	12.5	19.6
5	m	86	15.9	1.8	12.5	19.4
6	m	98	16.7	1.7	13.4	20.6
7	m	106	17.4	1.9	14.3	20.6
8	m	96	17.4	1.9	14.1	21.0
9	m	122	18.3	2.1	14.7	22.9
10	m	134	18.8	2.2	14.3	22.9
11	m	143	18.9	2.2	14.2	22.8
12	m	78	19.7	2.7	13.8	25.9
2	f	92	15.1	1.7	12.1	17.9
3	f	86	14.9	1.7	12.0	17.4
4	f	79	15.7	1.7	13.0	18.5
5	f	94	16.1	1.9	12.7	19.9
6	f	92	16.8	1.7	13.9	20.1
7	f	93	17.3	1.8	14.3	21.0
8	f	95	18.1	2.0	14.7	23.0
9	f	122	18.4	2.0	14.7	22.1
10	f	136	19.5	2.1	16.0	23.4
11	f	151	19.9	2.1	16.1	23.7
12	f	79	20.3	2.6	16.1	25.5

DEFINITION

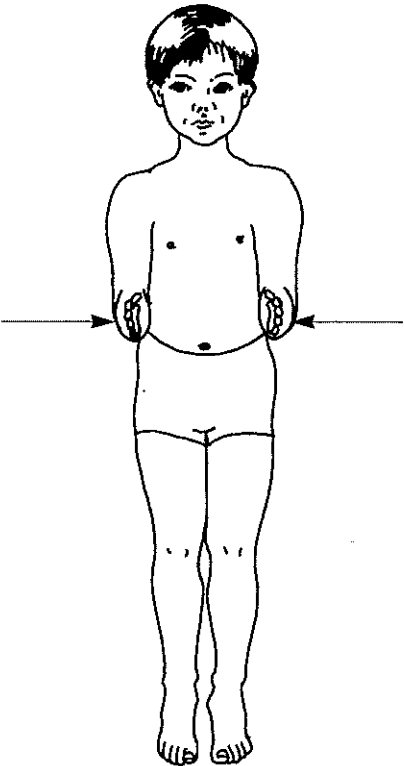
The subject stand erect with upper arms at sides, elbows at 90 degrees and lower arms close to chest. The maximum distance across the two elbows is measured. Infants are measured supine (lying on their back) (centimetres).

APPLICATION AND SUMMARY OF THE DATA

See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and the validity of Dutch data for use with the current UK population. Steenbekkers is the most recent data on European children and Dutch children are amongst the tallest in Europe. Static anthropometric measurements do not account for stretching or twisting the body into different postures or for the compression of soft tissue.

SEE ALSO

Shoulder breadth (bideltoid)



NUMBER OF SOURCES: 1

source	reference	country	age
1	Steenbekkers 1993	NL	0-12

Section 1.4

Static Anthropometry: Elbows

Elbow breadth 62

source 1 of 1

Steenbekkers 1993

Country Netherlands
Ages 0-12

age	sex	n	mean (cm)	sd	3rd%ile	97th%ile
0-2mo	m	16	21.1	1.8	17.9	24.0
3-5mo	m	21	22.0	1.6	18.2	24.8
6-8mo	m	22	23.4	1.4	21.5	25.9
9-11mo	m	13	24.5	0.9	23.6	26.7
12-14mo	m	15	24.3	1.8	21.6	26.7
2	m	81	26.6	2.1	22.6	29.9
3	m	97	27.6	1.8	23.7	32.0
4	m	85	28.7	1.8	25.1	32.6
5	m	86	29.2	1.9	25.8	33.5
6	m	98	29.8	1.8	26.2	33.2
7	m	106	30.8	1.9	28.0	34.8
8	m	96	31.6	2.2	28.0	36.8
9	m	122	32.7	2.6	28.6	39.3
10	m	134	33.8	3.0	29.7	41.1
11	m	143	34.8	3.1	30.4	41.7
12	m	78	35.6	3.3	30.3	42.1

continued

source 1 of 1 continued

age	sex	n	mean (cm)	sd	3rd%ile	97th%ile
0-2mo	f	9	18.8	1.8	16.4	21.7
3-5mo	f	20	20.7	1.3	17.4	22.4
6-8mo	f	14	23.5	1.4	20.5	25.8
9-11mo	f	16	23.0	1.9	20.3	25.3
12-14mo	f	23	24.5	1.7	20.6	26.8
2	f	92	26.2	1.7	22.9	29.6
3	f	86	27.1	1.6	24.5	31.0
4	f	79	28.2	1.8	24.5	31.6
5	f	84	28.6	2.1	25.6	33.7
6	f	92	29.2	2.0	26.1	32.9
7	f	93	30.7	2.7	25.1	36.1
8	f	95	31.0	2.4	25.8	36.7
9	f	122	31.7	2.8	27.6	37.9
10	f	136	34.0	3.2	29.7	41.3
11	f	151	34.4	3.1	29.6	39.9
12	f	79	35.4	3.1	29.9	41.3

DEFINITION

The subject stands erect, arms hanging at sides and elbows flexed 90 degrees with hands and fingers extended. The distance from the posterior or rear surface of the right upper arm just above the elbow to the tip of the middle finger is measured (centimetres).

APPLICATION AND SUMMARY OF THE DATA

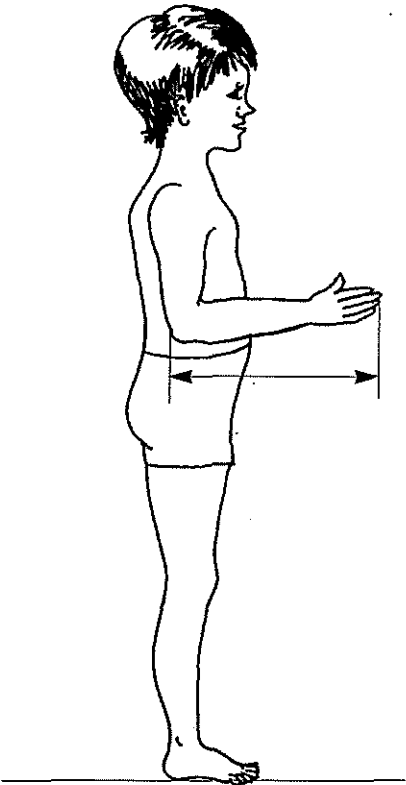
See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and the validity of these data for use with the current UK population. Static anthropometric measurements do not account for stretching or twisting the body into different postures or to achieve maximum reach.

SEE ALSO

Lower arm length (elbow to grip)

NUMBER OF SOURCES: 1

source	reference	country	age
1	Pheasant 1988	UK	0-18



source 1 of 1

Pheasant 1988

Country United Kingdom
Ages 0-18

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
0	mf		13.5	0.7	12.0	14.5
0-6mo	mf		16.0	1.0	12.5	19.0
6-12mo	mf		19.0	1.3	17.0	21.0
12-18mo	mf		19.5	1.2	17.5	21.5
18-24mo	mf		22.0	1.2	20.0	24.0
2	m		24.5	1.7	21.5	27.5
3	m		26.0	1.6	23.5	22.0
4	m		27.5	1.5	25.0	30.0
5	m		29.5	1.7	26.5	32.5
6	m		31.0	2.1	27.5	34.5
7	m		32.5	1.9	29.5	35.5
8	m		34.0	1.9	31.0	37.0
9	m		35.5	2.1	32.0	39.0
10	m		37.0	2.2	33.5	40.5
11	m		38.5	2.2	35.0	42.0
12	m		40.0	2.5	36.0	44.0
13	m		42.0	2.9	37.0	47.0
14	m		44.5	2.8	40.0	49.0
15	m		46.0	2.5	42.0	50.0
16	m		47.0	2.2	43.5	50.5
17	m		47.5	2.1	44.0	51.0
18	m		48.0	1.8	45.0	51.0

continued

source 1 of 1 continued

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2	f		23.5	1.4	21.0	26.0
3	f		25.5	1.6	23.0	28.0
4	f		27.5	1.8	24.5	30.5
5	f		29.0	1.7	26.0	32.0
6	f		30.5	1.8	27.5	33.5
7	f		32.0	1.8	29.0	35.0
8	f		33.5	1.9	30.5	36.5
9	f		35.0	2.3	31.0	39.0
10	f		37.0	2.5	33.0	41.0
11	f		38.5	2.8	34.0	43.0
12	f		40.0	2.7	35.5	44.5
13	f		41.0	2.2	37.5	44.5
14	f		42.0	2.1	38.5	45.5
15	f		42.5	1.7	39.5	45.5
16	f		42.5	1.7	39.5	45.5
17	f		42.5	1.7	39.5	45.5
18	f		42.5	1.7	39.5	45.5

DEFINITION

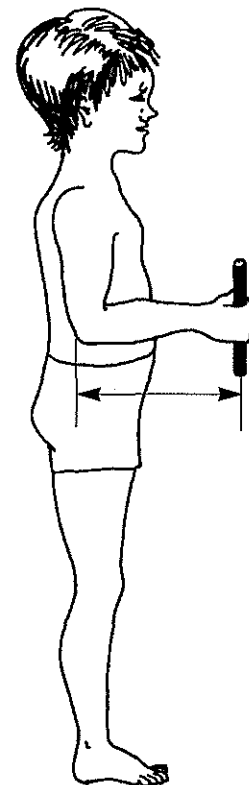
The subject stands with arms at sides and elbows at 90 degrees. The horizontal distance from the posterior or rear surface of the elbow to the axis of the grip is measured (centimetres).

APPLICATION AND SUMMARY OF THE DATA

See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and the validity of German data for use with the current UK population. Static anthropometric measurements do not account for stretching or twisting the body into different postures or for maximum reach.

SEE ALSO

Lower arm length (elbow to fingertip)

**NUMBER OF SOURCES: 1**

source	reference	country	age
1	DIN 1981	D	3-17

Section 1.4

Static Anthropometry: Lower arms

Lower arm length (elbow to grip) 64

source 1 of 1

DIN 1981

Country Germany

Ages 3-17

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
3	m		20.4		18.0	23.4
4	m		21.5		18.4	24.1
5	m		22.2		19.8	25.0
6	m		23.2		20.5	25.9
7	m		24.4		21.4	27.8
8	m		25.2		22.8	29.2
9	m		27.6		23.6	30.2
10	m		28.6		24.9	31.5
11	m		29.2		25.9	31.5
12	m		30.2		26.1	34.6
13	m		32.4		28.5	36.6
14	m		34.7		29.8	37.5
15	m		35.1		32.0	38.1
16-17	m		36.2		32.7	38.2

3	f		20.4		18.0	23.4
4	f		21.5		18.4	24.1
5	f		22.2		19.8	25.0
6	f		23.2		20.5	25.9
7	f		24.4		21.4	27.8
8	f		25.2		22.8	29.2
9	f		27.6		23.6	30.2
10	f		28.6		24.9	31.5
11	f		29.4		25.5	31.9
12	f		30.0		26.0	33.0
13	f		31.7		27.1	33.7
14	f		32.5		30.0	35.3
15	f		32.9		30.2	35.5
16-17	f		33.3		30.4	36.3

Section 1.4

Static Anthropometry: Lower arms

Lower arm breadth 65

DEFINITION

The subject stands erect, arms hanging at sides with palms in. The maximum breadth of the right forearm at the level of the maximum circumference is measured (centimetres).

APPLICATION AND SUMMARY OF THE DATA

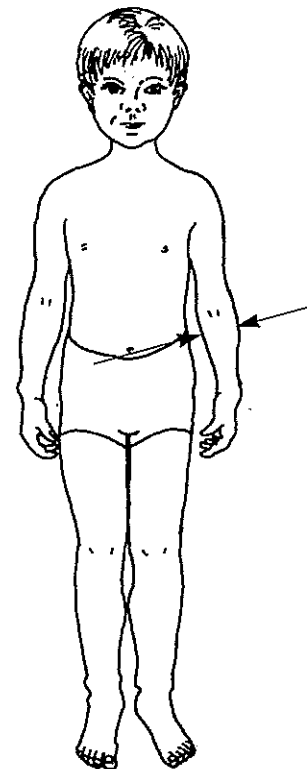
See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and the validity of USA data for use with the current UK population. Static anthropometric measurements do not account for stretching or twisting the body into different postures or for the compression of soft tissue.

SEE ALSO

Wrist breadth

NUMBER OF SOURCES: 1

source	reference	country	age
1	Snyder 1977	US	2-19



source 1 of 1

Snyder 1977

Country United States
Ages 2-19

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2-3.5	mf	66	4.7	0.4	3.9	5.4
3.5-4.5		72	4.8	0.5	3.9	5.5
4.5-5.5		91	5.0	0.4	4.3	5.7
5.5-6.5		79	5.3	0.6	4.3	6.1
6.5-7.5		87	5.5	0.6	4.6	6.5
7.5-8.5		68	5.8	0.6	4.9	6.7
8.5-9.5		91	6.0	0.6	5.0	7.0
9.5-10.5		84	6.3	0.8	5.1	7.5
10.5-11.5		86	6.2	0.7	5.1	7.5
11.5-12.5		97	6.7	0.6	5.7	7.7
12.5-13.5		108	7.0	0.7	5.8	8.3
13.5-14.5		89	7.3	0.7	6.2	8.6
14.5-15.5		81	7.5	0.7	6.3	8.6 ^a
15.5-16.5		78	7.8	0.9	6.3	9.3
16.5-17.5		67	7.8	0.8	6.3	8.9
17.5-19		61	8.4	0.1	6.4	10.0

DEFINITION

The subject stands erect, arms hanging at sides. The maximum circumference of the right forearm is measured. Infants are measured supine (lying on their back) (centimetres).

APPLICATION AND SUMMARY OF THE DATA

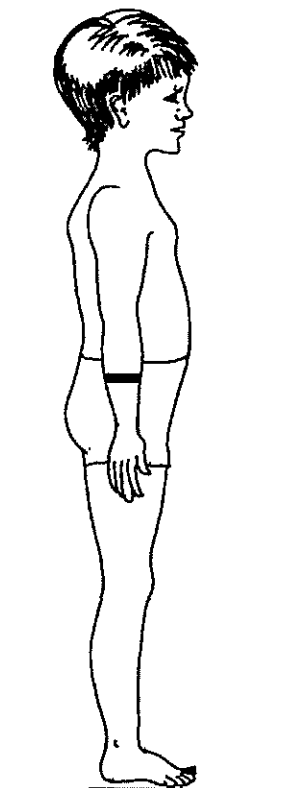
See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and the validity of USA data for use with the current UK population. Static anthropometric measurements do not account for stretching or twisting the body into different postures or for the compression of soft tissue.

SEE ALSO

Upper arm circumference, upper arm circumference at armpit, wrist circumference

NUMBER OF SOURCES: 1

source	reference	country	age
1	Snyder 1977	US	0-19



source 1 of 1

Snyder 1977

Country United States
Ages 0-19

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
0-2mo	mf	31	11.80	1.1	9.7	13.4
3-5mo		44	13.10	1.1	11.5	15.1
6-8mo		30	14.00	0.8	12.8	15.2
9-11mo		27	14.30	1.0	12.9	15.7
12-15mo		32	14.50	0.8	13.1	15.7
16-19mo		29	14.50	1.1	13.0	16.1
20-23mo		31	14.80	0.8	13.2	15.9
2-3.5		212	15.7	1.0	13.9	17.4
3.5-4.5		227	16.0	1.0	14.3	17.7
4.5-5.5		263	16.6	1.1	15.0	18.5
5.5-6.5		219	17.0	1.2	15.1	19.1
6.5-7.5		225	17.7	1.4	15.8	20.0
7.5-8.5		189	18.5	1.5	16.1	21.0
8.5-9.5		250	19.1	1.6	16.7	21.5
9.5-10.5		253	19.6	1.7	17.4	22.7
10.5-11.5		281	20.5	1.9	17.9	24.1
11.5-12.5		286	21.0	1.8	18.4	24.4
12.5-13.5		313	21.9	1.8	19.3	24.8
13.5-14.5		271	22.9	2.0	19.6	26.4
14.5-15.5		264	23.7	2.1	20.5	27.5
15.5-16.5		198	24.6	2.5	20.9	28.7
16.5-17.5		220	24.8	2.5	21.0	28.9
17.5-19		155	25.7	2.9	21.2	29.8

DEFINITION

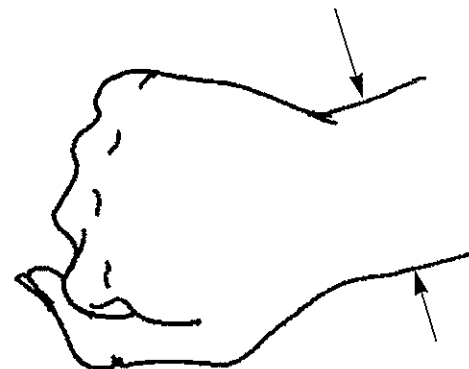
The maximum breadth of the wrist across the level of the ends of the forearm bones (the ulna and radius) (centimetres).

APPLICATION AND SUMMARY OF THE DATA

See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and the validity of USA data for use with the current UK population. Static anthropometric measurements do not account for stretching or twisting the body into different postures or for the compression of soft tissue.

SEE ALSO

Lower arm breadth, wrist depth

**NUMBER OF SOURCES: 1**

source	reference	country	age
1	Owings 1977	US	2-10

source 1 of 1

Owings 1977

Country USA
Ages 2-10

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2.5-3.5	mf	31	3.6	0.2	3.2	3.9
3.5-4.5	mf	45	3.7	0.2	3.3	4.1
4.5-5.5	mf	44	3.9	0.2	3.5	4.3
5.5-6.5	mf	49	4.0	0.2	3.5	4.2
6.5-7.5	mf	45	4.2	0.3	3.6	4.5
7.5-8.5	mf	52	4.3	0.3	3.7	4.8
8.5-9.5	mf	42	4.5	0.3	3.8	4.9
9.5-10.5	mf	45	4.6	0.3	4.1	5.1

Section 1.4

Static Anthropometry: Wrist

Wrist depth 68

DEFINITION

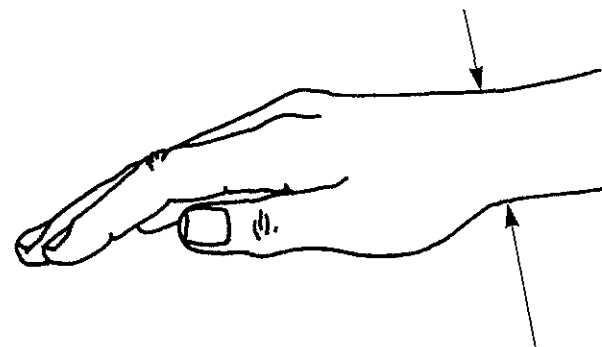
The subject stands erect, arms hanging at sides with palms in. The minimum horizontal depth (medio-lateral or front to back) of the right wrist above the protrusion of the wrist (the distal ulna styloid process) is measured (centimetres).

APPLICATION AND SUMMARY OF THE DATA

See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and the validity of USA data for use with the current UK population. Static anthropometric measurements do not account for stretching or twisting the body into different postures or for the compression of soft tissue.

SEE ALSO

Wrist breadth



NUMBER OF SOURCES: 1

source	reference	country	age
1	Snyder 1977	US	2-19

source 1 of 1

Snyder 1977

Country United States
Ages 2-19

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2-3.5	mf	66	2.90	0.30	2.40	3.50
3.5-4.5		76	2.90	0.30	2.40	3.40
4.5-5.5		91	3.00	0.20	2.50	3.30
5.5-6.5		80	3.10	0.30	2.40	3.50
6.5-7.5		87	3.20	0.30	2.70	3.50
7.5-8.5		68	3.30	0.30	2.70	4.00
8.5-9.5		91	3.30	0.30	2.80	3.80
9.5-10.5		85	3.40	0.40	3.80	4.00
10.5-11.5		86	3.40	0.30	2.90	3.90
11.5-12.5		96	3.60	0.40	3.00	4.20
12.5-13.5		107	3.70	0.30	3.20	4.30
13.5-14.5		89	4.00	0.40	3.30	4.60
14.5-15.5		80	3.90	0.40	3.20	4.50
15.5-16.5		77	4.10	0.40	3.30	4.80
16.5-17.5		67	4.00	0.50	3.10	4.80
17.5-19		63	4.20	0.50	3.40	5.00

DEFINITION

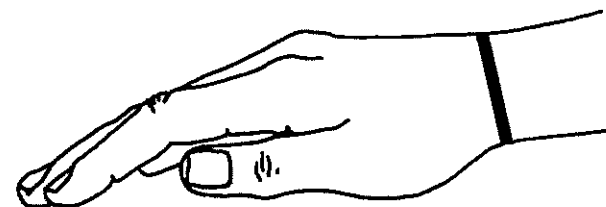
The subject stands erect, arms hanging at sides. Wrist circumference is measured on the right arm either over the protrusion of the two forearm bones (the ulna and radius) (source 1) or at the minimum circumference of the wrist above the protrusion of the wrist (source 2) (centimetres).

APPLICATION AND SUMMARY OF THE DATA

Two sources of data have been included to allow comparison between different countries. Of the sources, Pheasant (1986) is probably more appropriate for use with the current UK population. See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and choose between different sources. Static anthropometric measurements do not account for stretching or twisting the body into different postures or for the compression of soft tissue.

SEE ALSO

Lower arm circumference

**NUMBER OF SOURCES: 2**

source	reference	country	age
1	BSI 1990	UK	0-16
2	Snyder 1977	US	0-19

Section 1.4

Static Anthropometry: Wrist

Wrist circumference 69

source 1 of 2

BSI 1990

Country United Kingdom
Ages 5-16

Wrist circumference is measured on the right arm over the protrusion of the two forearm bones (the ulna and radius).

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
0-3mo	mf	21	8.92	1.04	n/a	n/a
3-6mo	mf	13	10.25	1.20	n/a	n/a
6-9mo	mf	7	10.96	0.59	n/a	n/a
9-12mo	mf	10	11.52	0.50	n/a	n/a
12-15mo	mf	14	11.42	1.03	n/a	n/a
15-18mo	mf	6	11.25	1.12	n/a	n/a
18-21mo	mf	12	12.09	1.19	n/a	n/a
21-24mo	mf	10	11.37	1.02	n/a	n/a
2-2.5	mf	20	11.32	0.73	n/a	n/a
2.5-3	mf	15	11.61	0.75	n/a	n/a
3	mf	50	11.60	0.68	10.4	13.0
4	mf	49	11.82	0.59	10.9	12.8
5	m	251	12.12	0.81	11.0	13.4
6	m	346	12.30	0.71	11.2	13.5
7	m	327	12.65	0.77	11.4	13.9
8	m	330	12.88	0.87	11.5	14.2
9	m	328	13.30	0.86	12.0	14.7
10	m	354	13.57	0.87	12.3	15.4
11	m	301	13.99	0.91	12.7	15.5
12	m	335	14.51	0.97	13.1	16.1
13	m	299	15.27	1.05	13.6	17.0
14	m	269	15.88	1.00	14.1	17.5
15	m	277	16.28	1.00	14.6	17.9
16	m	84	16.47	0.84	15.3	17.8

continued

source 1 of 2 continued

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
5	f	35	12.09	0.84	10.6	13.4
6	f	35	12.09	0.57	11.2	13.0
7	f	36	12.77	0.92	11.3	14.4
8	f	35	13.06	0.79	11.9	14.3
9	f	36	13.27	0.67	12.1	14.2
10	f	36	13.57	0.83	12.2	14.6
11	f	33	14.26	0.90	12.6	15.6
12	f	34	14.50	0.97	12.9	16.3
13	f	36	14.65	0.70	13.4	15.7
14	f	37	15.11	0.74	14.1	16.5
15	f	40	15.09	0.69	13.8	16.0
16	f	22	15.39	0.54	14.4	16.3

Section 1.4

Static Anthropometry: Wrist

Wrist circumference 69

source 2 of 2

Snyder 1977

Country United States

Ages 0-19

Wrist circumference is measured at the minimum circumference of the wrist above the protrusion of the wrist (the distal ulna styloid process).

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
0-2mo	mf	31	9.10	0.90	7.90	10.60
3-5mo		44	10.20	0.90	8.50	11.10
6-8mo		30	10.50	0.60	9.50	11.20
9-11mo		27	10.80	0.80	9.60	11.90
12-15mo		32	10.90	0.90	9.70	12.60
16-19mo		29	10.70	1.00	9.40	12.20
20-23mo		31	10.90	0.80	9.40	12.10
2-3.5		66	11.30	0.80	9.90	12.70
3.5-4.5		77	11.50	0.90	10.20	13.00
4.5-5.5		93	11.80	0.80	10.50	13.20
5.5-6.5		80	12.20	0.80	10.90	13.30
6.5-7.5		86	12.40	1.00	10.90	14.20
7.5-8.5		68	12.80	1.00	11.30	14.60
8.5-9.5		91	13.20	1.10	11.50	14.80
9.5-10.5		85	13.50	1.40	11.60	16.10
10.5-11.5		85	13.50	1.20	11.60	15.60
11.5-12.5		97	14.20	1.20	12.50	16.10
12.5-13.5		107	14.60	1.20	12.90	16.70
13.5-14.5		90	15.30	1.20	13.60	17.10
14.5-15.5		80	15.40	1.10	13.50	17.00
15.5-16.5		79	16.00	1.40	13.30	18.20
16.5-17.5		67	15.70	1.50	13.30	17.80
17.5-19		63	16.30	1.80	13.10	19.30

Section 1.4

Static Anthropometry: Hand

Knuckle height (from floor) 70

DEFINITION

The vertical distance from the floor to the proximal (first or largest) knuckle of the middle finger is measured while the subject stands erect with arms at the sides (centimetres).

APPLICATION AND SUMMARY OF THE DATA

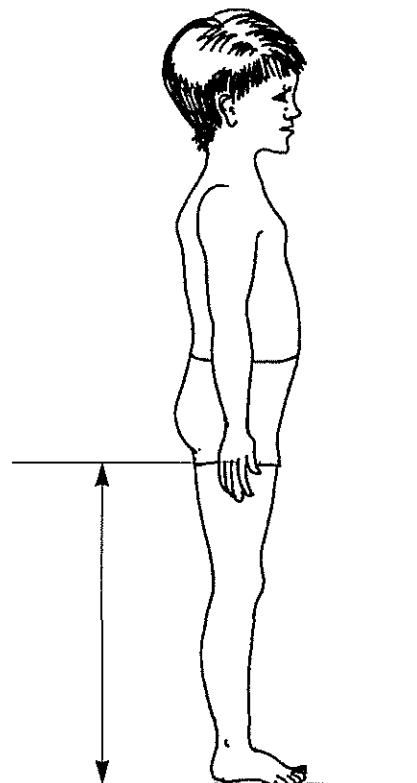
See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and the validity of these data for use with the current UK population. Static anthropometric measurements do not account for stretching or twisting the body into different postures or positions.

SEE ALSO

Middle fingertip height (from floor)

NUMBER OF SOURCES: 1

source	reference	country	age
1	Pheasant 1988	UK	2-18



Section 1.4

Static Anthropometry: Hand

Knuckle height (from floor) 70

source 1 of 1

Pheasant 1988

Country	United Kingdom					
Ages	2-18					
age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2	m		38.5	2.6	34.0	43.0
3	m		41.0	2.6	36.5	52.0
4	m		43.5	2.6	39.0	48.0
5	m		45.5	2.9	40.5	50.5
6	m		48.0	3.3	42.5	53.5
7	m		51.0	3.1	46.0	56.0
8	m		53.5	3.2	48.0	59.0
9	m		56.5	3.6	50.5	62.5
10	m		59.5	3.3	54.0	65.0
11	m		62.0	3.5	56.0	68.0
12	m		64.5	4.0	58.0	71.0
13	m		97.0	4.3	60.0	74.0
14	m		70.0	4.4	63.0	77.0
15	m		72.5	4.5	65.0	80.0
16	m		74.0	4.0	67.5	80.5
17	m		75.5	4.1	69.0	82.0
18	m		76.5	3.5	70.5	82.5

continued

source 1 of 1 continued

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2	f		37.5	2.5	33.5	41.5
3	f		41.0	2.9	36.0	46.0
4	f		44.5	3.3	39.0	50.0
5	f		46.5	3.4	41.0	52.0
6	f		49.0	3.6	43.0	55.0
7	f		52.5	3.7	46.5	58.5
8	f		55.5	3.7	49.5	61.5
9	f		59.0	3.7	53.0	65.0
10	f		61.5	3.6	55.5	67.5
11	f		64.5	4.2	57.5	71.5
12	f		66.5	4.6	59.0	74.0
13	f		67.5	4.3	60.5	74.5
14	f		70.5	4.0	64.0	77.0
15	f		71.5	3.9	65.0	78.0
16	f		72.0	3.6	66.0	78.0
17	f		72.5	3.3	67.0	78.0
18	f		72.5	3.2	67.0	78.0

Section 1.4 Static Anthropometry: Hand

Hand length 71

DEFINITION

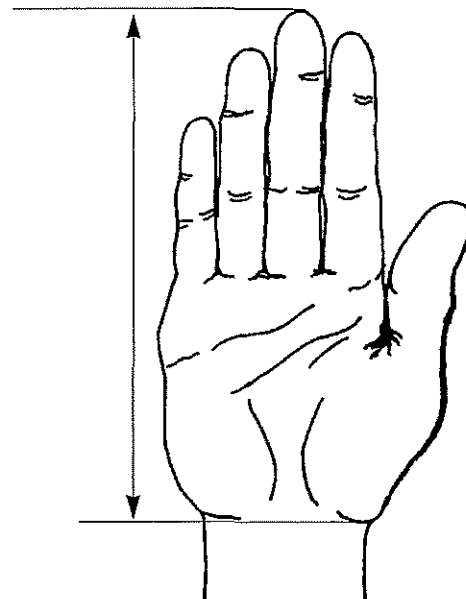
The right hand and fingers are extended and held with palm up. The distance from the wrist crease to the top of the middle finger is measured, parallel to the fingers (centimetres).

APPLICATION AND SUMMARY OF THE DATA

Two sources of data have been included to allow comparison between different countries. Of the sources, Pheasant (1986) is probably more appropriate for use with the current UK population. Steenbekkers is the most recent data on European children and Dutch children are amongst the tallest in Europe. See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and choose between different sources. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different postures or the compression of soft tissue (eg forcing the hand through an aperture).

SEE ALSO

Hand length (to thumb crotch), palm length, grip length (middle finger to thumb).



NUMBER OF SOURCES: 2

source	reference	country	age
1	Pheasant 1988	UK	2-18
2	Steenbekkers 1993	NL	2-12

source 1 of 2

Pheasant 1988

CountryUnited Kingdom
Ages2-18

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2	m		10.5	0.8	9.0	12.0
3	m		11.0	0.8	9.5	12.5
4	m		11.5	0.8	10.0	13.0
5	m		12.5	0.9	11.0	14.0
6	m		13.0	1.0	11.5	14.5
7	m		13.5	0.9	12.0	15.0
8	m		14.0	0.9	12.5	15.5
9	m		14.5	0.9	13.0	16.0
10	m		15.0	0.9	13.5	16.5
11	m		15.5	1.0	14.0	17.0
12	m		16.5	1.0	15.0	18.0
13	m		17.0	1.2	15.0	19.0
14	m		18.0	1.1	16.0	20.0
15	m		18.5	1.0	17.0	20.0
16	m		18.5	0.9	17.0	20.0
17	m		19.0	0.9	17.5	20.5
18	m		19.0	0.8	17.5	20.5

continued

source 1 of 2 continued

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2	f		10.0	0.6	9.0	11.0
3	f		11.0	0.7	10.0	12.0
4	f		12.0	0.8	10.5	13.5
5	f		12.0	0.8	10.5	13.5
6	f		12.5	0.8	11.0	14.0
7	f		13.5	0.8	12.0	15.0
8	f		14.0	0.8	12.5	15.5
9	f		14.5	1.0	13.0	16.0
10	f		15.0	1.0	13.5	16.5
11	f		15.5	1.1	13.5	17.5
12	f		16.5	1.1	14.5	18.5
13	f		17.0	1.0	15.5	18.5
14	f		17.0	0.9	15.5	18.5
15	f		17.0	0.9	15.5	18.5
16	f		17.5	0.9	16.0	19.0
17	f		17.5	0.9	16.0	19.0
18	f		17.5	0.8	16.0	19.0

Section 1.4 Static Anthropometry: Hand

Hand length 71

source 2 of 2

Steenbekkers 1993

Country Netherlands
Ages 2-12

age	sex	n	mean (cm)	sd	3rd%ile	97th%ile
2	m	81	10.4	0.6	9.2	11.3
3	m	97	11.2	0.6	10.3	12.4
4	m	85	11.9	0.7	10.5	13.1
5	m	86	12.7	0.7	11.4	14.1
6	m	98	13.3	0.6	12.1	14.8
7	m	106	13.9	0.7	12.6	15.3
8	m	96	14.5	0.7	13.2	15.8
9	m	122	15.1	0.7	13.8	16.5
10	m	134	15.6	0.9	14.0	17.0
11	m	143	16.1	0.9	14.5	17.9
12	m	78	16.7	1.0	15.1	18.6
2	f	92	10.2	0.6	9.1	11.2
3	f	86	11.0	0.7	9.7	12.2
4	f	79	11.8	0.7	10.7	13.0
5	f	94	12.6	0.6	11.3	13.8
6	f	92	13.2	0.7	11.9	14.3
7	f	93	13.8	0.7	12.5	15.0
8	f	95	14.3	0.7	12.9	15.7
9	f	122	14.9	0.8	13.1	16.3
10	f	136	15.6	0.8	14.2	17.3
11	f	151	16.1	0.9	14.5	17.9
12	f	79	16.6	1.1	14.9	18.7

Section 1.4

Static Anthropometry: Hand

Hand length (to thumb crotch) 72

DEFINITION

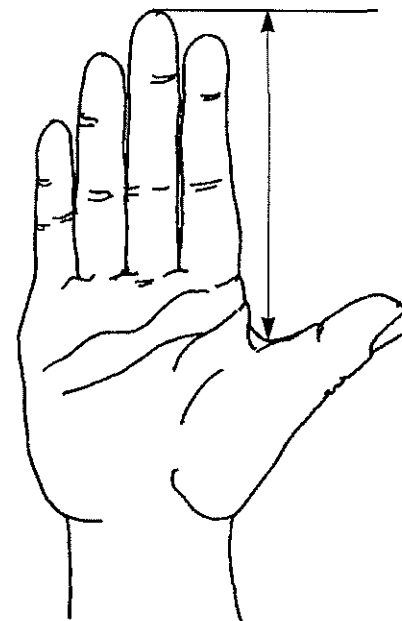
The subject extends the right hand with the palm up and thumb away (abducted) from hand. The distance from the crotch of the thumb to the tip of the middle finger is measured (centimetres).

APPLICATION AND SUMMARY OF THE DATA

See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and the validity of USA data for use with the current UK population. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different postures or the compression of soft tissue (eg forcing the hand through an aperture).

SEE ALSO

Hand length (to wrist), palm length, grip length (middle finger to thumb), index finger length



NUMBER OF SOURCES: 1

source	reference	country	age
1	Snyder 1977	US	2-18

Section 1.4

Static Anthropometry: Hand

Hand length (to thumb crotch) 72

source 1 of 1

Snyder 1977

Country USA
Ages 2-18

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2-3.5	m	30	1.4	0.6	6.4	8.4
3.5-4.5	m	32	8.0	0.5	6.7	8.6
4.5-5.5	m	46	8.4	0.7	6.9	9.3
5.5-6.5	m	24	8.9	1.1	7.2	10.7
6.5-7.5	m	29	9.7	0.8	8.2	11.0
7.5-8.5	m	30	9.6	0.8	8.0	10.9
8.5-9.5	m	39	10.3	0.7	9.1	11.3
9.5-10.5	m	46	10.8	0.8	9.3	12.2
10.5-11.5	m	52	11.2	0.9	9.9	12.7
11.5-12.5	m	46	11.4	1.0	9.7	13.0
12.5-13.5	m	46	11.9	0.8	10.2	13.2
13.5-14.5	m	53	12.3	1.1	10.2	14.4
14.5-15.5	m	50	13.0	1.0	11.3	14.3
15.5-16.5	m	31	13.5	0.9	11.3	14.8
16.5-17.5	m	38	13.3	1.0	11.1	14.9
17.5-19	m	27	14.0	1.0	12.3	15.6

continued

source 1 of 1 continued

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2.5-3.5	f	24	7.4	0.7	6.2	8.6
3.5-4.5	f	30	7.9	0.9	6.1	8.9
4.5-5.5	f	37	8.1	0.7	6.8	9.1
5.5-6.5	f	35	8.6	0.6	7.6	9.6
6.5-7.5	f	33	9.2	0.7	8.1	10.4
7.5-8.5	f	30	9.4	0.7	8.2	10.7
8.5-9.5	f	40	9.8	0.8	8.4	11.2
9.5-10.5	f	46	10.3	0.9	8.9	11.6
10.5-11.5	f	46	10.7	0.7	9.7	11.8
11.5-12.5	f	48	11.2	0.9	9.5	12.6
12.5-13.5	f	61	11.5	0.8	10.1	13.1
13.5-14.5	f	44	11.6	1.0	9.9	12.9
14.5-15.5	f	45	11.8	0.8	10.6	13.0
15.5-16.5	f	24	11.7	1.0	9.0	13.3
16.5-17.5	f	42	11.6	1.1	9.1	13.2
17.5-19	f	19	11.5	1.0	9.1	13.2

Section 1.4 Static Anthropometry: Hand

Palm length 73

DEFINITION

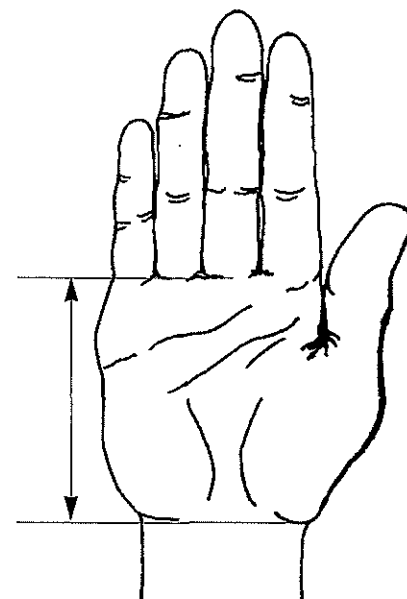
The subject extends right hand and fingers with palm up. The distance from the skin crease at the base of the middle finger to the skin crease at the base of the palm is measured (centimetres).

APPLICATION AND SUMMARY OF THE DATA

See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and the validity of German data for use with the current UK population. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different postures or the compression of soft tissue (eg forcing the hand through an aperture).

SEE ALSO

Hand length (to wrist), hand length (to thumb crotch)



NUMBER OF SOURCES: 1

source	reference	country	age
1	DIN 1981	D	3-17

source 1 of 1

DIN 81

Country Germany
Ages 3-17

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
3	m		6.4		5.7	6.9
4	m		6.8		6.3	7.4
5	m		7.2		6.5	7.7
6	m		7.5		6.7	8.0
7	m		7.8		7.0	8.6
8	m		8.0		7.3	9.0
9	m		8.5		7.6	9.1
10	m		9.0		8.1	9.5
11	m		9.0		8.2	9.7
12	m		9.1		8.2	9.8
13	m		10.1		9.1	10.9
14	m		10.4		9.4	11.7
15	m		10.8		9.8	11.8
16-17	m		10.8		9.9	11.9
3	f		6.4		5.7	6.9
4	f		6.8		6.3	7.4
5	f		7.2		6.5	7.7
6	f		7.5		6.7	8.0
7	f		7.8		7.0	8.6
8	f		8.0		7.3	9.0
9	f		8.5		7.6	9.1
10	f		9.0		8.1	9.5
11	f		9.0		8.1	9.7
12	f		9.1		8.3	9.8
13	f		9.7		8.9	10.3
14	f		10.0		9.4	10.8
15	f		10.2		9.4	11.3
16-17	f		10.5		9.4	11.4

Section 1.4

Static Anthropometry: Hand

Hand breadth at palm 74

DEFINITION

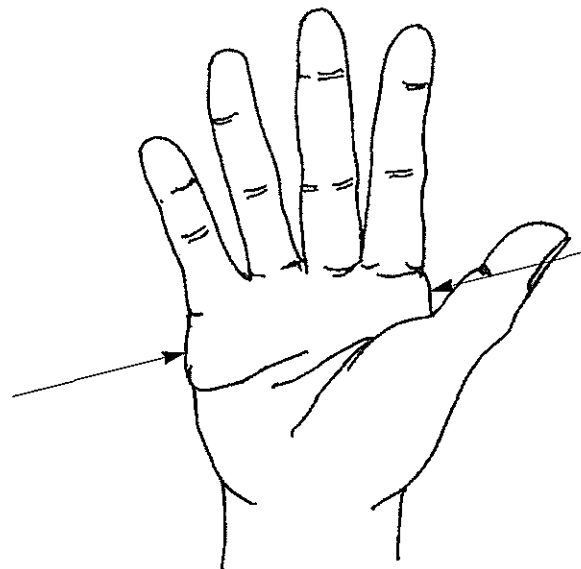
The subject extends the right hand and fingers with palm facing up and thumb held away (abducted) from hand. The width across the proximal (first or largest) knuckles of the four fingers (the metacarpal - phalangeal - joints II and V) is measured (centimetres).

APPLICATION AND SUMMARY OF THE DATA

Two sources of data have been included to allow comparison between different countries. Of the sources, Pheasant (1986) is probably more appropriate for use with the current UK population. Steenbekkers is the most recent data on European children and Dutch children are amongst the tallest in Europe. See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and choose between different sources. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different postures or the compression of soft tissue (eg forcing the hand through an aperture).

SEE ALSO

Hand breadth at thumb, hand circumference at palm, hand clearance (minimum aperture)



NUMBER OF SOURCES: 2

source	reference	country	age
1	Pheasant 1988	UK	0-18
2	Steenbekkers 1993	NL	2-12

source 1 of 2

Pheasant 1988

Country United Kingdom
Ages 0-18

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
0	mf		3.5	0.2	3.0	3.5
0-6 mo	mf		4.0	0.4	3.0	4.5
6-12 mo	mf		4.5	0.3	4.0	5.0
12-18 mo	mf		4.5	0.3	4.0	5.0
18-24 mo	mf		5.0	0.3	4.5	5.5
2	m		5.5	0.4	5.0	6.0
3	m		5.5	0.4	5.0	125
4	m		5.5	0.4	5.0	6.0
5	m		6.0	0.4	5.5	6.5
6	m		6.0	0.5	5.0	7.0
7	m		6.5	0.4	6.0	7.0
8	m		6.5	0.4	6.0	7.0
9	m		6.5	0.4	6.0	7.0
10	m		7.0	0.4	6.5	7.5
11	m		7.0	0.5	6.0	8.0
12	m		7.5	0.5	6.5	8.5
13	m		8.0	0.6	7.0	9.0
14	m		8.5	0.6	7.5	9.5
15	m		8.5	0.5	7.5	9.5
16	m		8.5	0.4	8.0	9.0
17	m		9.0	0.5	8.0	1.0
18	m		9.0	0.4	8.5	9.5

continued

source 1 of 2 continued

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2	f		4.5	0.4	4.0	5.0
3	f		5.0	0.4	4.5	5.5
4	f		5.5	0.4	5.0	6.0
5	f		5.5	0.4	5.0	6.0
6	f		6.0	0.4	5.5	6.5
7	f		6.0	0.4	5.5	6.5
8	f		6.5	0.4	6.0	7.0
9	f		6.5	0.4	6.0	7.0
10	f		7.0	0.5	6.0	8.0
11	f		7.0	0.5	6.0	8.0
12	f		7.0	0.5	6.0	8.0
13	f		7.5	0.4	7.0	8.0
14	f		7.5	0.4	7.0	8.0
15	f		7.5	0.4	7.0	8.0
16	f		7.5	0.4	7.0	8.0
17	f		7.5	0.4	7.0	8.0
18	f		7.5	0.4	7.0	8.0

Section 1.4

Static Anthropometry: Hand

Hand breadth at palm 74

source 2 of 2

Steenbekkers 1993Country Netherlands
Ages 2-12

age	sex	n	mean (cm)	sd	3rd%ile	97th%ile
2	m	81	5.2	0.3	4.6	5.9
3	m	97	5.4	0.3	4.9	6.3
4	m	85	5.6	0.3	5.1	6.1
5	m	86	6.0	0.3	5.4	6.6
6	m	98	6.2	0.3	5.6	6.7
7	m	106	6.4	0.3	5.8	7.0
8	m	96	6.6	0.3	6.0	7.3
9	m	122	6.9	0.4	6.3	7.8
10	m	134	7.1	0.4	6.4	8.0
11	m	143	7.3	0.4	6.6	8.1
12	m	78	7.4	0.4	6.6	8.3
2	f	92	5.1	0.3	4.4	5.6
3	f	86	5.3	0.3	4.9	5.8
4	f	79	5.5	0.3	5.1	6.2
5	f	94	5.8	0.3	5.3	6.4
6	f	92	6.1	0.3	5.6	6.8
7	f	93	6.4	0.3	5.6	7.1
8	f	95	6.5	0.3	5.8	7.1
9	f	122	6.6	0.4	5.8	7.5
10	f	136	6.9	0.4	6.3	7.6
11	f	151	7.1	0.4	6.5	7.9
12	f	79	7.2	0.5	6.2	8.1

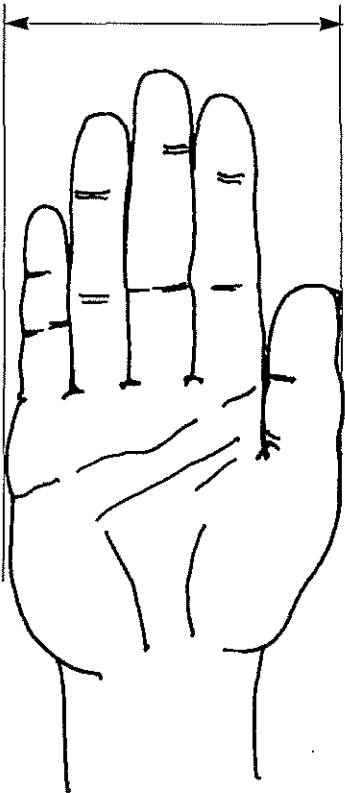
DEFINITION
The subject extends the hand and the thumb and is held against the side of the palm. The maximum distance across the hand and thumb at the level of the middle joint of the thumb is measured (millimetres).

APPLICATION AND SUMMARY OF THE DATA
Two sources of data have been included to allow comparison between different countries. Of the two sources, Owings (1977) is probably more appropriate for use with the current UK population. See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and choose between different sources. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different postures or the compression of soft tissue (eg forcing the hand through an aperture).

SEE ALSO
Hand breadth at palm, hand clearance (minimum aperture), fist breadth.

NUMBER OF SOURCES: 2

source	reference	country	age
1	Owings 1977	US	2-10
2	DIN 1981	D	3-17



source 1 of 2

Owings 1977

Country USA
Ages 2-10

age	sex	n	mean (mm)	sd	5th%ile	95th%ile
2.5-3.5	mf	31	55	5	44	61
3.5-4.5	mf	45	59	5	51	68
4.5-5.5	mf	44	61	4	55	67
5.5-6.5	mf	49	64	5	55	71
6.5-7.5	mf	46	66	5	56	73
7.5-8.5	mf	51	70	5	60	77
8.5-9.5	mf	42	74	6	62	81
9.5-10.5	mf	45	75	6	66	87

source 2 of 2

DIN 81 1981

Country Germany
Ages 3-17

age	sex	n	mean (mm)	sd	5th%ile	95th%ile
3	m		64		55	70
4	m		68		61	78
5	m		71		62	78
6	m		72		63	79
7	m		74		68	81
8	m		78		71	85
9	m		79		71	87
10	m		82		75	91
11	m		83		75	95
12	m		90		79	98
13	m		93		80	104
14	m		97		83	109
15	m		101		93	109
16-17	m		104		97	110
3	f		64		55	70
4	f		68		61	78
5	f		71		62	78
6	f		72		63	79
7	f		74		68	81
8	f		78		71	85
9	f		79		71	87
10	f		82		75	91
11	f		83		75	91
12	f		87		75	93
13	f		87		80	94
14	f		88		82	98
15	f		90		82	98
16-17	f		91		82	99

DEFINITION

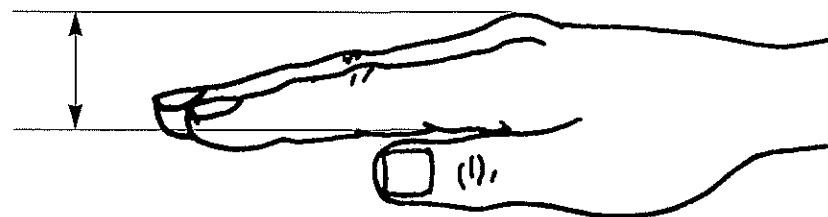
The maximum distance between the palm of the hand and the back of the hand at the level of the metacarpal joint (the first or largest knuckle) of the middle finger (centimetres).

APPLICATION AND SUMMARY OF THE DATA

Two sources of data have been included to allow comparison between different countries. Of the sources, Owings (1977) is probably more appropriate for use with the current UK population. Steenbekkers is the most recent data on European children and Dutch children are amongst the tallest in Europe. See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and choose between different sources. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different postures or the compression of soft tissue (eg forcing the hand through an aperture).

SEE ALSO

Middle finger depth at distal joint, middle finger depth at middle joint, hand clearance (minimum aperture)

**NUMBER OF SOURCES: 2**

source	reference	country	age
1	Steenbekkers 1993	NL	0-12
2	Owings 1977	US	2-10

source 1 of 2

Steenbekkers 1993

Country Netherlands
Ages 0-12

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
0-2mo	m	16	1.4	0.2	1.1	1.8
3-5mo	m	21	1.4	0.3	0.9	2.1
6-8mo	m	22	1.5	0.3	1.1	1.9
9-11mo	m	13	1.4	0.3	1.0	1.9
12-14mo	m	15	1.5	0.2	1.3	2.0
2	m	81	1.6	0.2	1.3	2.0
3	m	97	1.7	0.2	1.2	2.0
4	m	85	1.7	0.2	1.4	2.1
5	m	86	1.9	0.2	1.6	2.1
6	m	98	1.9	0.2	1.6	2.3
7	m	106	2.0	0.2	1.7	2.3
8	m	96	2.1	0.2	1.6	2.4
9	m	122	2.1	0.2	1.7	2.4
10	m	134	2.2	0.2	1.8	2.5
11	m	143	2.2	0.2	1.9	2.6
12	m	78	2.3	0.2	1.9	2.7

0-2mo	f	9	1.2	0.2	0.9	1.7
3-5mo	f	20	1.3	0.2	1.0	1.6
6-8mo	f	14	1.3	0.2	0.9	1.6
9-11mo	f	16	1.4	0.3	0.9	2.1
12-14mo	f	23	1.5	0.4	0.9	2.4
2	f	92	1.6	0.2	1.2	1.9
3	f	86	1.6	0.2	1.2	2.1
4	f	79	1.7	0.2	1.4	2.0
5	f	94	1.8	0.2	1.4	2.1
6	f	92	1.8	0.2	1.4	2.1
7	f	93	2.0	0.2	1.7	2.3
8	f	95	2.0	0.2	1.6	2.3
9	f	122	2.1	0.2	1.7	2.3
10	f	136	2.1	0.2	1.8	2.4
11	f	151	2.2	0.2	1.9	2.5
12	f	79	2.2	0.2	1.8	2.6

source 2 of 2

Owings 1977

Country USA
Ages 2-10

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2.5-3.5	mf	31	1.7	0.2	1.3	2.1
3.5-4.5	mf	45	1.8	0.2	1.4	2.2
4.5-5.5	mf	42	1.8	0.2	1.5	2.0
5.5-6.5	mf	49	1.9	0.2	1.4	2.1
6.5-7.5	mf	46	1.9	0.2	1.4	2.2
7.5-8.5	mf	52	2.0	0.3	1.4	2.4
8.5-9.5	mf	42	2.1	0.2	1.8	2.4
9.5-10.5	mf	45	2.2	0.2	1.8	2.6

Section 1.4

Static Anthropometry:Hand

Hand circumference at palm 77

DEFINITION

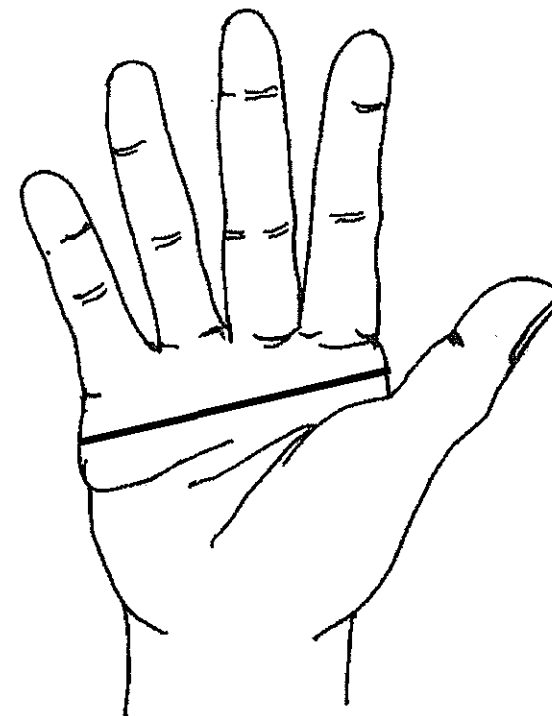
The maximum circumference measured around the palm of the hand at the level of the metacarpal joints (the first or largest knuckles)(centimetres).

APPLICATION AND SUMMARY OF THE DATA

Two sources of data have been included to allow comparison between different countries. Of the sources, BSI (1990) is probably more appropriate for use with the current UK population. See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and choose between different sources. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different postures or the compression of soft tissue (eg forcing the hand through an aperture).

SEE ALSO

Hand breadth at palm



Datasheet 77

NUMBER OF SOURCES: 2

source	reference	country	age
1	BSI 1990	UK	2-16 (5+ females only)
2	DIN 1981	D	3-17

Section 1.4

Static Anthropometry:Hand

Hand circumference at palm 77

source 1 of 2

BSI 1990

Country	United Kingdom					
Ages	2-16 (5+ females only)					
age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2-2.5	mf	20	12.25	0.58	n/a	n/a
2.5-3	mf	15	12.61	0.52	n/a	n/a
3	mf	50	13.10	0.85	11.8	14.4
4	mf	49	13.46	0.73	12.4	14.8
5	f	366	15.22	1.82	12.9	18.5
6	f	358	14.22	0.88	12.9	15.8
7	f	349	15.09	1.13	13.2	17.0
8	f	384	15.51	1.13	14.0	17.9
9	f	368	15.99	1.11	14.5	17.9
10	f	348	16.39	1.06	14.8	18.0
11	f	332	16.95	1.29	15.0	19.2
12	f	373	17.34	1.23	15.1	19.3
13	f	347	17.79	1.10	15.6	19.3
14	f	386	18.09	1.08	16.8	19.4
15	f	390	18.26	0.99	16.4	19.5
16	f	250	18.07	1.41	15.0	19.8

source 2 of 2

DIN81 1981

Country	Germany					
Ages	3-17					
age	sex	n	mean (cm)	sd	5th%ile	95th%ile
3	m		13.4		12.8	13.8
4	m		13.9		13.3	15.0
5	m		14.4		13.5	15.9
6	m		15.2		13.7	17.4
7	m		15.5		14.0	17.8
8	m		16.0		14.3	18.0
9	m		16.4		15.0	18.3
10	m		17.4		15.8	18.6
11	m		17.9		16.1	19.0
12	m		18.5		16.7	19.9
13	m		19.4		17.0	20.1
14	m		20.0		17.3	22.4
15	m		20.6		18.3	22.9
16-17	m		20.8		18.6	23.1
3	f		13.4		12.8	13.8
4	f		13.9		13.3	15.0
5	f		14.4		13.5	15.9
6	f		15.2		13.7	17.4
7	f		15.5		14.0	17.8
8	f		16.0		14.3	18.0
9	f		16.4		15.0	18.3
10	f		17.4		15.8	18.6
11	f		17.8		15.8	18.9
12	f		18.0		16.2	19.2
13	f		18.2		16.4	19.2
14	f		18.2		16.6	19.4
15	f		18.5		17.0	19.6
16-17	f		18.9		17.3	20.0

DEFINITION

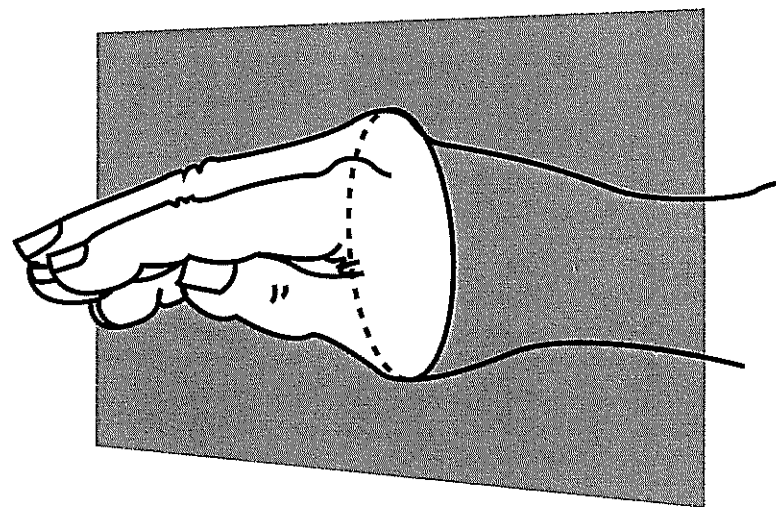
The subject extends the right hand and holds the fingers together to form its narrowest configuration. With a hand measurement board, the smallest diameter through which the hand can just pass without forcing it is measured (millimetres).

APPLICATION AND SUMMARY OF THE DATA

Two sources of data have been included to allow comparison between different countries. Of the sources, Snyder (1977) is probably more appropriate for use with the current UK population. Steenbekkers is the most recent data on European children and Dutch children are amongst the tallest in Europe. See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and choose between different sources. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different postures or the compression of soft tissue (eg forcing the hand through an aperture).

SEE ALSO

Hand breadth at palm, hand breadth at thumb, fist breadth, fist circumference, hand depth

**NUMBER OF SOURCES: 2**

source	reference	country	age
1	Snyder 1977	US	0-19
2	Steenbekkers 1993	NL	0-12

Section 1.4

Static Anthropometry: Hand

Hand clearance (minimum aperture) 78

source 1 of 2

Snyder 1977

Country United States
Ages 0-19

age	sex	n	mean (mm)	sd	5th%ile	95th%ile
0-2mo	mf	30	33.9	3.0	28.6	37.8
3-5mo		43	36.1	2.7	31.8	39.9
6-8mo		30	37.9	2.0	34.9	4.3
9-11mo		26	40.3	2.2	38.1	43.1
12-15mo		29	40.6	2.0	38.1	43.0
16-19mo		28	40.1	3.3	34.9	45.4
20-23mo		31	41.2	2.5	38.1	44.2
2.5-3.5		77	43.6	2.9	38.1	47.0
3.5-4.5		70	45.8	2.8	39.1	49.2
4.5-5.5		92	47.8	3.1	41.6	52.4
5.5-6.5		62	49.2	3.6	44.5	53.6
6.5-7.5		62	51.8	3.7	44.9	56.3
7.5-8.5		60	53.1	3.5	47.6	58.2
8.5-9.5		78	53.9	3.1	47.9	58.3
9.5-10.5		93	56.2	3.3	48.3	59.9
10.5-11.5		98	58.5	4.4	49.4	64.9
11.5-12.5		94	59.4	4.2	51.4	65.6
12.5-13.5		107	61.3	4.0	54.2	65.9
13.5-14.5		98	64.0	4.9	55.1	72.0
14.5-15.5		94	65.2	5.5	55.8	73.3
15.5-16.5		56	67.9	5.9	57.7	77.5
16.5-17.5		80	66.7	6.8	54.6	76.2
17.5-19		46	69.6	7.8	57.3	79.3

source 2 of 2

Steenbekkers 1993

Country Netherlands
Ages 0-12

age	sex	n	mean (mm)	sd	3rd%ile	97th%ile
0-2mo	m	16	37	3	32	42
3-5mo	m	21	39	3	35	42
6-8mo	m	22	40	3	35	45
9-11mo	m	13	42	2	38	45
12-14mo	m	15	44	2	38	48
2	m	81	47	3	42	52
3	m	97	48	3	42	52
4	m	85	50	3	45	55
5	m	86	53	3	48	58
6	m	98	53	3	48	62
7	m	106	55	4	48	62
8	m	96	56	4	52	65
9	m	122	58	4	52	65
10	m	134	59	4	55	68
11	m	143	62	5	55	72
12	m	78	64	4	58	72
0-2mo	f	9	35	3	32	38
3-5mo	f	20	36	2	35	42
6-8mo	f	14	40	2	35	42
9-11mo	f	16	40	3	35	45
12-14mo	f	23	42	3	35	48
2	f	92	45	3	42	52
3	f	86	46	3	42	52
4	f	79	48	3	42	55
5	f	94	51	3	45	55
6	f	92	52	3	48	58
7	f	93	54	4	48	62
8	f	95	55	3	48	62
9	f	122	56	4	48	62
10	f	136	59	4	52	65
11	f	151	61	4	52	68
12	f	79	64	4	55	72

Section 1.4 Static Anthropometry: Hand Maximum grip diameter (between thumb and index finger) 79

DEFINITION

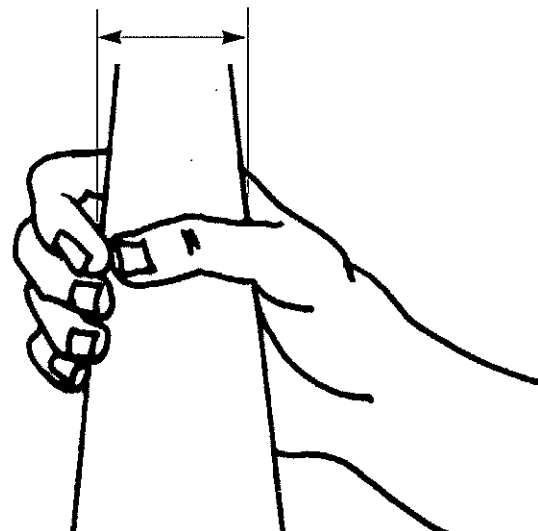
The subject grips a graduated cone and slides the hand down the cone until the maximum diameter that can be gripped (with thumb and index finger touching) is reached. The circumference of the cone at the level of the tip of the thumb and index finger is measured (centimetres).

APPLICATION AND SUMMARY OF THE DATA

Two sources of data have been included to allow comparison between different countries. Of the sources, DIN (1981) is probably more appropriate for use with the current UK population. Steenbekkers is the most recent data on European children and Dutch children are amongst the tallest in Europe. See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and choose between different sources. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different postures or the compression of soft tissue.

SEE ALSO

Maximum grip diameter (between thumb and middle finger), grip length (middle finger to thumb)



NUMBER OF SOURCES: 2

source	reference	country	age
1	DIN 1981	D	3-17
2	Steenbekkers 1993	NL	2-12

Section 1.4 Static Anthropometry: Hand Maximum grip diameter (between thumb and index finger) 79

source 1 of 2

DIN 1981

Country Germany
Ages 3-17

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
3	m		8.0		7.5	8.3
4	m		8.5		8.0	8.9
5	m		8.5		8.0	9.4
6	m		9.0		8.1	10.3
7	m		9.5		8.3	10.5
8	m		10.0		8.8	10.8
9	m		10.5		9.0	11.5
10	m		11.0		9.5	12.0
11	m		11.3		9.5	13.0
12	m		12.0		10.5	13.0
13	m		13.0		10.9	14.6
14	m		13.0		11.0	15.2
15	m		13.0		11.2	15.2
16-17	m		13.5		11.7	15.3
3	f		8.0		7.5	8.3
4	f		8.5		8.0	8.9
5	f		8.5		8.0	9.4
6	f		8.9		8.1	10.3
7	f		9.5		8.3	10.5
8	f		10.0		8.8	10.8
9	f		10.5		9.0	11.5
10	f		11.0		9.5	12.0
11	f		11.3		9.5	12.3
12	f		11.8		10.0	13.0
13	f		12.5		10.6	14.2
14	f		12.5		10.7	14.6
15	f		12.6		10.8	14.7
16-17	f		13.0		11.2	14.9

source 2 of 2

Steenbekkers 1993

Country Netherlands
Ages 2-12

age	sex	n	mean (cm)	sd	3rd%ile	97th%ile
2	m	81	6.8	0.6	5.9	8.2
3	m	97	7.5	0.7	6.3	9.0
4	m	85	7.6	0.6	6.5	8.6
5	m	86	8.2	0.7	6.9	9.5
6	m	98	8.6	0.7	7.3	10.3
7	m	106	9.1	0.8	7.6	10.6
8	m	96	9.6	0.7	8.0	11.0
9	m	122	10.1	0.8	8.8	11.8
10	m	134	10.5	1.0	8.4	12.5
11	m	143	10.9	1.0	9.1	12.9
12	m	78	11.1	1.0	9.5	13.3
2	f	92	6.8	0.6	5.9	8.2
3	f	86	7.4	0.6	6.3	8.6
4	f	79	7.6	0.7	6.5	9.1
5	f	94	8.1	0.7	6.9	9.5
6	f	92	8.7	0.8	7.3	10.3
7	f	93	9.2	0.8	8.0	10.6
8	f	95	9.6	0.9	8.0	11.4
9	f	122	10.1	0.9	8.0	11.8
10	f	136	10.6	0.9	9.1	12.1
11	f	151	11.0	1.0	9.5	12.9
12	f	79	11.5	1.2	9.5	14.0

Section 1.4 Static Anthropometry: Hand Maximum grip diameter (between thumb and middle finger) 80

DEFINITION

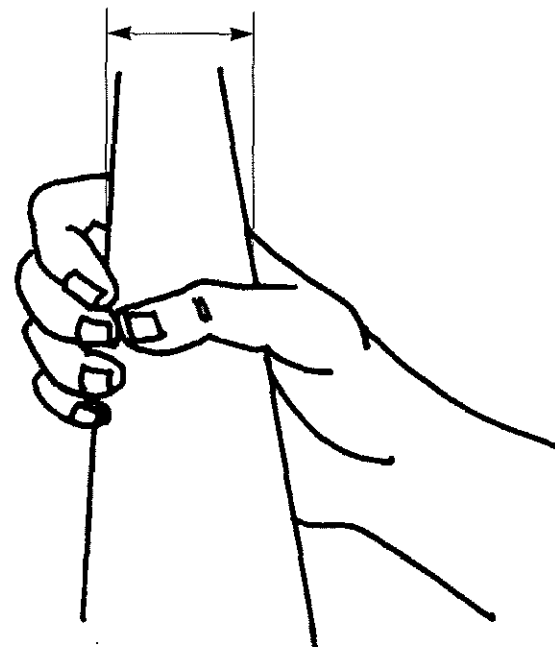
The subject grips a graduated cone and slides the hand down the cone until the maximum diameter that can be gripped (with thumb and middle finger touching) is reached. The diameter of the cone at the level of the tip of the thumb and middle finger is measured (centimetres).

APPLICATION AND SUMMARY OF THE DATA

See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and the validity of USA data for use with the current UK population. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different postures or the compression of soft tissue.

SEE ALSO

Maximum grip diameter (between thumb and index finger), grip length (middle finger to thumb)



NUMBER OF SOURCES: 1

source	reference	country	age
1	Snyder 1975	US	0-13

Section 1.4 Static Anthropometry: Hand

Maximum grip diameter (between thumb and middle finger)

00

source 1 of 1

Snyder 1975

Country USA
Ages 0-13

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
0-3mo	m	74	1.73	0.19	1.43	2.02
4-6mo	m	47	1.97	0.19	1.5	2.26
7-9mo	m	23	2.06	0.2	1.61	2.30
10-12mo	m	17	2.20	0.23	1.75	2.55
13-18mo	m	31	2.41	0.22	1.95	2.67
19-24mo	m	39	2.59	0.17	2.23	2.79
2-2.5	m	35	2.76	0.2	2.27	3.14
2.5-3	m	49	2.91	0.26	2.40	3.22
3-3.5	m	131	3.00	0.23	2.58	3.29
3.5-4	m	123	3.04	0.24	2.59	3.37
4-4.5	m	175	3.19	0.23	2.75	3.53
4.5-5	m	154	3.27	0.2	2.85	3.61
5.5-6	m	125	3.35	0.27	2.86	3.71
6-6.5	m	94	3.46	0.26	3.02	3.81
6.5-7	m	77	3.57	0.25	3.09	3.88
7	m	76	3.65	0.25	3.20	4.00
8	m	133	3.81	0.30	3.24	4.27
9	m	128	3.93	0.30	3.40	4.42
10	m	106	4.12	0.32	3.54	4.61
11	m	95	4.32	0.33	3.75	4.8
12	m	55	4.42	0.36	3.82	5.05
13	m	21	4.54	0.36	3.83	5.17

continued

source 1 of 1 continued

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
0-3 mo	f	60	1.68	0.18	1.43	1.91
4-6 mo	f	55	1.91	0.19	1.59	2.17
7-9 mo	f	29	2.21	0.21	1.68	2.35
10-12mo	f	25	2.17	0.18	1.91	2.45
13-18mo	f	26	2.35	0.24	1.77	2.69
19-24mo	f	29	2.57	0.20	2.23	2.84
2-2.5	f	30	2.72	0.24	2.26	3.10
2.5-3	f	54	2.87	0.23	2.42	3.20
3-3.5	f	141	2.96	0.19	2.57	3.17
3.5-4	f	170	3.02	0.22	2.62	3.31
4-4.5	f	186	3.13	0.23	2.71	3.45
4.5-5	f	175	3.23	0.25	2.75	3.60
5.5-6	f	120	3.29	0.26	2.78	3.65
6-6.5	f	81	3.40	0.26	2.83	3.79
6.5-7	f	99	3.52	0.25	3.07	3.82
7	f	95	3.58	0.26	3.18	3.93
8	f	146	3.77	0.27	3.32	4.14
9	f	143	4.00	0.30	3.50	4.49
10	f	152	4.06	0.37	3.54	4.65
11	f	108	4.34	0.38	3.68	4.91
12	f	62	4.51	0.38	3.75	4.97
13	f	32	4.87	0.36	4.42	5.35



Section 1.4

Static Anthropometry: Hand

Grip length (middle finger to thumb) 81

DEFINITION

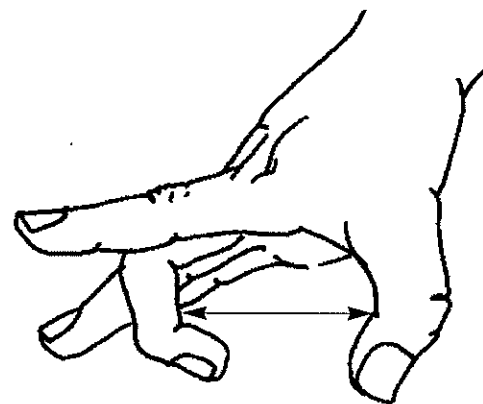
The subject grasps the pointed blades of a sliding calliper with the right hand. The distance between the middle portion of the middle finger and thumb keeping the middle portions of these digits parallel is measured (centimetres).

APPLICATION AND SUMMARY OF THE DATA

See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and the validity of USA data for use with the current UK population. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different postures or the compression of soft tissue.

SEE ALSO

Maximum grip diameter (between thumb and middle finger), maximum grip diameter (between thumb and index finger), hand length (to thumb crotch)



NUMBER OF SOURCES: 1

source	reference	country	age
1	Snyder 1977	US	2-19

source 1 of 1

Snyder 1977

Country United States
Ages 2-19

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2-3.5	mf	64	6.00m	0.80	4.50	7.20
3.5-4.5		63	6.20	1.00	4.10	7.70
4.5-5.5		90	6.40	0.80	4.70	7.50
5.5-6.5		61	7.00	1.00	5.00	8.40
6.5-7.5		62	7.50	1.00	4.90	8.60
7.5-8.5		59	7.60	1.10	5.40	9.10
8.5-9.5		78	8.10	0.90	6.50	9.50
9.5-10.5		92	8.50	1.10	6.40	10.10
10.5-11.5		98	8.90	1.10	6.60	10.60
11.5-12.5		94	9.10	1.10	6.90	10.70
12.5-13.5		107	9.50	1.00	7.60	11.20
13.5-14.5		97	9.40	1.20	7.10	11.20
14.5-15.5		95	10.20	1.00	8.40	11.90
15.5-16.5		56	10.10	1.10	8.30	11.50
16.5-17.5		80	10.00	1.20	7.60	11.60
17.5-19		45	10.30	1.10	8.50	11.70



DEFINITION

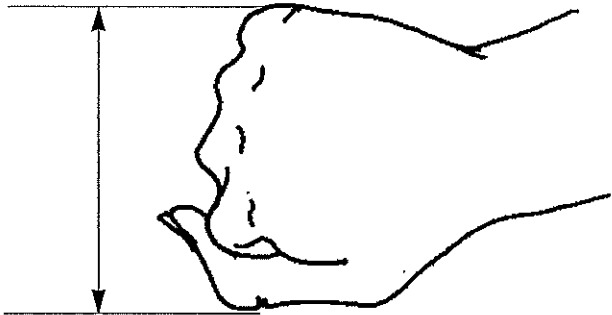
The subject forms a fist with the right hand with the thumb lying across the fingers. The maximum breadth across the fist of the hand at the level of the first (or largest) knuckles of the hand and thumb is measured (centimetres).

APPLICATION AND SUMMARY OF THE DATA

See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and the validity of USA data for use with the current UK population. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different postures or the compression of soft tissue (eg forcing the hand through an aperture).

SEE ALSO

Hand clearance (minimum aperture), fist depth, hand breadth at thumb.



NUMBER OF SOURCES: 1

source	reference	country	age
1	Snyder 1977	US	0-19

Section 1.4

Static Anthropometry: Hand

Fist breadth 82

source 1 of 1

Snyder 1977

Country United States
Ages 0-19

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
0-2	mf	31	4.20	0.40	3.40	4.80
3-5		44	4.60	0.50	3.70	5.30
6-8		30	4.90	0.40	4.20	5.40
9-11		27	5.10	0.50	4.30	5.80
12-15		31	5.30	0.60	4.40	6.10
16-19		27	5.50	0.50	4.50	6.10
20-23		31	5.50	0.50	4.60	6.10
2-3.5		74	5.80	0.50	4.90	6.60
3.5-4.5		71	6.10	0.60	5.20	6.90
4.5-5.5		94	6.20	0.50	5.30	7.00
5.5-6.5		62	6.30	0.50	5.50	7.20
6.5-7.5		63	6.70	0.50	5.90	7.60
7.5-8.5		60	6.90	0.50	5.90	7.60
8.5-9.5		79	7.10	0.50	6.30	7.90
9.5-10.5		93	7.30	0.60	6.30	8.20
10.5-11.5		99	7.60	0.70	6.40	8.60
11.5-12.5		94	7.70	0.70	6.70	9.00
12.5-13.5		107	8.10	0.80	6.90	9.20
13.5-14.5		66	8.40	0.90	7.10	9.80
14.5-15.5		65	8.70	1.10	7.00	10.30
15.5-16.5		56	8.90	1.10	7.10	10.70
16.5-17.5		80	8.90	1.20	7.00	10.70
17.5-19		46	9.20	1.30	7.20	11.20

DEFINITION

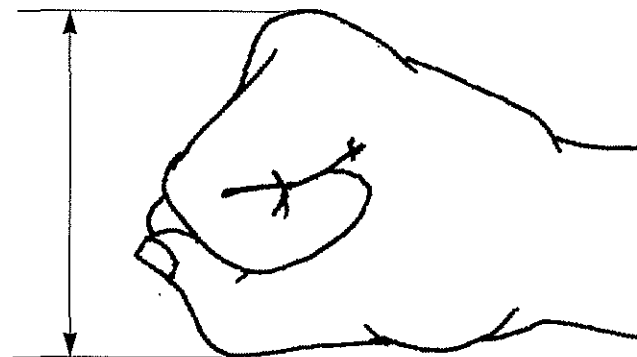
The subject forms a fist with the right hand with the thumb lying across the fingers. The maximum depth of the fist of the hand between the (largest) knuckles and thumb is measured (centimetres).

APPLICATION AND SUMMARY OF THE DATA

See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and the validity of USA data for use with the current UK population. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different postures or the compression of soft tissue (eg forcing the hand through an aperture).

SEE ALSO

Fist breadth, hand clearance (minimum aperture), middle finger length (knuckle to middle joint, hand clenched).

**NUMBER OF SOURCES: 1**

source	reference	country	age
1	Snyder 1977	US	2-19

source 1 of 1

Snyder 1977

Country United States
Ages 2-19

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2-3.5	mf	74	4.40	0.60	3.40	5.40
3.5-4.5		71	4.80	0.50	3.90	5.50
4.5-5.5		94	5.20	0.50	4.10	5.90
5.5-6.5		62	5.50	0.50	4.50	6.40
6.5-7.5		63	5.80	0.60	4.60	6.70
7.5-8.5		60	6.00	0.50	5.00	6.60
8.5-9.5		79	6.20	0.50	5.20	6.90
9.5-10.5		93	6.50	0.50	5.50	7.20
10.5-11.5		99	6.80	0.50	6.00	7.50
11.5-12.5		94	6.90	0.50	6.10	7.60
12.5-13.5		107	7.20	0.60	6.00	8.10
13.5-14.5		99	7.40	0.70	6.40	8.50
14.5-15.5		95	7.70	0.80	6.40	8.70
15.5-16.5		56	7.90	0.80	6.60	9.10 ^a
16.5-17.5		80	7.70	0.90	6.10	9.10
17.5-19		46	7.90	1.00	6.00	9.40

DEFINITION

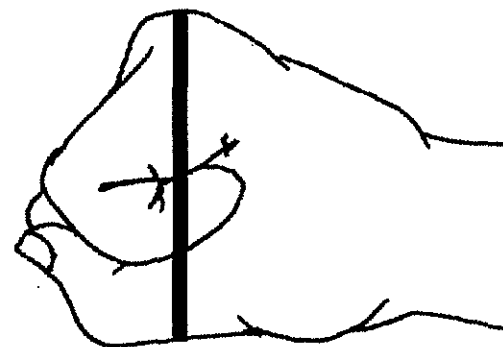
The subject forms a fist with the right hand with the thumb lying across the fingers. The maximum circumference of the fist is measured by passing a tape over the thumb and across the knuckles (centimetres).

APPLICATION AND SUMMARY OF THE DATA

See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and the validity of USA data for use with the current UK population. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different postures or the compression of soft tissue (eg forcing the hand through an aperture).

SEE ALSO

Hand clearance (minimum aperture)

**NUMBER OF SOURCES: 1**

source	reference	country	age
1	Snyder 1977	US	2-19

source 1 of 1

Snyder 1977

Country United States
Ages 2-19

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2-3.5	mf	74	16.20	1.10	14.20	18.10
3.5-4.5		71	17.00	1.30	14.80	18.60
4.5-5.5		94	17.80	1.20	15.90	19.60
5.5-6.5		61	18.80	1.30	15.90	20.70
6.5-7.5		63	20.00	1.20	18.00	21.80
7.5-8.5		59	20.40	1.30	18.40	22.80
8.5-9.5		79	21.00	1.10	18.80	23.10
9.5-10.5		92	21.70	1.40	19.50	23.90
10.5-11.5		99	22.80	1.60	20.00	25.00
11.5-12.5		93	23.10	1.50	20.60	25.50
12.5-13.5		106	24.30	1.70	21.30	27.10
13.5-14.5		98	25.10	2.10	21.70	28.50
14.5-15.5		94	26.20	2.20	22.50	29.40
15.5-16.5		56	26.60	2.50	22.00	30.00
16.5-17.5		80	26.30	2.50	21.80	30.00
17.5-19		47	27.60	2.90	23.00	31.90

Section 1.4

Static Anthropometry: Thumb

Thumb length 85

DEFINITION

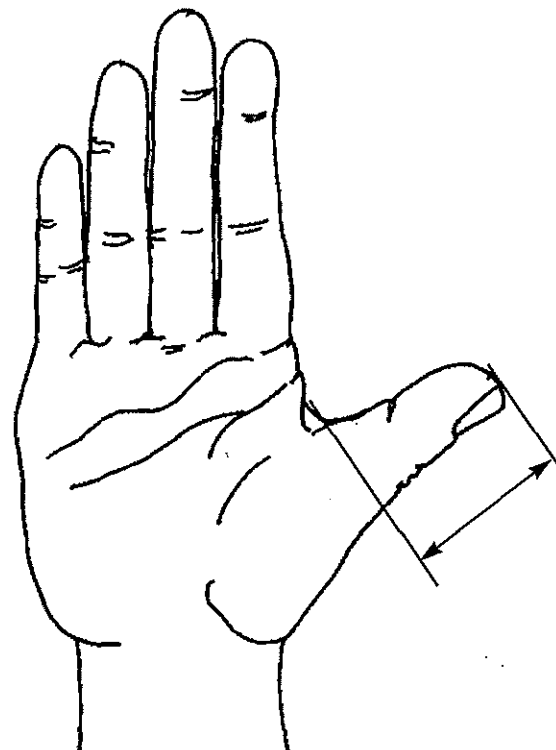
The subject extends the right hand and fingers with the palm facing up and the thumb away (abducted) from hand. The distance from the skin crease at the base of the thumb to the tip of the thumb parallel to the long axis of the thumb is measured (centimetres).

APPLICATION AND SUMMARY OF THE DATA

Two sources of data have been included to allow comparison between different countries. Of the sources, Snyder (1977) is probably more appropriate for use with the current UK population. See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and choose between different sources. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different postures or the compression of soft tissue (eg forcing the thumb through an aperture).

NUMBER OF SOURCES: 2

source	reference	country	age
1	DIN 1981	D	3-17
2	Snyder 1977	US	2-19



source 1 of 2

DIN 1981

Country Germany
Ages 3-17

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
3	m		3.7		3.4	4.1
4	m		4.0		3.5	4.5
5	m		4.1		3.7	4.6
6	m		4.3		3.8	4.8
7	m		4.6		4.1	5.2
8	m		4.7		4.2	5.4
9	m		5.0		4.6	5.6
10	m		5.3		4.6	6.0
11	m		5.3		4.7	6.0
12	m		5.5		5.0	6.3
13	m		6.0		5.2	6.5
14	m		6.2		5.3	6.9
15	m		6.4		5.5	7.0
16-17	m		6.6		5.9	7.2
3	f		3.7		3.4	4.1
4	f		4.0		3.5	4.5
5	f		4.1		3.7	4.6
6	f		4.3		3.8	4.8
7	f		4.6		4.1	5.2
8	f		4.7		4.2	5.4
9	f		5.0		4.6	5.6
10	f		5.3		4.6	6.0
11	f		5.3		4.6	6.1
12	f		5.7		4.8	6.1
13	f		5.7		5.0	6.3
14	f		5.9		5.3	6.5
15	f		6.0		5.3	6.6
16-17	f		6.0		5.3	6.8

source 2 of 2

Snyder 1977

Country United States
Ages 2-19

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2-3.5	mf	75	3.6	0.4	3.0	4.1
3.5-4.5		71	3.8	0.4	3.1	4.4
4.5-5.5		94	4.1	0.4	3.4	4.8
5.5-6.5		62	4.4	0.4	3.7	5.1
6.5-7.5		63	4.7	0.4	4.1	5.2
7.5-8.5		60	4.8	0.4	4.0	5.2
8.5-9.5		79	5.0	0.4	4.1	5.7
9.5-10.5		93	5.3	0.5	4.5	6.0
10.5-11.5		98	5.5	0.5	4.8	6.5
11.5-12.5		94	5.7	0.4	4.9	6.4
12.5-13.5		107	5.9	0.5	5.1	6.6
13.5-14.5		98	6.1	0.6	5.1	7.1
14.5-15.5		95	6.4	0.5	5.5	7.1
15.5-16.5		56	6.4	0.5	5.5	7.1
16.5-17.5		80	6.4	0.7	5.4	7.4
17.5-19		46	6.6	0.5	5.7	7.4

DEFINITION

The maximum breadth measured across the distal (furthest) joint of the thumb (centimetres).

APPLICATION AND SUMMARY OF THE DATA

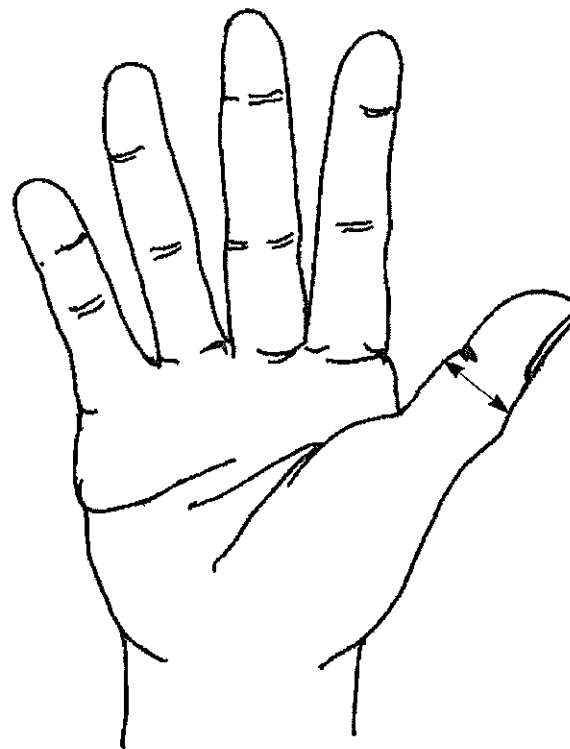
Two sources of data have been included to allow comparison between different countries. Of the sources, DIN (1981) is probably more appropriate for use with the current UK population. Steenbekkers is the most recent data on European children and Dutch children are amongst the tallest in Europe. See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and choose between different sources. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different postures or the compression of soft tissue (eg forcing the thumb through an aperture).

SEE ALSO

Thumb diameter (minimum aperture)

NUMBER OF SOURCES: 2

source	reference	country	age
1	Steenbekkers 1993	NL	2-12
2	DIN 1981	D	3-17



Section 1.4

Static Anthropometry: Thumb

Thumb breadth at distal joint 86

source 1 of 2

Steenbekkers 1993Country Netherlands
Ages 2-12

age	sex	n	mean (cm)	sd	3rd%ile	97th%ile
2	m	81	1.3	0.1	1.2	1.4
3	m	97	1.4	0.1	1.1	1.5
4	m	85	1.4	0.1	1.2	1.6
5	m	86	1.5	0.1	1.2	1.6
6	m	98	1.5	0.1	1.3	1.8
7	m	106	1.6	0.1	1.3	1.7
8	m	96	1.6	0.1	1.4	1.8
9	m	122	1.7	0.1	1.4	1.9
10	m	134	1.7	0.1	1.5	1.9
11	m	143	1.7	0.1	1.5	2.0
12	m	78	1.8	0.1	1.6	2.1
2	f	92	1.3	0.1	1.1	1.5
3	f	86	1.3	0.1	1.1	1.5
4	f	79	1.3	0.1	1.1	1.5
5	f	94	1.4	0.1	1.3	1.6
6	f	92	1.4	0.1	1.3	1.7
7	f	93	1.5	0.1	1.3	1.7
8	f	95	1.5	0.1	1.3	1.7
9	f	122	1.5	0.1	1.3	1.7
10	f	136	1.6	0.1	1.4	1.8
11	f	151	1.6	0.1	1.5	1.9
12	f	79	1.7	0.1	1.5	1.9

source 2 of 2

DIN 1981Country Germany
Ages 3-17

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
3	m		1.4		1.3	1.5
4	m		1.5		1.3	1.6
5	m		1.5		1.4	1.6
6	m		1.5		1.4	1.6
7	m		1.6		1.4	1.7
8	m		1.6		1.5	1.7
9	m		1.6		1.5	1.7
10	m		1.8		1.6	1.9
11	m		1.8		1.6	2.0
12	m		1.9		1.7	2.0
13	m		2.0		1.7	2.2
14	m		2.0		1.7	2.2
15	m		2.1		1.9	2.3
16-17	m		2.2		1.9	2.4
3	f		1.4		1.3	1.5
4	f		1.5		1.3	1.6
5	f		1.5		1.4	1.6
6	f		1.5		1.4	1.6
7	f		1.6		1.4	1.7
8	f		1.6		1.5	1.7
9	f		1.6		1.5	1.7
10	f		1.8		1.6	1.9
11	f		1.8		1.6	1.9
12	f		1.8		1.6	1.9
13	f		1.8		1.6	1.9
14	f		1.8		1.6	2.0
15	f		1.8		1.6	2.1
16-17	f		1.9		1.7	2.1

Section 1.4 Static Anthropometry: Thumb **Thumb diameter (minimum aperture) 87**

DEFINITION

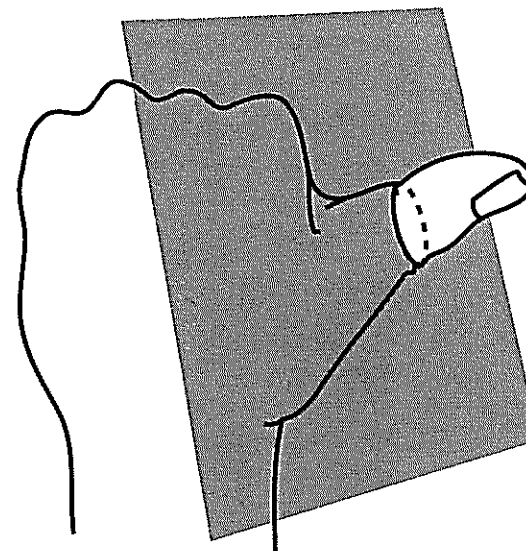
The subject extends the thumb of the right hand. With a finger measurement board the greatest diameter through which the end or furthest joint of the thumb cannot pass is measured (millimetres).

APPLICATION AND SUMMARY OF THE DATA

See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and the validity of USA data for use with the current UK population. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different postures or the compression of soft tissue (eg forcing the thumb through an aperture).

SEE ALSO

Thumb breadth at distal joint



NUMBER OF SOURCES: 1

source	reference	country	age
1	Snyder 1977	US	0-19

Section 1.4 Static Anthropometry: Thumb Thumb diameter (minimum aperture) 87

source 1 of 1

Snyder 1977

Country United States
Ages 0-19

age	sex	n	mean (mm)	sd	5th%ile	95th%ile
0-2 mo	mf	31	8.60	0.80	7.10	9.70
3-5 mo		44	9.20	0.80	7.40	10.20
6-8 mo		29	9.90	0.70	8.70	10.70
9-11 mo		26	10.60	0.80	9.50	11.80
12-15 mo		28	11.00	0.70	8.80	11.70
16-19 mo		28	10.70	0.70	9.50	11.70
20-23 mo		31	11.40	1.00	9.60	12.60
2-3.5		77	12.40	0.90	10.50	13.50
3.5-4.5		70	13.10	0.90	11.10	14.10
4.5-5.5		93	13.60	0.90	11.90	14.70
5.5-6.5		62	14.10	0.80	12.20	15.00
6.5-7.5		62	15.00	1.00	13.50	16.50
7.5-8.5		59	15.40	0.90	13.00	16.50
8.5-9.5		79	15.70	0.80	13.80	16.50
9.5-10.5		90	15.90	1.00	13.90	17.30
10.5-11.5		99	16.50	1.20	14.30	17.90
11.5-12.5		91	17.00	1.10	15.00	18.40
12.5-13.5		106	17.50	1.10	15.40	19.00
13.5-14.5		98	18.10	1.50	15.80	20.30
14.5-15.5		95	18.70	1.50	16.10	20.90
15.5-16.5		55	19.40	1.70	16.50	21.50
16.5-17.5		80	18.90	1.80	15.80	21.20
17.5-19		46	19.50	1.80	16.10	21.40

Section 1.4

Static Anthropometry: Index finger

Index finger length 88

DEFINITION

The subject extends the right hand and fingers with the palm facing up. The distance from the skin crease at the base of the index finger to the tip of the index finger parallel to the long axis of the index finger is measured (centimetres).

APPLICATION AND SUMMARY OF THE DATA

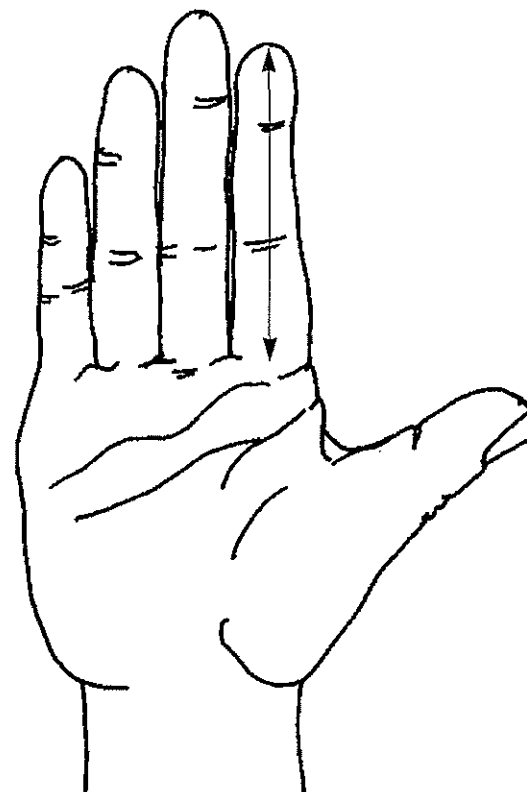
Two sources of data have been included to allow comparison between different countries. Of the sources, Snyder (1977) is probably more appropriate for use with the current UK population. See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and choose between different sources. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different postures or the compression of soft tissue (eg forcing the finger through an aperture).

SEE ALSO

Hand length (to thumb crotch)

NUMBER OF SOURCES: 2

source	reference	country	age
1	Snyder 1977	US	2-19
2	DIN 1981	D	3-17



Section 1.4

Static Anthropometry: Index finger

Index finger length 88

source 1 of 2

Snyder 1977

Country	United States					
Ages	2-19					
age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2-3.5	mf	74	4.1	0.4	3.4	4.7
3.5-4.5		71	4.4	0.4	3.87	5.0
4.5-5.5		94	4.6	0.4	4.0	5.2
5.5-6.5		62	4.9	0.4	4.2	5.5
6.5-7.5		63	5.2	0.3	4.6	5.8
7.5-8.5		60	5.3	0.3	4.7	5.8
8.5-9.5		79	5.6	0.4	4.8	6.1
9.5-10.5		93	5.9	0.5	5.1	6.6
10.5-11.5		98	6.1	0.5	5.2	6.9
11.5-12.5		94	6.4	0.5	5.4	7.1
12.5-13.5		107	6.6	0.5	5.7	7.5
13.5-14.5		98	6.8	0.5	6.1	8.0
14.5-15.5		95	7.1	0.5	6.2	8.0
15.5-16.5		56	7.1	0.5	6.3	7.9
16.5-17.5		80	7.0	0.6	5.9	7.8
17.5-19		46	7.3	0.6	6.3	8.0

source 2 of 2

DIN 1981

Country	Germany					
Ages	3-17					
age	sex	n	mean (cm)	sd	5th%ile	95th%ile
3	m		4.2		3.8	4.6
4			4.6		3.9	5.1
5			4.9		4.2	5.3
6			5.0		4.4	5.6
7			5.4		4.8	5.9
8			5.5		4.9	6.2
9			5.7		5.1	6.5
10			6.0		5.4	6.8
11			6.0		5.4	6.9
12			6.4		5.4	7.0
13			6.8		5.9	7.5
14			7.1		6.1	7.9
15			7.0		6.3	8.0
16-17			7.5		6.7	8.3
3	f		4.2		3.8	4.6
4			4.6		3.9	5.1
5			4.9		4.2	5.3
6			5.0		4.4	5.6
7			5.4		4.8	5.9
8			5.5		4.9	6.2
9			5.7		5.1	6.5
10			6.0		5.4	6.8
11			6.2		5.5	6.9
12			6.7		5.8	7.0
13			6.8		5.9	7.2
14			6.9		6.3	7.6
15			6.9		6.3	7.6
16-17			7.0		6.3	7.8

Section 1.4 Static Anthropometry: Index finger Index finger breadth at distal joint 89

DEFINITION

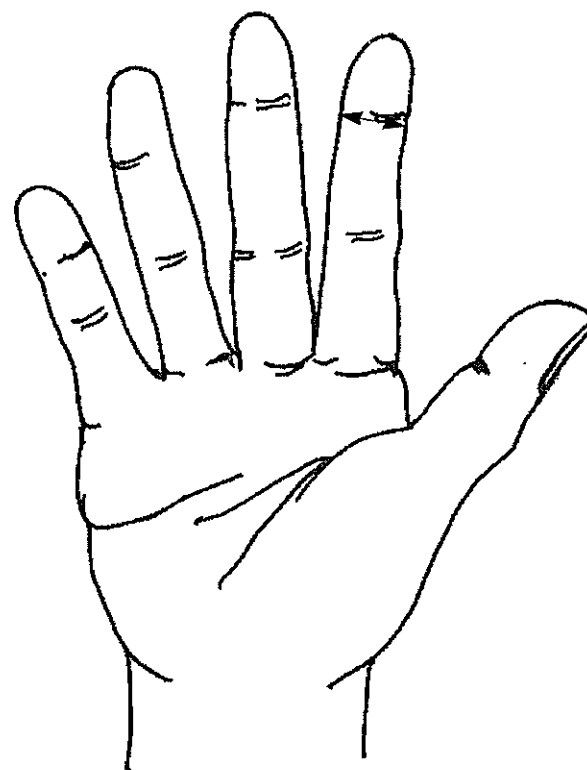
The maximum breadth measured across the distal (end or furthest) joint of the index finger (millimetres).

APPLICATION AND SUMMARY OF THE DATA

See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and the validity of German data for use with the current UK population. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different postures or the compression of soft tissue (eg forcing the finger through an aperture).

SEE ALSO

Index finger breadth at middle joint, index finger diameter (minimum aperture)



NUMBER OF SOURCES: 1

source	reference	country	age
1	Din 1981	D	3-17

Section 1.4

Static Anthropometry: Index finger

Index finger breadth at distal joint 89

source 1 of 1

Din 1981

Country Germany
Ages 3-17

age	sex	n	mean (mm)	sd	5th%ile	95th%ile
3	m		11		10	12
4	m		12		11	13
5	m		12		11	13
6	m		12		11	13
7	m		12		11	14
8	m		13		11	14
9	m		13		12	14
10	m		14		12	15
11	m		15		13	16
12	m		15		13	16
13	m		15		13	17
14	m		15		13	18
15	m		17		15	18
16-17	m		18		15	20
3	f		11		10	12
4	f		12		11	13
5	f		12		11	13
6	f		12		11	13
7	f		12		11	14
8	f		13		11	14
9	f		13		12	14
10	f		14		12	15
11	f		14		12	15
12	f		14		12	15
13	f		14		12	15
14	f		14		12	16
15	f		14		12	16
16-17	f		15		13	17

Section 1.4 Static Anthropometry: Index finger Index finger breadth at middle joint 90

DEFINITION

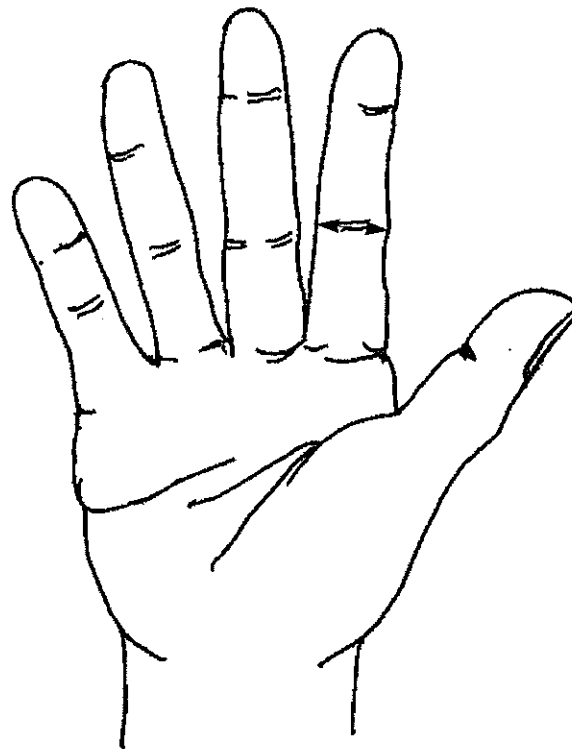
The maximum breadth measured across the middle joint of the index finger (millimetres).

APPLICATION AND SUMMARY OF THE DATA

See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and the validity of German data for use with the current UK population. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different postures or the compression of soft tissue (eg forcing the finger through an aperture).

SEE ALSO

Index finger breadth at distal joint, index finger diameter (minimum aperture)



NUMBER OF SOURCES: 1

source	reference	country	age
1	Din 1981	D	3-17

Section 1.4 Static Anthropometry: Index finger Index finger breadth at middle joint 90

source 1 of 1

Din 1981

Country Germany
Ages 3-17

age	sex	n	mean (mm)	sd	5th%ile	95th%ile
3	m		13		11	14
4	m		14		12	15
5	m		14		13	15
6	m		14		13	15
7	m		14		13	16
8	m		15		14	16
9	m		15		14	17
10	m		16		15	17
11	m		16		15	17
12	m		17		15	18
13	m		18		16	20
14	m		18		17	20
15	m		20		18	22
16-17	m		21		19	23
3	f		13		11	14
4	f		14		12	15
5	f		14		13	15
6	f		14		13	15
7	f		14		13	16
8	f		15		14	16
9	f		15		14	17
10	f		16		15	17
11	f		16		15	17
12	f		16		15	17
13	f		16		15	17
14	f		16		15	18
15	f		17		15	19
16-17	f		18		16	20

Section 1.4 Static Anthropometry: Index finger Index finger diameter (minimum aperture) 91

DEFINITION

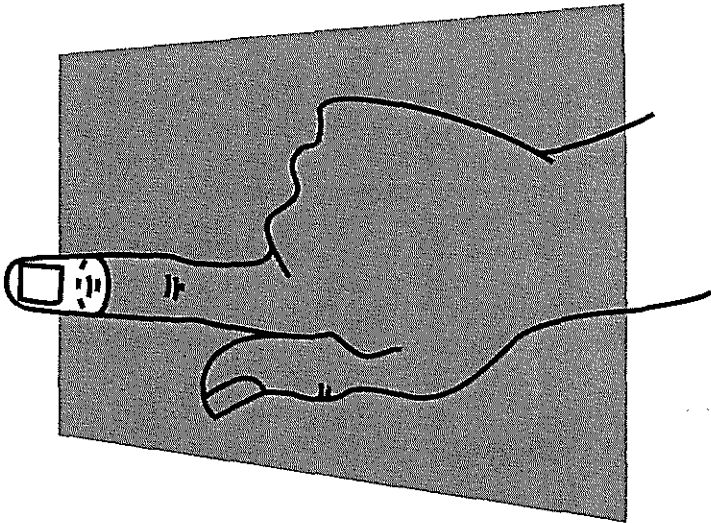
The subject extends the index finger of the right hand. With a finger measurement board the maximum diameter through which the first (end or furthest) joint of the index finger cannot pass is measured (millimetres).

APPLICATION AND SUMMARY OF THE DATA

See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and the validity of USA data for use with the current UK population. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different postures or the compression of soft tissue (eg forcing the finger through an aperture).

SEE ALSO

Index finger breadth at middle joint, index finger breadth at distal joint



NUMBER OF SOURCES: 1

source	reference	country	age
1	Snyder 1977	US	2-19

Section 1.4 Static Anthropometry: Index finger Index finger diameter (minimum aperture) 91

source 1 of 1

Snyder 1977

Country United States
Ages 2-19

age	sex	n	mean (mm)	sd	5th%ile	95th%ile
2-3.5	mf	76	9.60	0.60	8.40	10.20
3.5-4.5		70	10.10	0.60	8.90	10.90
4.5-5.5		93	10.60	0.80	9.20	11.70
5.5-6.5		61	11.00	0.70	9.50	11.80
6.5-7.5		62	11.70	0.80	10.30	12.70
7.5-8.5		60	11.90	0.80	10.30	12.70
8.5-9.5		79	12.20	0.70	10.60	13.10
9.5-10.5		92	12.60	0.80	11.10	13.50
10.5-11.5		99	13.00	0.80	11.20	14.00
11.5-12.5		94	13.20	0.90	11.90	14.30
12.5-13.5		106	13.80	0.90	11.90	14.80
13.5-14.5		98	14.10	1.10	12.10	15.80
14.5-15.5		94	14.60	1.10	12.70	16.30
15.5-16.5		56	15.00	1.20	12.70	16.70
16.5-17.5		80	14.80	1.40	12.10	16.50
17.5-19		46	15.40	1.40	12.70	17.10

DEFINITION

The vertical distance from the floor to the tip of the middle finger (dactylion) is measured while the arm is held at the side of the body (millimetres).

APPLICATION AND SUMMARY OF THE DATA

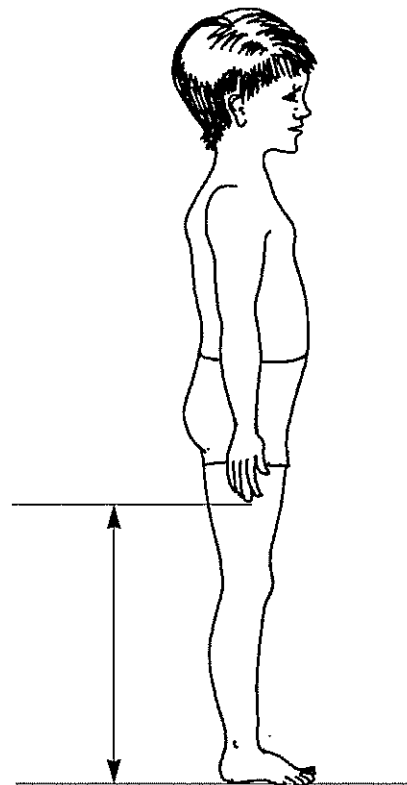
See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and the validity of these data for use with the current UK population. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different postures or positions.

SEE ALSO

Knuckle height (from floor)

NUMBER OF SOURCES: 1

source	reference	country	age
1	Pheasant 1988	UK	2-18



Section 1.4

Static Anthropometry: Middle finger

Fingertip height (from floor) 92

source 1 of 1

Pheasant 1988

Country United Kingdom
Ages 2-18

age	sex	n	mean (mm)	sd	5th%ile	95th%ile
2	m		315	26	275	360
3	m		340	26	295	455
4	m		360	26	315	405
5	m		375	29	325	420
6	m		395	33	340	450
7	m		420	31	370	475
8	m		445	32	390	495
9	m		470	36	410	530
10	m		500	33	445	550
11	m		520	35	460	575
12	m		540	40	470	605
13	m		560	43	490	630
14	m		585	44	510	655
15	m		605	45	530	680
16	m		620	40	555	685
17	m		630	41	565	700
18	m		640	35	585	700

*continued*source 1 of 1 *continued*

age	sex	n	mean (mm)	sd	5th%ile	95th%ile
2	f		310	25	270	350
3	f		340	29	290	385
4	f		365	33	315	420
5	f		385	34	330	445
6	f		410	36	350	470
7	f		435	37	375	500
8	f		465	37	405	525
9	f		495	37	435	555
10	f		520	36	460	575
11	f		545	42	475	615
12	f		560	46	480	635
13	f		565	43	495	635
14	f		595	40	530	660
15	f		605	39	540	670
16	f		605	36	545	665
17	f		610	33	555	665
18	f		610	32	560	665

Datasheet 92

DEFINITION

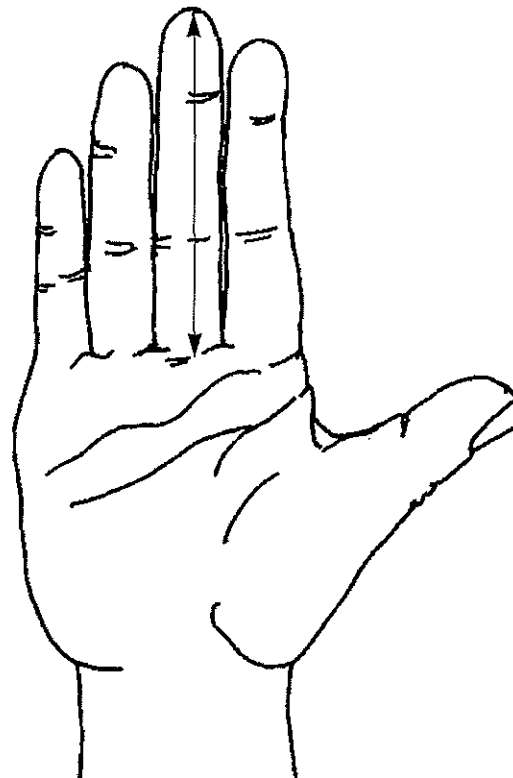
The subject extends the right hand and fingers with the palm facing up. The distance from the skin crease at the base of the middle finger to the tip of the middle finger parallel to the long axis of the middle finger is measured (centimetres).

APPLICATION AND SUMMARY OF THE DATA

Three sources of data have been included to allow comparison between different countries and because of different age groups. Of the sources, Snyder (1975 and 1977) are probably more appropriate for use with the current UK population. Steenbekkers is the most recent data on European children and Dutch children are amongst the tallest in Europe. See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and choose between different sources. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different postures or the compression of soft tissue (eg forcing the finger through an aperture).

SEE ALSO

Middle finger length (distal joint to tip), middle finger length (middle joint to distal joint), middle finger length (knuckle to middle joint, hand clenched) :

**NUMBER OF SOURCES: 3**

source	reference	country	age
1	Snyder 1975	US	0-3
2	Snyder 1977	US	2-19
3	Steenbekkers 1993	NL	2-12

Section 1.4

Static Anthropometry: Middle finger

Middle finger length 93

source 1 of 3

Snyder 1975

Country United States
Ages 0-3

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
0-3mo	m	76	3.0	0.4	2.3	3.9
4-6mo	m	42	3.4	0.4	2.8	4.3
7-9mo	m	25	3.7	0.5	2.7	4.6
10-12mo	m	18	3.6	0.4	2.9	4.6
13-18mo	m	30	3.9	0.3	3.3	4.5
19-24mo	m	42	4.2	0.4	3.6	5.0
2-2.5	m	34	4.3	0.4	3.4	5.0
2.5-3	m	49	4.5	0.3	3.9	5.0
3-3.5	m	131	4.6	0.3	4.0	5.1
0-3mo	f	62	2.9	0.4	2.3	3.8
4-6mo	f	56	3.2	0.4	2.3	4.1
7-9mo	f	24	3.5	0.3	2.9	4.0
10-12mo	f	22	3.6	0.3	3.1	4.2
13-18mo	f	23	3.8	0.3	2.9	4.1
19-24mo	f	29	4.2	0.4	3.6	4.9
2-2.5	f	30	4.3	0.3	3.7	4.8
2.5-3	f	54	4.5	0.4	3.8	5.1
3-3.5	f	141	4.6	0.3	4.0	5.1

source 2 of 3

Snyder 1977

Country United States
Ages 2-19

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2-3.5	mf	74	4.40	0.40	3.80	5.20
3.5-4.5		71	4.80	0.40	4.20	5.50
4.5-5.5		94	5.10	0.40	4.40	5.60
5.5-6.5		62	5.40	0.40	4.60	6.20
6.5-7.5		63	5.80	0.40	5.10	6.30
7.5-8.5		60	5.90	0.40	5.10	6.50
8.5-9.5		79	6.20	0.40	5.60	7.00
9.5-10.5		93	6.50	0.50	5.80	7.20
10.5-11.5		98	6.70	0.50	5.90	7.70
11.5-12.5		94	7.00	0.50	6.00	7.80
12.5-13.5		107	7.30	0.50	6.40	8.20
13.5-14.5		98	7.50	0.60	6.60	8.60
14.5-15.5		95	7.80	0.60	6.70	8.60
15.5-16.5		56	7.90	0.60	6.90	8.80
16.5-17.5		80	7.80	0.60	6.60	8.60
17.5-19		46	8.10	0.60	7.00	9.00

Section 1.4

Static Anthropometry: Middle finger

Middle finger length 93

source 3 of 3

Steenbekkers 1993

Country Netherlands
Ages 2-12

age	sex	n	mean (cm)	sd	3rd%ile	97th%ile
2	m	81	4.5	0.3	3.9	5.0
3	m	97	4.9	0.4	4.3	5.5
4	m	85	5.1	0.3	4.5	5.6
5	m	86	5.4	0.4	4.7	6.0
6	m	98	5.7	0.3	5.1	6.4
7	m	106	5.9	0.4	5.3	6.6
8	m	96	6.2	0.4	5.5	6.8
9	m	122	6.4	0.4	5.7	7.2
10	m	134	6.7	0.4	5.8	7.4
11	m	143	6.9	0.5	6.0	7.7
12	m	78	7.1	0.5	6.3	8.1
2	f	92	4.5	0.3	3.9	5.0
3	f	86	4.8	0.3	4.2	5.4
4	f	79	5.0	0.3	4.5	5.6
5	f	94	5.4	0.3	4.7	6.1
6	f	92	5.6	0.3	5.1	6.2
7	f	93	5.9	0.3	5.4	6.6
8	f	95	6.2	0.4	5.4	6.9
9	f	122	6.4	0.4	5.5	7.1
10	f	136	6.7	0.4	6.0	7.5
11	f	151	6.9	0.5	6.1	7.9
12	f	79	7.1	0.5	6.1	8.2

Section 1.4 Static Anthropometry: Middle finger Middle finger length (distal joint to tip) 94

DEFINITION

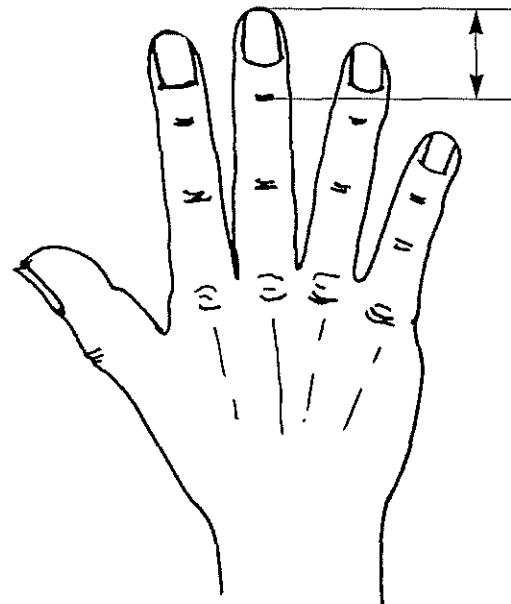
The distance from the centre of the distal (end or furthest) joint to the tip of the middle finger, measured on the back of the hand with the hand fully extended (centimetres).

APPLICATION AND SUMMARY OF THE DATA

See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and the validity of USA data for use with the current UK population. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different postures or the compression of soft tissue (eg forcing the finger through an aperture).

SEE ALSO

Middle finger length, middle finger length (middle joint to distal joint), middle finger length (knuckle to middle joint, hand clenched)



NUMBER OF SOURCES: 1

source	reference	country	age
1	Owings 1977	US	2-10

Section 1.4

Static Anthropometry: Middle finger

Middle finger length (distal joint to tip)

94

source 1 of 1

Owings 1977

Country USA
Ages 2-10

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2.5-3.5	mf	31	1.3	0.2	0.9	1.5
3.5-4.5	mf	44	1.4	0.2	1.0	1.6
4.5-5.5	mf	44	1.4	0.2	1.1	1.8
5.5-6.5	mf	49	1.5	0.2	1.0	1.8
6.5-7.5	mf	46	1.6	0.2	1.2	1.8
7.5-8.5	mf	52	1.6	0.3	1.1	2.0
8.5-9.5	mf	42	1.7	0.2	1.1	2.0
9.5-10.5	mf	45	1.9	0.2	1.4	2.3

Section 1.4 Static Anthropometry: Middle finger **Middle finger length** (middle joint to distal joint) 95

DEFINITION

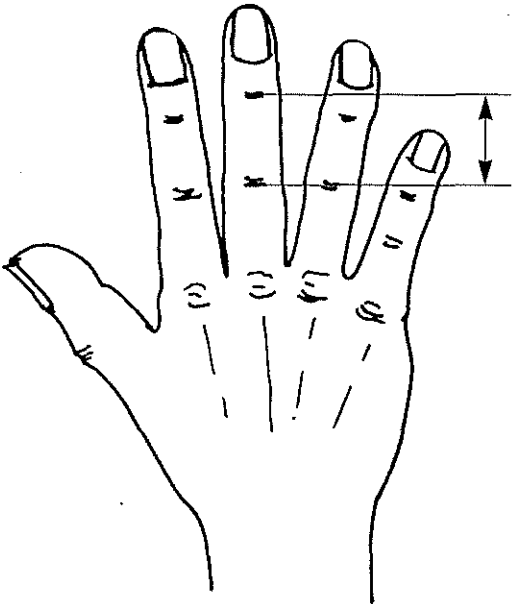
The distance from the centre of the middle joint to the centre of the distal (end or furthest) joint of the middle finger, measured on the back of the hand with the hand fully extended (centimetres).

APPLICATION AND SUMMARY OF THE DATA

See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and the validity of USA data for use with the current UK population. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different postures or the compression of soft tissue (eg forcing the finger through an aperture).

SEE ALSO

Middle finger length (distal joint to tip), middle finger length, middle finger length (knuckle to middle joint, hand clenched)



NUMBER OF SOURCES: 1

source	reference	country	age
1	Owings 1977	US	2-10

Section 1.4 Static Anthropometry: Middle finger **Middle finger length** (middle joint to distal joint) **95**

source 1 of 1

Owings 1977

Country USA
Ages 2-10

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2.5-3.5	mf	31	1.6	0.6	1.2	2.0
3.5-4.5	mf	45	1.7	0.2	1.3	2.0
4.5-5.5	mf	43	1.8	0.2	1.3	2.1
5.5-6.5	mf	49	1.8	0.3	1.1	2.3
6.5-7.5	mf	46	1.9	0.3	1.4	2.3
7.5-8.5	mf	52	2.0	0.3	1.6	2.3
8.5-9.5	mf	42	2.1	0.3	1.5	2.4
9.5-10.5	mf	44	2.1	0.3	1.5	2.6

Section 1.4 Static Anthropometry: Middle finger Middle finger length (knuckle to middle joint, hand clenched) 96

DEFINITION

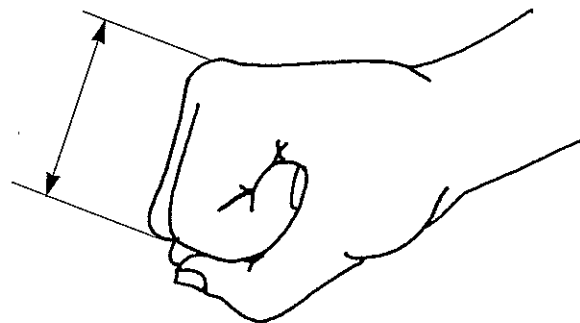
The subject makes a fist with the right hand and the maximum distance from the furthest edge of the middle joint to the furthest edge of the largest knuckle of the middle finger is measured (centimetres).

APPLICATION AND SUMMARY OF THE DATA

See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and the validity of USA data for use with the current UK population. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different postures or the compression of soft tissue (eg forcing the hand through an aperture).

SEE ALSO

Middle finger length, middle finger length (distal joint to tip), middle finger length (middle joint to distal joint), fist depth.



NUMBER OF SOURCES: 1

source	reference	country	age
1	Owings 1977	US	2-10

Section 1.4 Static Anthropometry: Middle finger Middle finger length (knuckle to middle joint, hand clenched) 96

source 1 of 1

Owings 1977

Country USA
Ages 2-10

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2.5-3.5	mf	31	3.7	0.3	2.9	4.1
3.5-4.5	mf	45	3.9	0.3	3.5	4.3
4.5-5.5	mf	44	4.2	0.3	3.7	4.6
5.5-6.5	mf	49	4.4	0.2	3.9	4.7
6.5-7.5	mf	46	4.5	0.3	4.0	4.9
7.5-8.5	mf	51	4.7	0.3	4.1	5.2
8.5-9.5	mf	42	5.0	0.3	4.5	5.3
9.5-10.5	mf	45	5.2	0.4	4.6	5.9

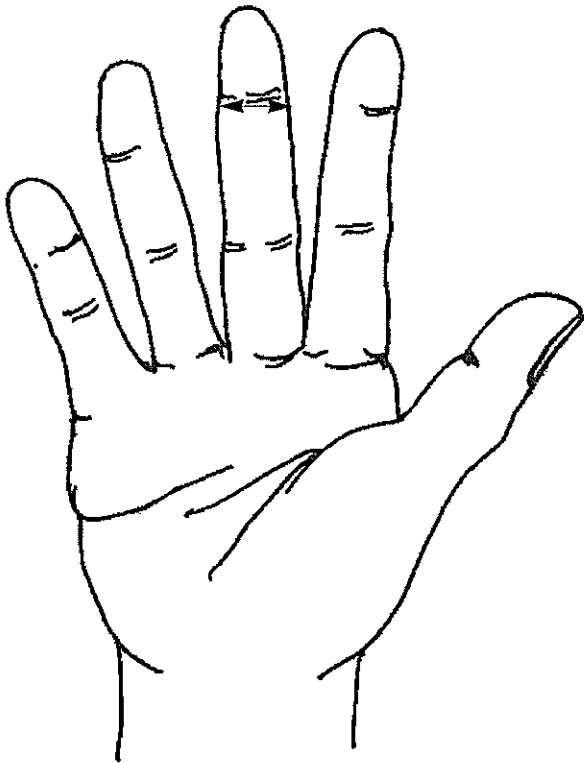
Section 1.4 Static Anthropometry: Middle finger

Middle finger breadth at distal joint 97

DEFINITION
The maximum breadth measured across the distal (end or furthest) joint of the middle finger (centimetres).

APPLICATION AND SUMMARY OF THE DATA
Two sources of data have been included to allow comparison between different countries. Of the sources, Owings (1977) is probably more appropriate for use with the current UK population. See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and choose between different sources. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different postures or the compression of soft tissue (eg forcing the finger through an aperture).

SEE ALSO
Middle finger breadth at middle joint, middle finger diameter (minimum aperture), middle finger depth at middle joint, middle finger depth at distal joint.



NUMBER OF SOURCES: 2

source	reference	country	age
1	Owings 1977	US	2-10
2	Din 1981	D	3-17

Section 1.4 Static Anthropometry: Middle finger

Middle finger breadth at distal joint 97

source 1 of 2

Owings 1977

Country USA
Ages 2-10

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2.5-3.5	mf	31	1.1	0.1	0.8	1.3
3.5-4.5	mf	45	1.1	0.1	0.9	1.2
4.5-5.5	mf	44	1.1	0.1	0.9	1.3
5.5-6.5	mf	49	1.2	0.1	1.0	1.3
6.5-7.5	mf	46	1.2	0.1	0.9	1.3
7.5-8.5	mf	51	1.2	0.1	1.0	1.4
8.5-9.5	mf	42	1.2	0.1	1.0	1.4
9.5-10.5	mf	45	1.2	0.1	1.0	1.4

source 2 of 2

Din81 1981

Country Germany
Ages 3-17

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
3	m		1.1		1.0	1.2
4	m		1.2		1.1	1.3
5	m		1.2		1.1	1.3
6	m		1.2		1.1	1.3
7	m		1.3		1.2	1.4
8	m		1.3		1.2	1.4
9	m		1.3		1.2	1.4
10	m		1.4		1.3	1.5
11	m		1.4		1.3	1.6
12	m		1.5		1.3	1.6
13	m		1.5		1.3	1.7
14	m		1.5		1.4	1.7
15	m		1.8		1.7	2.0
16-17	m		1.8		1.7	2.0
3	f		1.1		1.0	1.2
4	f		1.2		1.1	1.3
5	f		1.2		1.1	1.3
6	f		1.2		1.1	1.3
7	f		1.3		1.2	1.4
8	f		1.3		1.2	1.4
9	f		1.3		1.2	1.4
10	f		1.4		1.3	1.5
11	f		1.4		1.3	1.5
12	f		1.4		1.3	1.5
13	f		1.4		1.3	1.6
14	f		1.4		1.3	1.6
15	f		1.4		1.3	1.6
16-17	f		1.5		1.4	1.7

Section 1.4 Static Anthropometry: Middle finger Middle finger breadth at middle joint 98

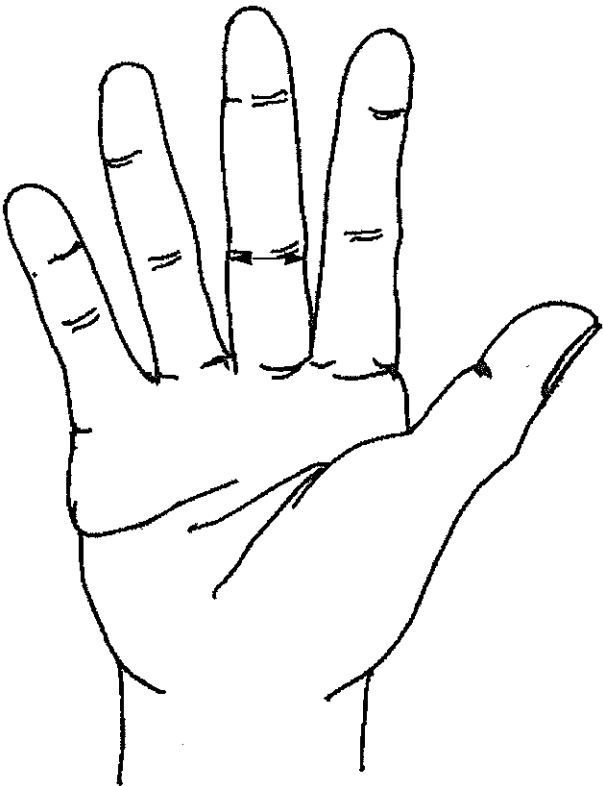
DEFINITION
The maximum breadth measured across the middle joint of the middle finger (centimetres).

APPLICATION AND SUMMARY OF THE DATA
Two sources of data have been included to allow comparison between different countries. Of the sources, Owings (1977) is probably more appropriate for use with the current UK population. See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and choose between different sources. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different postures or the compression of soft tissue (eg forcing the finger through an aperture).

SEE ALSO
Middle finger breadth at distal joint, middle finger diameter (minimum aperture), middle finger depth at middle joint, middle finger depth at distal joint.

NUMBER OF SOURCES: 2

source	reference	country	age
1	Owings 1977	US	2-10
2	Din 1981	D	3-17



Section 1.4 Static Anthropometry: Middle finger Middle finger breadth at middle joint 98

source 1 of 2

Owings 1977

Country USA
Ages 2-10

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2.5-3.5	mf	31	1.2	0.1	0.9	1.3
3.5-4.5	mf	45	1.2	0.1	1.0	1.4
4.5-5.5	mf	44	1.3	0.1	1.0	1.4
5.5-6.5	mf	48	1.3	0.1	1.1	1.4
6.5-7.5	mf	46	1.3	0.2	1.0	1.6
7.5-8.5	mf	52	1.3	0.1	1.1	1.5
8.5-9.5	mf	42	1.4	0.1	1.2	1.6
9.5-10.5	mf	45	1.4	0.1	1.2	1.6

source 2 of 2

Din 1981

Country Germany
Ages 3-17

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
3	m		1.3		1.2	1.4
4	m		1.4		1.2	1.5
5	m		1.4		1.2	1.5
6	m		1.4		1.3	1.5
7	m		1.4		1.3	1.6
8	m		1.5		1.4	1.6
9	m		1.5		1.4	1.6
10	m		1.5		1.4	1.7
11	m		1.6		1.5	1.7
12	m		1.7		1.6	1.8
13	m		1.8		1.6	2.0
14	m		1.8		1.6	2.1
15	m		2.0		1.7	2.3
16-17	m		2.0		1.8	2.3
3	f		1.3		1.2	1.4
4	f		1.4		1.2	1.5
5	f		1.4		1.2	1.5
6	f		1.4		1.3	1.5
7	f		1.4		1.3	1.6
8	f		1.5		1.4	1.6
9	f		1.5		1.4	1.6
10	f		1.5		1.4	1.7
11	f		1.6		1.4	1.7
12	f		1.6		1.5	1.7
13	f		1.6		1.5	1.7
14	f		1.7		1.5	1.8
15	f		1.7		1.5	1.9
16-17	f		1.8		1.6	2.0

Section 1.4 Static Anthropometry: Middle finger

Middle finger depth at distal joint 99

DEFINITION

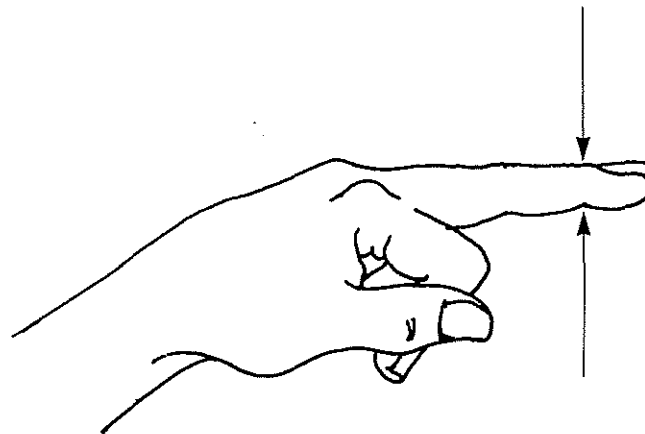
The maximum depth of the middle finger at the distal (end or furthest) joint measured from the front to the back of the finger (centimetres).

APPLICATION AND SUMMARY OF THE DATA

See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and the validity of USA data for use with the current UK population. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different postures or the compression of soft tissue (eg forcing the finger through an aperture).

SEE ALSO

Hand depth, middle finger depth at middle joint, middle finger diameter (minimum aperture), middle finger breadth at distal joint, middle finger breadth at middle joint.



NUMBER OF SOURCES: 1

source	reference	country	age
1	Owings 1977	US	2-10

Section 1.4 Static Anthropometry: Middle finger

Middle finger depth at distal joint 99

source 1 of 1

Owings 1977

Country USA
Ages 2-10

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2.5-3.5	mf	31	0.9	0.1	0.8	1.1
3.5-4.5	mf	45	1.0	0.1	0.8	1.1
4.5-5.5	mf	44	1.0	0.1	0.8	1.1
5.5-6.5	mf	49	1.0	0.1	0.8	1.2
6.5-7.5	mf	43	1.0	0.1	0.8	1.2
7.5-8.5	mf	52	1.0	0.1	0.8	1.2
8.5-9.5	mf	42	1.1	0.1	0.9	1.3
9.5-10.5	mf	45	1.1	0.1	0.9	1.3

Section 1.4 Static Anthropometry: Middle finger Middle finger depth at middle joint 100

DEFINITION

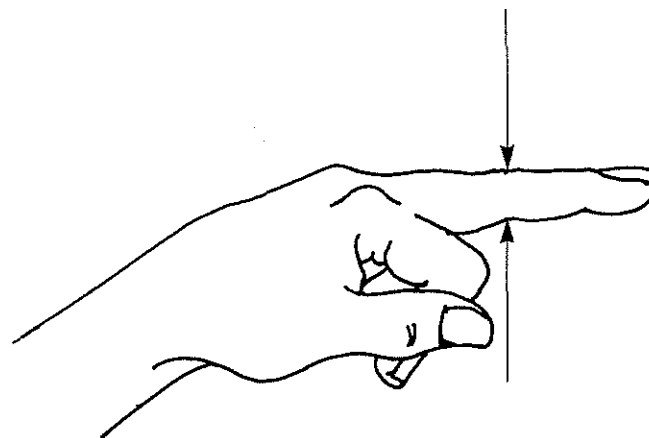
The maximum depth (millimetres) of the middle joint of the middle finger, measured from the back of the hand to the palm of the hand.

APPLICATION AND SUMMARY OF THE DATA

See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and the validity of USA data for use with the current UK population. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different postures or the compression of soft tissue (eg forcing the finger through an aperture).

SEE ALSO

Hand depth, middle finger depth at distal joint, middle finger diameter (minimum aperture), middle finger breadth at middle joint, middle finger breadth at distal joint.



NUMBER OF SOURCES: 1

source	reference	country	age
1	Owings 1977	US	2-10

Section 1.4 Static Anthropometry:Middle finger Middle finger depth at middle joint 100

source1 of 1

Owings 1977
Country USA
Ages 2-10

age	sex	n	mean (mm)	sd	5th%ile	95th%ile
2.5-3.5	mf	31	11	1	8	13
3.5-4.5	mf	45	11	1	9	13
4.5-5.5	mf	44	12	1	9	13
5.5-6.5	mf	48	12	1	10	14
6.5-7.5	mf	45	13	1	10	14
7.5-8.5	mf	51	13	1	10	16
8.5-9.5	mf	42	14	1	12	16
9.5-10.5	mf	44	14	1	12	16

Section 1.4 Static Anthropometry: Middle finger Middle finger diameter (minimum aperture) 101

DEFINITION

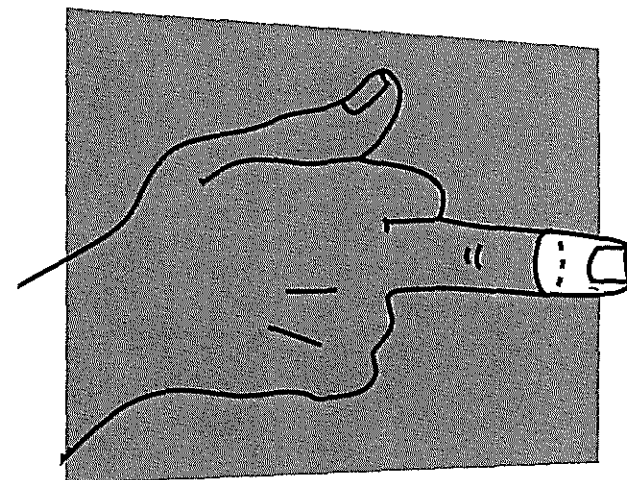
The subject extends the middle finger of the right hand. With a finger measurement board the maximum diameter through which the first (end or furthest) joint of the middle finger cannot pass is measured (millimetres).

APPLICATION AND SUMMARY OF THE DATA

See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and the validity of USA data for use with the current UK population. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different postures or the compression of soft tissue (eg forcing the finger through an aperture).

SEE ALSO

Middle finger breadth at distal joint, middle finger breadth at middle joint, middle finger depth at distal joint, middle finger depth at middle joint



NUMBER OF SOURCES: 1

source	reference	country	age
1	Snyder 1977	US	0-19

Section 1.4 Static Anthropometry: Middle finger Middle finger diameter (minimum aperture) 101

source 1 of 1

Snyder 1977

Country United States
Ages 0-19

age	sex	n	mean (mm)	sd	5th%ile	95th%ile
0-2mo	mf	31	7.20	0.60	6.30	8.10
3-5mo		43	7.60	0.60	6.30	8.30
6-8mo		29	8.30	0.70	7.50	9.00
9-11mo		27	8.90	0.70	7.60	10.00
12-15mo		29	9.00	0.60	7.90	9.70
16-19mo		28	8.80	0.60	7.90	9.50
20-23mo		31	9.10	0.80	7.90	10.10
2-3.5		77	9.90	0.60	8.70	10.80
3.5-4.5		71	10.40	0.70	9.10	11.20
4.5-5.5		93	10.80	0.80	9.50	11.70
5.5-6.5		62	11.30	0.70	9.60	12.10
6.5-7.5		63	12.00	0.90	10.30	13.50
7.5-8.5		60	12.20	0.70	11.10	13.20
8.5-9.5		79	12.60	0.70	11.20	13.40
9.5-10.5		92	12.90	0.80	11.20	14.00
10.5-11.5		99	13.20	0.90	11.40	14.30
11.5-12.5		94	13.50	0.80	11.90	14.40
12.5-13.5		106	14.00	0.90	12.00	15.10
13.5-14.5		98	14.40	1.10	12.30	16.10
14.5-15.5		95	15.00	1.10	12.70	16.50
15.5-16.5		56	15.30	1.30	12.70	17.20
16.5-17.5		80	15.10	1.40	12.20	17.00
17.5-19		46	15.80	1.50	12.90	18.00

Section 1.4 Static Anthropometry: Third finger

Third finger length 102

DEFINITION

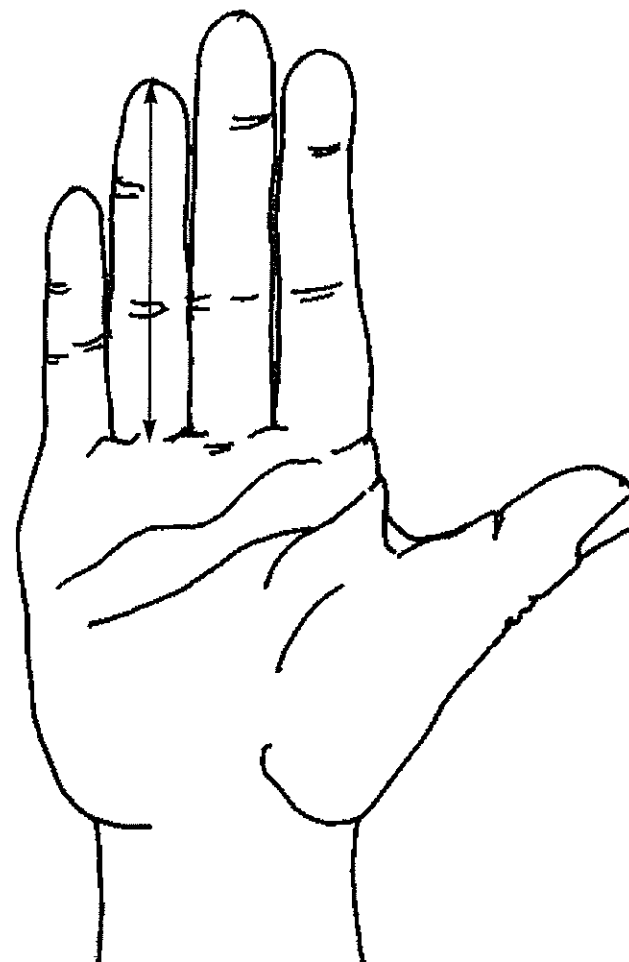
The subject extends the right hand and fingers with the palm facing up. The distance from the skin crease at the base of the third finger to the tip of the third finger parallel to the long axis of the third finger is measured (millimetres).

APPLICATION AND SUMMARY OF THE DATA

See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and the validity of German data for use with the current UK population. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different postures or the compression of soft tissue (eg forcing the finger through an aperture).

NUMBER OF SOURCES: 1

source	reference	country	age
1	DIN 1981	D	3-17



Section 1.4 Static Anthropometry: Third finger

Third finger length 102

source 1

DIN 1981

Country Germany
Ages 3-17

age	sex	n	mean (mm)	sd	5th%ile	95th%ile
3	m		45		40	49
4	m		48		42	54
5	m		51		46	55
6	m		53		46	58
7	m		55		50	61
8	m		57		52	65
9	m		60		54	66
10	m		62		57	71
11	m		64		59	71
12	m		68		60	74
13	m		72		62	79
14	m		73		66	81
15	m		75		67	83
16-17	m		76		69	84

3	f		45		40	49
4	f		48		42	54
5	f		51		46	55
6	f		53		46	58
7	f		55		50	61
8	f		57		52	65
9	f		60		54	66
10	f		62		57	71
11	f		65		58	72
12	f		70		59	73
13	f		70		63	76
14	f		71		64	80
15	f		71		64	80
16-17	f		71		65	80



Section 1.4 Static Anthropometry: Third finger

Third finger breadth at distal joint 103

DEFINITION

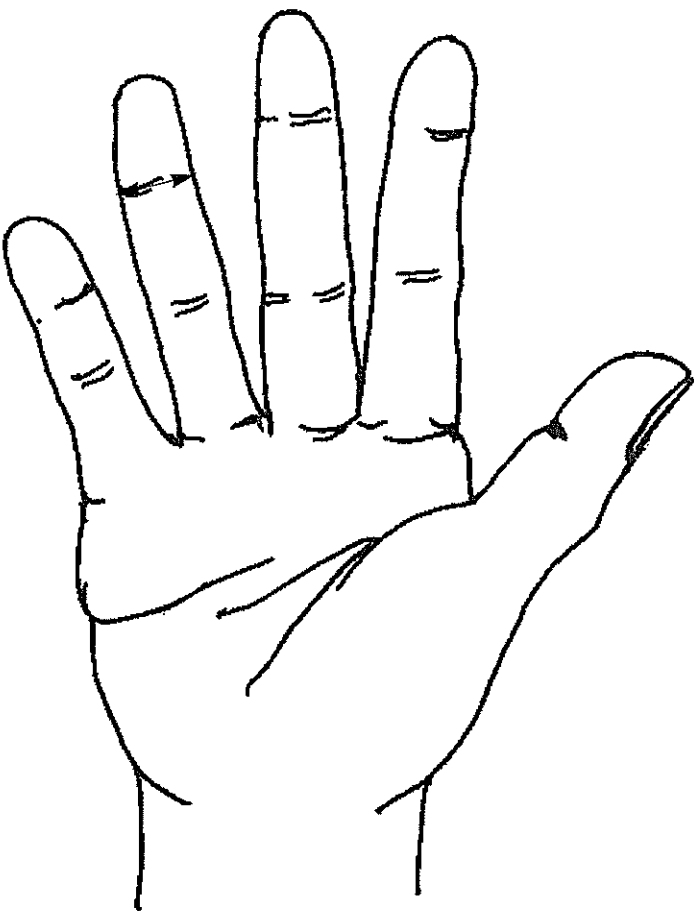
The maximum breadth measured across the distal (furthest) joint of the third finger (millimetres).

APPLICATION AND SUMMARY OF THE DATA

See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and the validity of German data for use with the current UK population. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different postures or the compression of soft tissue (eg forcing the finger through an aperture).

SEE ALSO

Third finger breadth at middle joint



NUMBER OF SOURCES: 1

source	reference	country	age
1	DIN 1981	D	3-17

Section 1.4Static Anthropometry: Third finger

Third finger breadth at distal joint 103

source 1 of 1

DIN 1981

CountryGermany
Ages3-17

age	sex	n	mean (mm)	sd	5th%ile	95th%ile
3	m		11		10	12
4	m		11		10	12
5	m		12		11	13
6	m		12		11	13
7	m		12		11	13
8	m		12		11	13
9	m		12		11	13
10	m		13		12	14
11	m		14		12	15
12	m		14		12	15
13	m		14		13	15
14	m		15		13	17
15	m		17		14	19
16-17	m		17		15	19
3	f		11		10	12
4	f		11		10	12
5	f		12		11	13
6	f		12		11	13
7	f		12		11	13
8	f		12		11	13
9	f		12		11	13
10	f		13		12	14
11	f		13		12	14
12	f		13		12	14
13	f		13		12	14
14	f		13		12	14
15	f		14		13	15
16-17	f		14		13	15

Section 1.4 Static Anthropometry: Third finger Third finger breadth at middle joint 104

DEFINITION

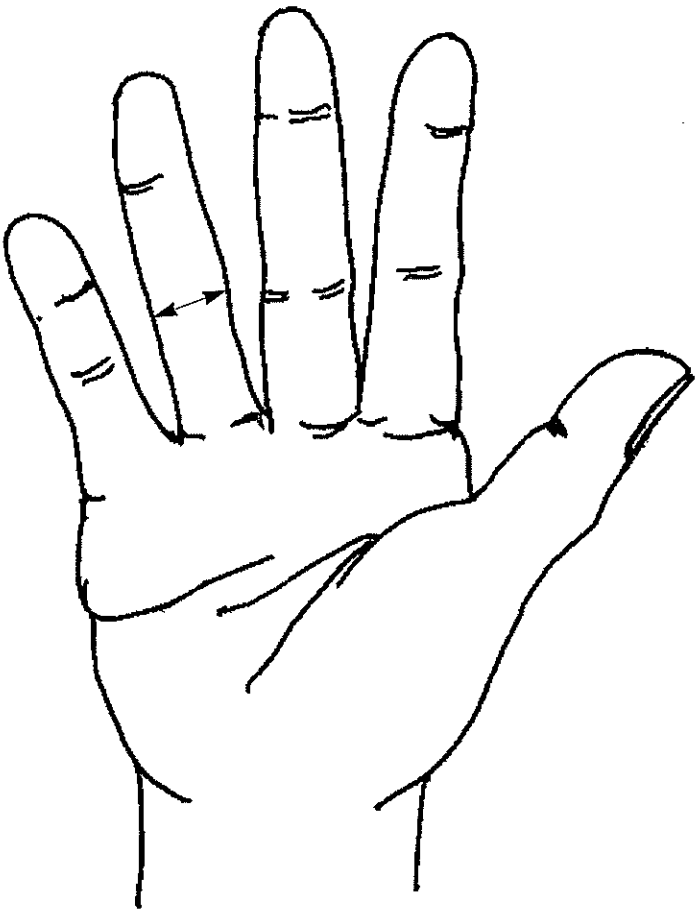
The maximum diameter measured across the middle joint of the third finger (millimetres).

APPLICATION AND SUMMARY OF THE DATA

See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and the validity of German data for use with the current UK population. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different postures or the compression of soft tissue (eg forcing the finger through an aperture).

SEE ALSO

Third finger breadth at distal joint



NUMBER OF SOURCES: 1

source	reference	country	age
1	DIN 1981	D	3-17

Section 1.4 Static Anthropometry: Third finger Third finger breadth at middle joint 104

source 1 of 1

DIN 1981

Country Germany
Ages 3-17

age	sex	n	mean (mm)	sd	5th%ile	95th%ile
3	m		12		11	13
4	m		13		12	14
5	m		13		12	14
6	m		13		12	14
7	m		13		12	14
8	m		14		13	15
9	m		14		13	15
10	m		14		13	16
11	m		15		14	17
12	m		16		14	18
13	m		16		14	18
14	m		17		15	18
15	m		17		15	18
16-17	m		19		18	21

3	f		12		11	13
4	f		13		12	14
5	f		13		12	14
6	f		13		12	14
7	f		13		12	14
8	f		14		13	15
9	f		14		13	15
10	f		14		13	16
11	f		15		13	16
12	f		15		13	16
13	f		15		14	16
14	f		16		14	17
15	f		15		14	18
16-17	f		16		14	17

Section 1.4 Static Anthropometry: Little finger

Little finger length 105

DEFINITION

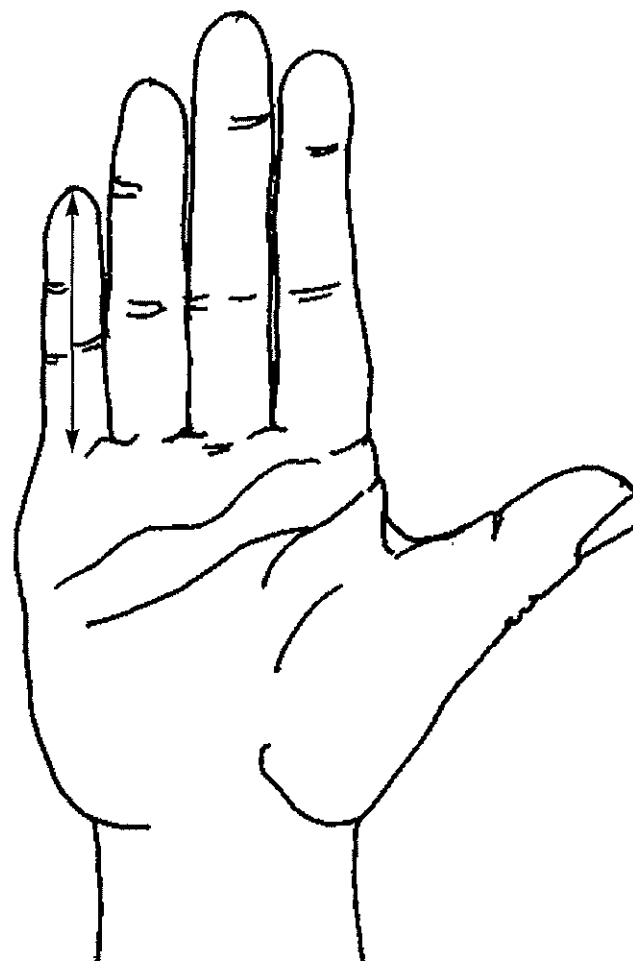
The subject extends the right hand and fingers with the palm facing up. The distance (millimetres) from the skin crease at the base of the little finger to the tip of the little finger parallel to the long axis of the little finger is measured.

APPLICATION AND SUMMARY OF THE DATA

Two sources of data have been included to allow comparison between different countries. Of the sources, Snyder (1977) is probably more appropriate for use with the current UK population. See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and choose between different sources. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different postures or the compression of soft tissue (eg forcing the finger through an aperture).

NUMBER OF SOURCES: 2

source	reference	country	age
1	Snyder 1975	US	0-13
2	DIN 1981	D	3-17



Section 1.4 Static Anthropometry: Little finger

Little finger length 105

source 1 of 2

Snyder 1975

Country USA
Ages 0-13

age	sex	n	mean (mm)	sd	5th%ile	95th%ile
0-3mo	m	76	24	4	17	35
4-6mo	m	43	28	4	23	37
7-9mo	m	24	30	5	22	40
10-12mo	m	18	29	4	22	39
13-18mo	m	30	30	3	25	34
19-24mo	m	40	31	2	25	34
2-2.5	m	34	34	5	24	41
2.5-3	m	49	34	3	27	39
3-3.5	m	131	34	3	27	40
3.5-4	m	123	35	4	28	42
4-4.5	m	173	36	3	29	42
4.5-5	m	155	36	3	29	41
5.5-6	m	126	38	3	31	44
6-6.5	m	94	39	4	31	44
6.5-7	m	76	41	3	33	47
7	m	77	41	4	33	48
8	m	135	43	4	35	50
9	m	133	45	4	37	53
10	m	107	47	4	39	53
11	m	98	49	4	42	57
12	m	55	51	4	43	57
13	m	21	53	3	47	57

continued

source 1 of 2 continued

age	sex	n	mean (mm)	sd	5th%ile	95th%ile
0-3mo	f	62	24	4	17	34
4-6mo	f	56	26	4	18	34
7-9mo	f	27	29	4	21	39
10-12mo	f	21	30	3	25	33
13-18mo	f	23	29	2	23	33
19-24mo	f	30	31	3	25	37
2-2.5	f	32	32	3	27	37
2.5-3	f	53	33	3	26	37
3-3.5	f	141	33	3	27	38
3.5-4	f	170	34	3	28	39
4-4.5	f	186	35	3	29	41
4.5-5	f	175	36	3	29	4
5.5-6	f	120	38	4	30	44
6-6.5	f	82	39	4	32	46
6.5-7	f	99	40	4	32	46
7	f	95	41	4	32	46
8	f	147	43	5	34	50
9	f	145	45	4	38	51
10	f	154	46	4	39	54
11	f	108	48	4	40	55
12	f	62	50	4	44	56
13	f	32	53	4	45	60

Section 1.4 Static Anthropometry: Little finger

Little finger length 105

source 2 of 2

DIN 1981

Country Germany
Ages 3-17

age	sex	n	mean (mm)	sd	5th%ile	95th%ile
3	m		36		32	41
4	m		38		33	41
5	m		41		36	45
6	m		43		37	48
7	m		44		38	50
8	m		45		40	53
9	m		48		42	55
10	m		50		44	59
11	m		51		45	59
12	m		53		48	60
13	m		58		49	63
14	m		60		53	67
15	m		61		53	69
16-17	m		62		55	70

3	f		36		32	41
4	f		38		33	42
5	f		41		36	45
6	f		43		37	48
7	f		44		38	50
8	f		45		40	53
9	f		48		42	55
10	f		50		44	59
11	f		51		44	58
12	f		55		46	60
13	f		55		49	61
14	f		57		51	62
15	f		59		53	64
16-17	f		58		53	65

Section 1.4 Static Anthropometry: Little finger Little finger breadth at distal joint 106

DEFINITION

The maximum diameter measured across the distal (end or furthest) joint of the little finger (centimetres).

APPLICATION AND SUMMARY OF THE DATA

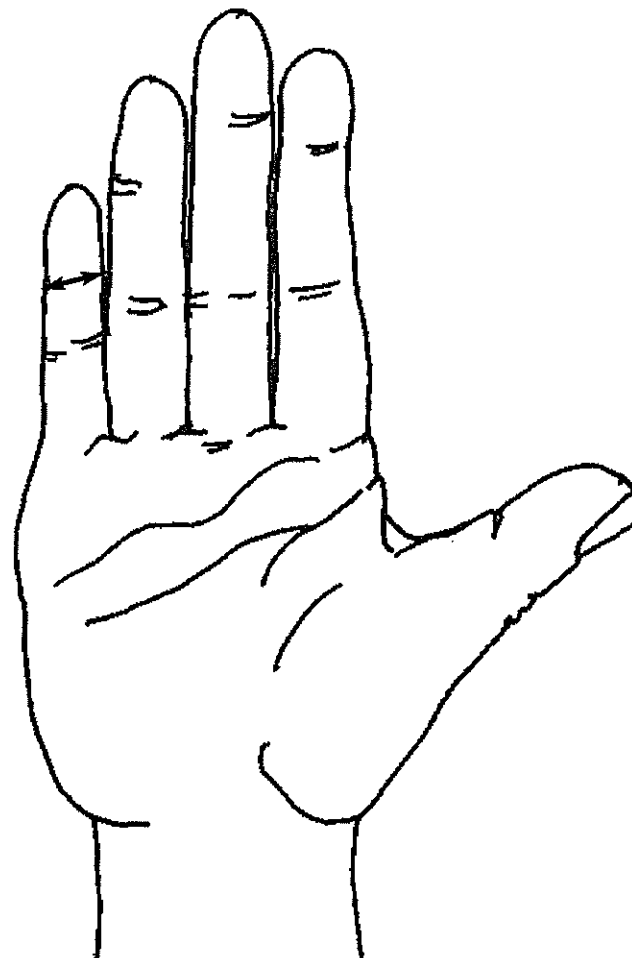
Two sources of data have been included to allow comparison between different countries. Of the sources, DIN (1981) is probably more appropriate for use with the current UK population. Steenbekkers is the most recent data on European children and Dutch children are amongst the tallest in Europe. See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and choose between different sources. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different postures or the compression of soft tissue (eg forcing the finger through an aperture).

SEE ALSO

Little finger breadth (at middle joint), little finger diameter (minimum aperture)

NUMBER OF SOURCES: 2

source	reference	country	age
1	DIN 1981	D	3-17
2	Steenbekkers 1993	NL	0-12



Section 1.4 Static Anthropometry: Little finger Little finger breadth at distal joint 106

source 1 of 2

DIN 1981

Country Germany
Ages 3-17

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
3	m		1.0		0.9	1.1
4	m		1.1		1.0	1.1
5	m		1.1		1.0	1.2
6	m		1.1		1.0	1.2
7	m		1.1		1.0	1.2
8	m		1.1		1.0	1.2
9	m		1.2		1.1	1.2
10	m		1.2		1.1	1.3
11	m		1.3		1.2	1.3
12	m		1.3		1.2	1.4
13	m		1.3		1.2	1.4
14	m		1.3		1.2	1.5
15	m		1.4		1.3	1.5
16-17	m		1.5		1.3	1.5
3	f		1.0		0.9	1.1
4	f		1.1		1.0	1.1
5	f		1.1		1.0	1.2
6	f		1.1		1.0	1.2
7	f		1.1		1.0	1.2
8	f		1.1		1.0	1.2
9	f		1.2		1.1	1.2
10	f		1.2		1.1	1.3
11	f		1.2		1.1	1.3
12	f		1.2		1.1	1.4
13	f		1.2		1.1	1.4
14	f		1.2		1.1	1.5
15	f		1.3		1.2	1.5
16-17	f		1.3		1.1	1.5

source 2 of 2

Steenbekkers 1993

Country Netherlands
Ages 0-12

age	sex	n	mean (cm)	sd	3rd%ile	97th%ile
0-2mo	m	16	0.7	0.1	0.6	0.8
3-5mo	m	21	0.7	0.1	0.6	1.0
6-8mo	m	22	0.8	0.1	0.6	0.9
9-11mo	m	13	0.8	0.0	0.7	0.8
12-14mo	m	15	0.8	0.0	0.7	0.9
2	m	81	0.9	0.1	0.8	1.0
3	m	97	1.0	0.1	0.8	1.1
4	m	85	1.0	0.1	0.9	1.1
5	m	86	1.0	0.1	0.9	1.1
6	m	98	1.0	0.1	0.9	1.2
7	m	106	1.0	0.1	0.9	1.2
8	m	96	1.1	0.1	0.9	1.2
9	m	122	1.1	0.1	1.0	1.3
10	m	134	1.1	0.1	1.0	1.3
11	m	143	1.2	0.1	1.0	1.3
12	m	78	1.2	0.1	1.0	1.4
0-2mo	f	9	0.6	0.1	0.5	0.7
3-5mo	f	20	0.7	0.1	0.5	0.8
6-8mo	f	14	0.7	0.1	0.6	0.9
9-11mo	f	16	0.7	0.1	0.6	0.9
12-14mo	f	23	0.8	0.1	0.6	0.9
2	f	92	0.9	0.1	0.7	1.1
3	f	86	0.9	0.1	0.8	1.1
4	f	79	0.9	0.1	0.8	1.0
5	f	94	1.0	0.1	0.8	1.1
6	f	92	1.0	0.1	0.9	1.1
7	f	93	1.0	0.1	0.8	1.1
8	f	95	1.0	0.1	0.9	1.2
9	f	122	1.0	0.1	0.9	1.2
10	f	136	1.1	0.1	0.9	1.2
11	f	151	1.1	0.1	1.0	1.2
12	f	79	1.1	0.1	1.0	1.3

Section 1.4 Static Anthropometry: Little finger Little finger breadth at middle joint 107

DEFINITION

The maximum breadth (millimetres) measured across the proximal (end or furthest) joint of the little finger.

APPLICATION AND SUMMARY OF THE DATA

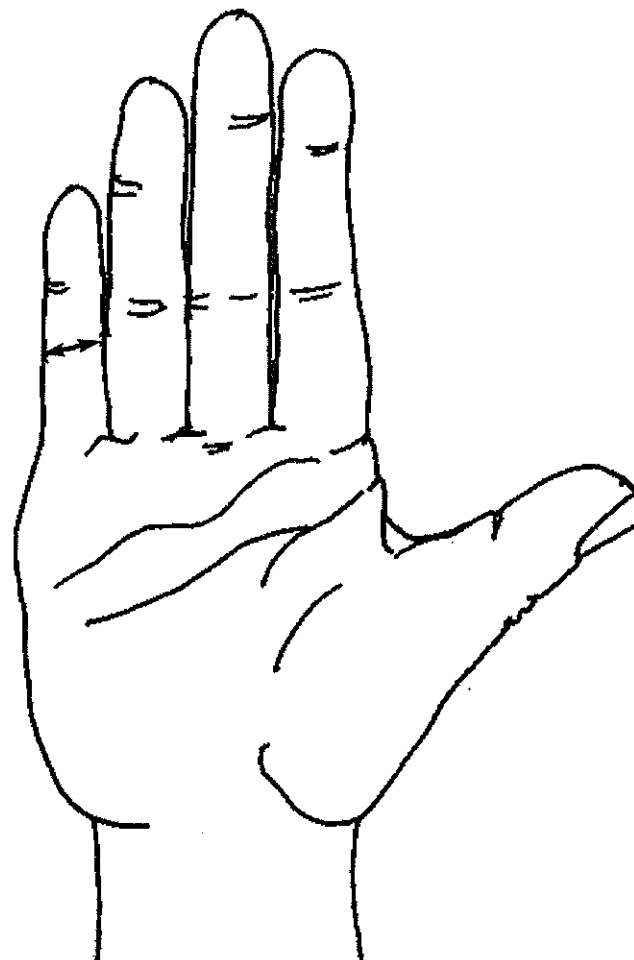
Two sources of data have been included to allow comparison between different countries. Of the sources, DIN (1981) is probably more appropriate for use with the current UK population. Steenbekkers is the most recent data on European children and Dutch children are amongst the tallest in Europe. See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and choose between different sources. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different postures or the compression of soft tissue (eg forcing the finger through an aperture).

SEE ALSO

Little finger breadth (at distal joint), little finger diameter (minimum aperture)

NUMBER OF SOURCES: 2

source	reference	country	age
1	Steenbekkers 1993	NL	0-2
2	DIN 1981	D	3-17



Section 1.4 Static Anthropometry: Little finger Little finger breadth at middle joint 107

source 1 of 2

Steenbekkers 1993

Country	NL					
Ages	0-2					
age	sex	n	mean (mm)	sd	3rd%ile	97th%ile
0-2mo	m	16	7	1	6	8
3-5	m	21	7	1	6	1
6-8	m	22	8	1	6	9
9-11	m	13	8	0	7	8
12-14	m	15	8	0	7	9
0-2mo	f	9	6	1	5	7
3-5	f	20	7	1	5	8
6-8	f	14	7	1	6	9
9-11	f	16	7	1	6	9
12-14	f	23	8	1	6	9

source 2 of 2

DIN 1981

Country	Germany					
Ages	3-17					
age	sex	n	mean (mm)	sd	5th%ile	95th%ile
3	m		10		9	11
4	m		11		10	11
5	m		11		10	12
6	m		11		10	12
7	m		11		10	12
8	m		11		10	12
9	m		12		11	12
10	m		12		11	13
11	m		13		12	13
12	m		13		12	14
13	m		13		12	14
14	m		13		12	15
15	m		14		13	15
16-17	m		15		13	15
3	f		10		9	11
4	f		11		10	11
5	f		11		10	12
6	f		11		10	12
7	f		11		10	12
8	f		11		10	12
9	f		12		11	12
10	f		12		11	13
11	f		12		11	13
12	f		12		11	14
13	f		12		11	14
14	f		12		11	15
15	f		13		12	15
16-17	f		13		11	15

Section 1.4 Static Anthropometry: Little finger

Little finger diameter 108

DEFINITION

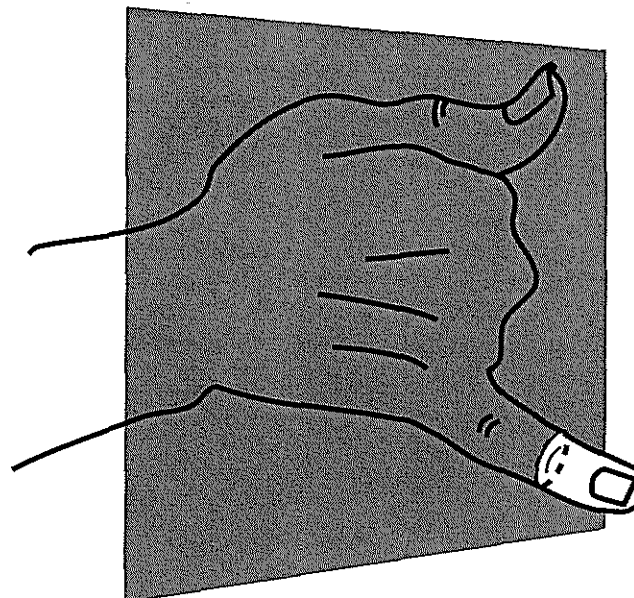
The subject extends the little finger of the right hand. With a finger measurement board the maximum diameter through which the first (end or furthest) joint of the index finger can just pass is measured. (Note that the diameter of the thumb, index and middle fingers, measurements number 87, 91 & 101 is measured as the maximum diameter hole through which the first joint cannot pass) (centimetres).

APPLICATION AND SUMMARY OF THE DATA

See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and the validity of Dutch data for use with the current UK population. Steenbekkers is the most recent data on European children and Dutch children are amongst the tallest in Europe. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different postures or the compression of soft tissue (eg forcing the finger through an aperture).

SEE ALSO

Little finger breadth (at distal joint), little finger breadth (at middle joint)



NUMBER OF SOURCES: 1

source	reference	country	age
1	Steenbekkers 1993	NL	0-14

source 1 of 1

Steenbekkers 1993

Country Netherlands
Ages 0-14 months

age	sex	n	mean (cm)	sd	3rd%ile	97th%ile
0-2mo	m	16	0.7	0.1	0.6	0.9
3-5	m	21	0.7	0.0	0.6	0.8
6-8	m	22	0.7	0.0	0.7	0.8
9-11	m	13	0.7	0.0	0.7	0.8
12-14	m	15	0.8	0.0	0.7	0.9
0-2mo	f	9	0.6	0.0	0.6	0.7
3-5	f	20	0.6	0.1	0.5	0.7
6-8	f	14	0.7	0.0	0.6	0.7
9-11	f	16	0.8	0.1	0.7	0.8
12-14	f	23	0.8	0.0	0.7	0.8

DEFINITION

The subject sits erect with thighs supported, right leg extended and foot at right angles to the leg. The distance from the most rearward part of the buttocks (against the backrest) to the sole of the right foot is measured (centimetres).

APPLICATION AND SUMMARY OF THE DATA

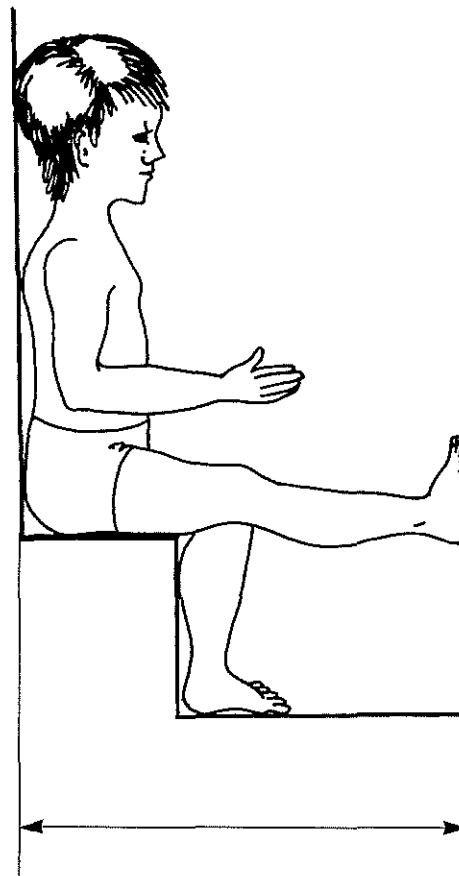
See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and the validity of Dutch data for use with the current UK population. Steenbekkers is the most recent data on European children and Dutch children are amongst the tallest in Europe. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different postures or the compression of soft tissue.

SEE ALSO

Leg length, buttock to sole (supine)

NUMBER OF SOURCES: 1

source	reference	country	age
1	Steenbekkers 1993	NL	2-12



Section 1.4 Static Anthropometry: Legs

Leg length, buttock to sole (seated) 109

source 1 of 1

Steenbekkers 1993

Country Netherlands
Ages 2-12

age	sex	n	mean (cm)	sd	3rd%ile	97th%ile
2	m	81	50.8	3.0	45.1	55.2
3	m	97	57.1	3.6	51.2	64.5
4	m	85	60.9	3.5	54.7	66.5
5	m	86	66.8	3.9	60.0	75.8
6	m	98	70.6	4.0	62.0	78.1
7	m	106	75.3	4.2	67.3	82.1
8	m	96	79.5	4.5	71.8	88.3
9	m	122	84.8	4.5	76.1	93.6
10	m	134	88.1	5.6	78.3	102.0
11	m	143	91.5	6.0	81.0	102.0
12	m	78	95.7	7.0	82.6	110.3
2	f	92	50.8	3.4	45.4	56.1
3	f	86	56.3	3.3	49.2	62.9
4	f	79	61.7	3.8	54.9	66.8
5	f	94	66.6	4.0	59.6	75.0
6	f	92	71.2	4.3	63.8	82.1
7	f	93	75.8	4.6	66.9	87.9
8	f	95	79.6	4.0	71.2	86.6
9	f	122	83.4	5.2	73.7	93.1
10	f	136	89.0	5.4	79.5	99.2
11	f	151	92.0	5.0	82.1	101.4
12	f	79	96.2	5.7	85.3	106.0

Section 1.5 Static Anthropometry: Legs

Leg length, buttock to sole (supine) 110

DEFINITION

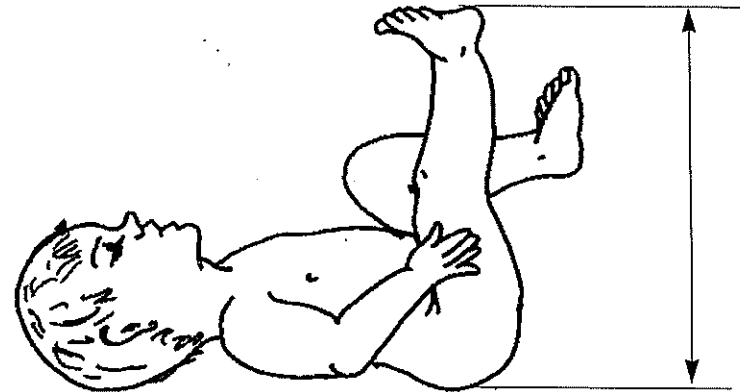
The subject lies on their left side with hips flexed 90 degrees and the right leg fully extended. The distance from the posterior (rear) surface of the right buttock to the sole of the right foot is measured (centimetres).

APPLICATION AND SUMMARY OF THE DATA

See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and the validity of USA data for use with the current UK population. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different postures or the compression of soft tissue.

SEE ALSO

Leg length, buttock to sole (seated)



NUMBER OF SOURCES: 1

source	reference	country	age
1	Snyder 1977	US	0-2

Section 1.5 Static Anthropometry: Legs Leg length, buttock to sole (supine) 110

source 1 of 1

Snyder 1977

Country United States
Ages 0-2

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
0-2mo	mf	31	23.10	1.90	19.70	26.00
3-5		42	26.80	2.40	23.40	30.30
6-8		31	29.90	2.30	25.70	33.50
9-11		27	33.80	3.70	27.60	39.70
12-15		32	35.40	2.10	32.30	39.50
16-19		29	37.50	2.90	31.50	41.50
20-23		31	40.50	3.40	35.10	45.50

Section 1.5 Static Anthropometry: Legs Upper leg length, buttock to knee (seated) 111

DEFINITION

The subject flexes the hip and knee 90 degrees. The distance from the posterior (rear) surface of the right buttock to the anterior (front) surface of the knee parallel to the long axis of the leg is measured. Infants (0-2) are measured supine (lying on their back) (centimetres).

APPLICATION AND SUMMARY OF THE DATA

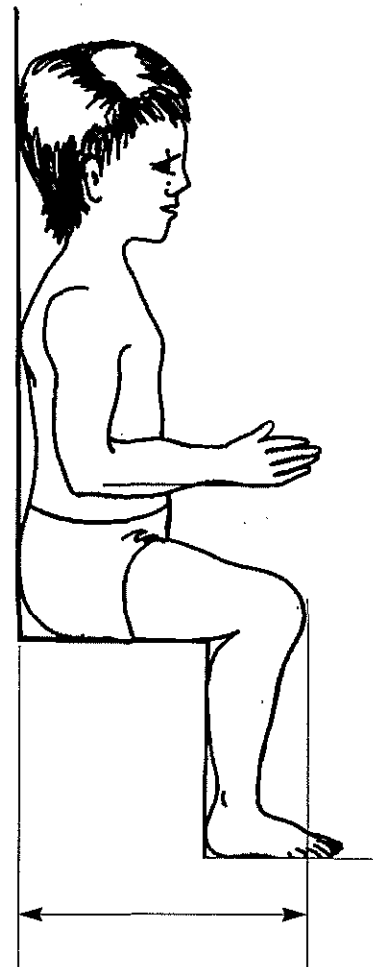
Two sources of data have been included to allow comparison between different countries. Of the sources, Pheasant (1986) is probably more appropriate for use with the current UK population. Steenbekkers is the most recent data on European children and Dutch children are amongst the tallest in Europe. See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and choose between different sources. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different postures or the compression of soft tissue.

SEE ALSO

Upper leg length buttock to popliteal (seated) upper leg length, buttock to popliteal (supine)

NUMBER OF SOURCES: 2

source	reference	country	age
1	Pheasant 1988	UK	0-18
2	Steenbekkers 1993	NL	0-12



Section 1.5 Static Anthropometry: Legs Upper leg length, buttock to knee (seated) 111

source 1 of 2

Pheasant 1988

Country United Kingdom
Ages 0-18

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
0	mf		12.5	1.0	10.5	14.0
0-6mo	mf		15.0	2.8	10.5	19.5
6-12mo	mf		18.5	1.9	15.5	21.5
12-18mo	mf		19.5	1.8	17.0	22.5
18-24mo	mf		23.0	1.8	20.0	26.0
2	m		27.5	1.9	24.5	30.5
3	m		30.0	1.9	27.0	10.5
4	m		32.5	1.9	29.5	35.5
5	m		34.5	2.1	31.0	38.0
6	m		37.0	2.5	33.0	41.0
7	m		39.5	2.4	35.5	43.5
8	m		41.5	2.5	37.5	45.5
9	m		44.0	2.6	39.5	48.5
10	m		46.0	2.7	41.5	50.5
11	m		48.0	2.8	43.5	52.5
12	m		50.0	3.2	44.5	55.5
13	m		52.5	3.5	46.5	58.5
14	m		55.0	3.4	49.5	60.5
15	m		57.0	3.2	51.5	62.5
16	m		58.0	2.9	53.0	63.0
17	m		58.5	3.0	53.5	63.5
18	m		59.0	2.6	54.5	63.5

continued

source 1 of 2 continued

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2	f		28.0	1.7	25.0	31.0
3	f		30.5	2.0	27.0	34.0
4	f		33.0	2.3	29.0	37.0
5	f		35.0	2.3	31.0	39.0
6	f		37.0	2.5	33.0	41.0
7	f		40.0	2.6	35.5	44.5
8	f		42.0	2.6	37.5	46.5
9	f		44.5	3.0	39.5	49.5
10	f		47.0	3.2	41.5	52.5
11	f		49.0	3.7	43.0	55.0
12	f		51.0	3.6	45.0	57.0
13	f		53.0	3.1	48.0	58.0
14	f		54.5	2.9	49.5	59.5
15	f		55.0	2.7	50.5	59.5
16	f		55.5	2.7	51.0	60.0
17	f		56.0	2.8	51.5	60.5
18	f		56.0	2.8	51.5	60.5

Section 1.5 Static Anthropometry: Legs Upper leg length, buttock to knee (seated) 111

source 2 of 2

Steenbekkers 1993

Country Netherlands
Ages 0-12

age	sex	n	mean (cm)	sd	3rd%ile	97th%ile
0-2mo	m	16	15.7	1.3	14.0	18.7
3-5mo	m	21	17.3	1.6	13.1	20.5
6-8mo	m	22	19.4	1.5	17.1	23.3
9-11mo	m	13	20.7	1.4	18.1	23.6
12-14mo	m	15	22.5	1.8	20.1	26.3
2	m	81	29.6	2.1	25.7	33.3
3	m	97	33.2	1.7	30.1	36.4
4	m	85	35.2	1.8	32.1	38.4
5	m	86	38.6	2.2	34.4	43.1
6	m	98	40.7	2.2	36.2	44.9
7	m	106	43.3	2.4	38.8	48.0
8	m	96	45.6	2.5	40.9	50.7
9	m	122	48.5	2.8	43.1	53.8
10	m	134	50.5	2.9	45.1	56.5
11	m	143	52.6	3.2	47.1	59.4
12	m	78	54.6	3.4	48.4	60.5

continued

source 2 of 2 continued

age	sex	n	mean (cm)	sd	3rd%ile	97th%ile
0-2mo	f	9	15.6	1.2	13.6	17.0
3-5mo	f	20	16.7	1.3	13.8	18.8
6-8mo	f	14	18.3	0.9	16.5	20.0
9-11mo	f	16	20.7	1.8	17.5	24.0
12-14mo	f	23	22.0	1.5	19.6	24.4
2	f	92	30.2	1.9	26.6	34.2
3	f	86	32.8	1.9	29.5	35.7
4	f	79	35.9	2.2	32.7	40.6
5	f	94	39.0	2.0	35.0	42.9
6	f	92	41.6	2.3	37.8	46.5
7	f	93	44.2	2.3	38.9	48.7
8	f	95	46.0	2.4	40.8	50.5
9	f	122	48.3	2.7	43.1	54.7
10	f	136	51.6	2.7	47.1	57.2
11	f	151	53.3	2.9	48.0	58.9
12	f	79	55.5	3.2	50.0	60.3

Section 1.5 Static Anthropometry: Legs

Upper leg length, buttock to popliteal (seated) 112

DEFINITION

The subject sits with hips and knees at 90 degrees. The horizontal distance between the posterior (rear) surface of the buttocks and the inferior surface of the calf at the crease of the back of the knee is measured (centimetres).

APPLICATION AND SUMMARY OF THE DATA

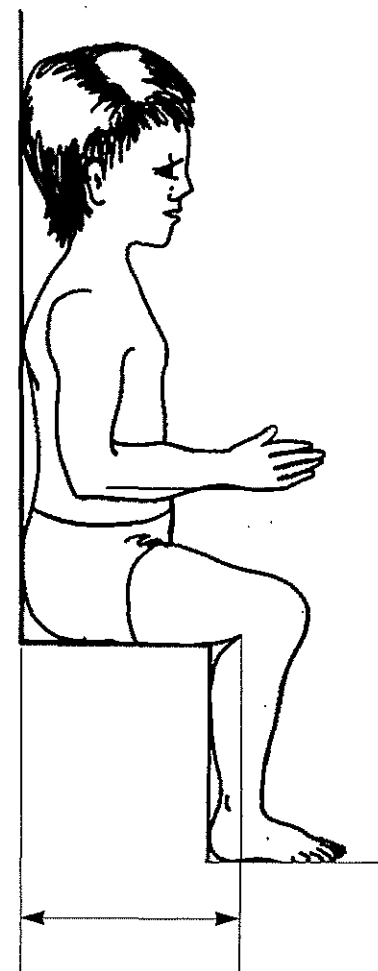
Two sources of data have been included to allow comparison between different countries. Of the sources, Pheasant (1986) is probably more appropriate for use with the current UK population. Steenbekkers is the most recent data on European children and Dutch children are amongst the tallest in Europe. See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and choose between different sources. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different postures or the compression of soft tissue.

SEE ALSO

Upper leg length buttock to knee (seated), upper leg length buttock to popliteal (supine)

NUMBER OF SOURCES: 2

source	reference	country	age
1	Pheasant 1988	UK	2-18
2	Steenbekkers 1993	NL	2-12



Section 1.5

Static Anthropometry: Legs

Upper leg length, buttock to popliteal (seated) 112

source 1 of 2

Pheasant 1988

Country United Kingdom
Ages 2-18

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2	m		23.5	1.6	21.0	26.0
3	m		25.0	1.6	22.5	33.0
4	m		26.5	1.6	24.0	29.0
5	m		28.0	1.7	25.0	31.0
6	m		30.5	2.1	27.0	34.0
7	m		32.5	2.7	28.0	37.0
8	m		34.0	2.2	30.5	37.5
9	m		36.5	2.5	32.5	40.5
10	m		38.0	2.5	34.0	42.0
11	m		39.5	3.0	34.5	44.5
12	m		41.5	2.3	37.5	45.5
13	m		43.5	3.5	37.5	49.5
14	m		46.0	3.3	40.5	51.5
15	m		48.0	3.2	42.5	53.5
16	m		49.0	3.2	43.5	54.5
17	m		49.5	3.0	44.5	54.5
18	m		50.0	2.9	45.0	55.0

continued

source 1 of 2 continued

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2	f		24.5	3.6	18.5	30.5
3	f		26.0	2.6	21.5	30.5
4	f		27.5	1.6	25.0	30.0
5	f		29.5	1.9	26.5	32.5
6	f		31.0	2.0	27.5	34.5
7	f		33.5	2.7	29.0	38.0
8	f		35.5	2.7	31.0	40.0
9	f		38.0	3.1	33.0	43.0
10	f		40.0	2.9	35.0	45.0
11	f		41.0	2.6	36.5	45.5
12	f		43.5	3.3	38.0	49.0
13	f		44.5	2.7	40.0	49.0
14	f		45.5	2.5	41.5	49.5
15	f		47.0	2.2	43.5	50.5
16	f		48.0	2.6	43.5	52.5
17	f		48.0	2.7	43.5	52.5
18	f		48.0	2.7	43.5	52.5

Section 1.5 Static Anthropometry: Legs

Upper leg length, buttock to popliteal (seated) 112

source 2 of 2

Steenbekkers 1993

Country Netherlands
Ages 2-12

age	sex	n	mean (cm)	sd	3rd%ile	97th%ile
2	m	81	24.1	1.6	21.4	27.0
3	m	97	26.7	1.6	24.1	29.9
4	m	85	28.5	1.9	25.7	32.1
5	m	86	31.5	2.1	27.8	35.6
6	m	98	33.2	2.1	28.8	36.9
7	m	106	35.4	2.2	31.3	39.5
8	m	96	37.2	2.5	32.5	42.4
9	m	122	39.8	2.5	35.0	44.9
10	m	134	41.4	2.6	36.7	46.5
11	m	143	42.9	2.6	39.1	48.4
12	m	78	44.7	2.9	38.5	50.3
2	f	92	24.6	1.8	21.0	28.7
3	f	86	26.5	1.8	22.5	29.7
4	f	79	29.2	2.0	26.3	32.8
5	f	94	32.1	2.0	28.4	35.7
6	f	92	34.2	2.2	30.5	38.5
7	f	93	36.3	2.2	32.8	41.1
8	f	95	37.6	2.2	33.9	41.8
9	f	122	39.9	2.6	35.6	45.4
10	f	136	42.5	2.6	37.9	47.3
11	f	151	43.9	2.6	39.3	48.5
12	f	79	45.6	2.5	40.6	50.0

Section 1.5 Static Anthropometry: Legs

Upper leg length, buttock to popliteal (supine) 113

DEFINITION

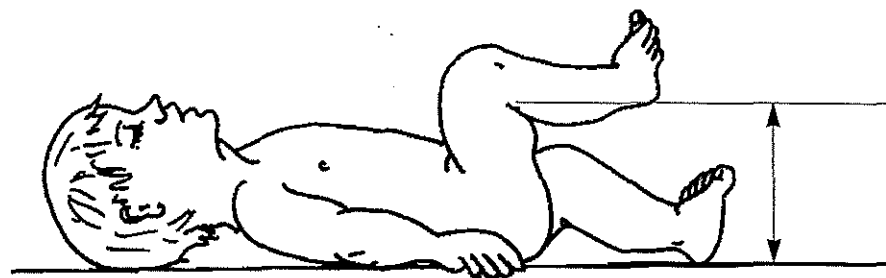
The subject lies on their back with the right leg raised and the hip and knee at 90 degrees. The distance between the posterior (rear) surface of the buttock and the posterior surface of the calf at the posterior crease of knee is measured (centimetres).

APPLICATION AND SUMMARY OF THE DATA

See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and the validity of Dutch data for use with the current UK population. Steenbekkers is the most recent data on European children and Dutch children are amongst the tallest in Europe. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different postures or the compression of soft tissue.

SEE ALSO

Upper leg length buttock to popliteal (seated), upper leg length buttock to knee (seated)



NUMBER OF SOURCES: 1

source	reference	country	age
1	Steenbekkers 1993	NL	0-14mo

Section 1.5

Static Anthropometry: Legs

Upper leg length, buttock to popliteal (supine)

113

source 1

Steenbekkers 1993

Country Netherlands
Ages 0-14 months

age	sex	n	mean (cm)	sd	3rd%ile	97th%ile
0-2mo	m	16	11.9	2.0	7.9	15.5
3-5	m	21	13.6	1.7	10.9	17.0
6-8	m	22	15.5	1.6	12.7	18.6
9-11	m	13	16.9	1.2	14.5	18.5
12-14	m	15	18.9	2.0	16.8	24.8
0-2mo	f	9	12.3	1.9	10.3	15.6
3-5	f	20	13.7	1.5	11.2	16.3
6-8	f	14	14.3	1.2	12.3	15.7
9-11	f	16	16.7	2.5	11.5	20.4
12-14	f	23	18.5	1.7	15.5	22.1

DEFINITION

The subject sits erect with knees together and at 90 degrees. The maximum breadth across the thighs parallel to the seated surface is measured.

APPLICATION AND SUMMARY OF THE DATA

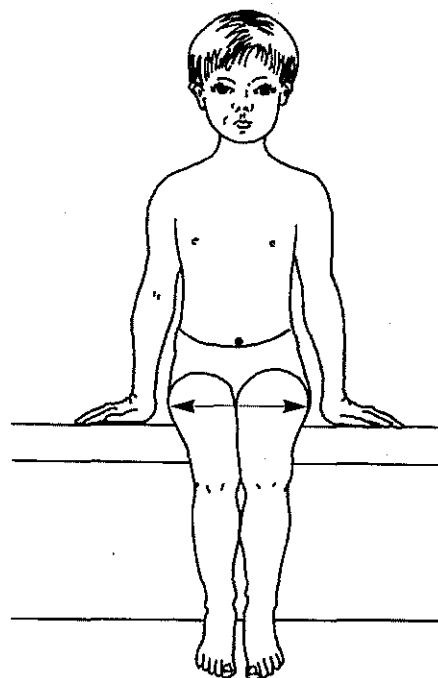
See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and the validity of USA data for use with the current UK population. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different postures or the compression of soft tissue.

SEE ALSO

Hip breadth (maximum when seated)

NUMBER OF SOURCES: 1

source	reference	country	age
1	Snyder 1977	US	2-19



Section 1.5

Static Anthropometry: Legs

Thigh breadth (maximum when seated) 114

source 1 of 1

Snyder 1977

Country United States
Ages 2-19

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2-3.5	mf	210	19.10	1.30	17.10	21.30
3.5-4.5		225	19.90	1.30	17.80	21.90
4.5-5.5		257	20.70	1.30	18.60	23.00
5.5-6.5		214	21.50	1.60	19.10	23.80
6.5-7.5		225	22.70	2.10	19.80	26.60
7.5-8.5		190	23.90	2.00	21.10	28.10
8.5-9.5		249	24.90	2.30	21.60	29.20
9.5-10.5		251	26.00	2.50	22.50	29.70
10.5-11.5		276	27.20	3.00	23.20	32.80
11.5-12.5		283	28.30	3.00	23.90	33.20
12.5-13.5		311	29.90	3.10	25.10	35.00
13.5-14.5		269	31.10	2.80	26.60	35.70
14.5-15.5		259	32.70	2.90	27.70	37.10
15.5-16.5		195	33.60	2.30	29.80	38.00
16.5-17.5		220	34.20	2.60	30.50	39.30
17.5-19		156	34.60	2.50	31.10	39.10

DEFINITION

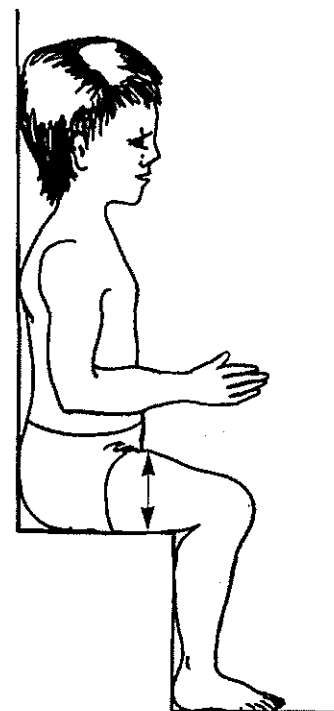
Subject sits erect with knees together degrees. The vertical distance from the sitting surface to the highest point on the superior (top) surface of the thigh at the junction abdomen and thigh is measured (centimetres).

APPLICATION AND SUMMARY OF THE DATA

Two sources of data have been included to allow comparison between different countries. Of the sources, Pheasant (1986) is probably more appropriate for use with the current UK population. Steenbekkers is the most recent data on European children and Dutch children are amongst the tallest in Europe. See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and choose between different sources. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different postures or the compression of soft tissue.

SEE ALSO

Hip depth, upper thigh depth, mid thigh depth (supine in infants)

**NUMBER OF SOURCES: 2**

source	reference	country	age
1	Pheasant 1988	UK	2-18
2	Steenbekkers 1993	NL	2-12

Section 1.5Static Anthropometry: Legs

Thigh depth (clearance when seated) 115

source 1 of 2

Pheasant 1988

CountryUnited Kingdom

Ages2-19

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2	m		8.0	1.0	6.5	9.5
3	m		8.5	1.1	6.5	18.5
4	m		9.0	1.2	7.0	11.0
5	m		9.0	1.0	7.5	10.5
6	m		9.5	1.3	7.5	11.5
7	m		10.5	1.3	8.5	12.5
8	m		11.0	1.4	8.5	13.5
9	m		11.5	1.5	9.0	14.0
10	m		12.0	1.3	10.0	14.0
11	m		12.0	1.1	10.0	14.0
12	m		12.5	1.3	10.5	14.5
13	m		13.0	1.5	10.5	15.5
14	m		14.0	1.6	11.5	16.5
15	m		14.0	1.5	11.5	16.5
16	m		15.0	1.5	12.5	17.5
17	m		15.5	1.7	12.5	18.5
18	m		16.0	1.5	13.5	18.5

continued

source 1 of 2 continued

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2	f		7.5	1.0	6.0	9.
3	f		8.0	1.2	6.0	10.0
4	f		8.5	1.4	6.0	11.0
5	f		9.0	1.2	7.0	11.0
6	f		9.5	1.1	7.5	11.5
7	f		10.5	1.3	8.5	12.5
8	f		11.0	1.3	9.0	13.0
9	f		11.5	1.5	9.0	14.0
10	f		12.0	1.6	9.5	14.5
11	f		12.5	1.6	10.0	15.0
12	f		13.0	1.7	10.0	16.0
13	f		13.5	1.5	11.0	16.0
14	f		14.0	1.4	11.5	16.5
15	f		14.0	1.4	11.5	16.5
16	f		14.5	1.4	12.0	17.0
17	f		14.5	1.6	12.0	17.0
18	f		14.5	1.4	12.0	17.0

Datasheet 115

Section 1.5 Static Anthropometry: Legs

Thigh depth (clearance when seated) 115

source 2 of 2

Steenbekkers 1993

Country Netherlands
Ages 2-12

age	sex	n	mean (cm)	sd	3rd%ile	97th%ile
2	m	81	7.6	0.7	6.0	8.9
3	m	97	7.9	0.8	6.0	9.2
4	m	85	8.0	0.8	6.7	9.6
5	m	86	8.4	0.8	6.9	10.3
6	m	98	8.7	0.9	7.1	10.7
7	m	106	9.3	1.0	7.8	11.4
8	m	96	9.7	1.0	8.0	11.8
9	m	122	10.3	0.9	8.9	12.2
10	m	134	10.9	1.2	8.7	13.8
11	m	143	11.3	1.3	9.6	14.3
12	m	78	11.3	1.0	9.2	13.4
2	f	92	7.7	0.7	6.5	9.0
3	f	86	7.9	0.7	6.7	9.3
4	f	79	8.1	0.8	6.5	9.6
5	f	94	8.6	0.9	7.1	10.7
6	f	92	9.2	0.8	7.8	10.7
7	f	93	9.8	1.0	8.0	12.1
8	f	95	10.1	0.9	8.3	12.3
9	f	122	10.5	1.2	8.5	13.1
10	f	136	11.5	1.3	8.9	14.5
11	f	151	11.6	1.3	9.4	14.2
12	f	79	12.0	1.4	9.6	14.5

DEFINITION

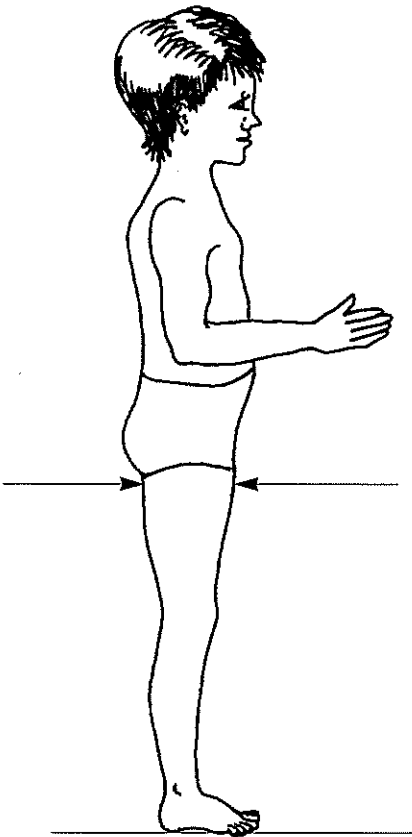
The subject stands erect, with feet together, weight evenly distributed. The horizontal depth (anterior-posterior or front to back) of the right thigh at the level of the gluteal furrow (the lowest curve of the bottom) is measured (centimetres).

APPLICATION AND SUMMARY OF THE DATA

See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and the validity of USA data for use with the current UK population. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different postures or the compression of soft tissue.

SEE ALSO

Hip depth, thigh depth (clearance when seated), mid thigh depth (supine in infants)



NUMBER OF SOURCES: 1

source	reference	country	age
1	Snyder 1977	US	2-19

source 1 of 1

Snyder 1977

Country United States
Ages 2-19

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2-3.5	mf	62	8.50	0.90	6.90	9.90
3.5-4.5		75	9.20	1.10	7.40	11.30
4.5-5.5		90	9.60	1.10	7.60	11.00
5.5-6.5		76	10.20	1.40	8.10	12.40
6.5-7.5		86	10.90	1.60	8.60	13.80
7.5-8.5		67	11.90	1.90	9.60	14.10
8.5-9.5		89	12.40	1.90	9.20	15.50
9.5-10.5		81	12.80	2.40	9.20	16.90
10.5-11.5		85	13.10	2.20	10.10	16.50
11.5-12.5		95	13.70	2.10	10.60	17.60
12.5-13.5		105	14.40	1.90	11.10	17.50
13.5-14.5		86	15.10	1.90	11.60	18.40
14.5-15.5		79	15.40	2.10	12.00	18.50
15.5-16.5		76	15.60	1.80	12.70	19.20
16.5-17.5		66	16.20	1.80	13.50	19.20
17.5-19		62	16.80	2.20	13.30	20.00

DEFINITION

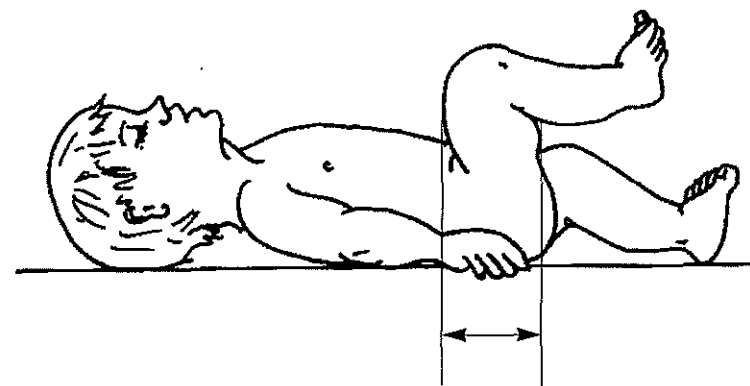
The subject lies on their back with knee and hip at right angles. The depth (anterior-posterior or front to back) of the right leg midway between the abdomen-thigh crease and the knee is measured (centimetres).

APPLICATION AND SUMMARY OF THE DATA

Two sources of data have been included to allow comparison between different countries. Of the sources, Snyder (1977) is probably more appropriate for use with the current UK population. Steenbekkers is the most recent data on European children and Dutch children are amongst the tallest in Europe. See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and choose between different sources. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different postures or the compression of soft tissue.

SEE ALSO

Upper thigh depth, thigh depth (clearance when seated)



NUMBER OF SOURCES: 2

source	reference	country	age
1	Snyder 1977	US	0-2
2	Steenbekkers 1993	NL	0-14mo

Section 1.5 Static Anthropometry: Legs

Mid thigh depth (supine in infant) 117

source 1 of 2

Snyder 1977

Country United States
Ages 0-2

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
0-2mo	mf	27	5.20	0.70	3.90	6.20
3-5		45	5.90	0.90	4.30	7.40
6-8		31	6.20	0.90	4.90	7.30
9-11		27	6.90	0.90	4.70	8.20
12-15		32	7.00	1.00	5.20	8.40
16-19		29	7.00	0.90	5.40	8.50
20-23		30	7.20	1.00	4.90	8.60

source 2 of 2

Steenbekkers 1993

Country Netherlands
Ages 0-14 months

age	sex	n	mean (cm)	sd	3rd%ile	97th%ile
0-2mo	m	16	4.9	0.9	3.7	6.8
3-5	m	21	5.8	0.9	4.2	7.3
6-8	m	22	5.8	1.0	4.2	8.1
9-11	m	13	6.0	1.0	4.5	7.4
12-14	m	15	6.7	1.0	4.7	8.3
0-2mo	f	9	4.7	1.2	3.1	6.6
3-5	f	20	5.0	0.9	3.5	6.7
6-8	f	14	6.2	1.0	4.7	8.0
9-11	f	16	6.6	1.0	5.2	8.8
12-14	f	23	6.4	1.2	4.7	9.2

Section 1.5 Static Anthropometry: Legs

Upper thigh circumference 118

DEFINITION

Subject stands erect, with feet together, weight evenly distributed. The horizontal circumference (centimetres) of the right thigh at the level of the crotch or of the gluteal furrow (lowest curve of the bottom) is measured.

APPLICATION AND SUMMARY OF THE DATA

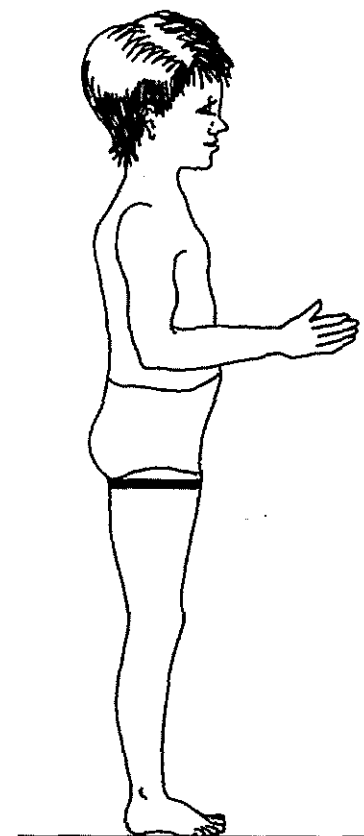
Two sources of data have been included to allow comparison between different countries. Of the sources, BSI (1990) is probably more appropriate for use with the current UK population. See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and choose between different sources. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different postures or the compression of soft tissue.

SEE ALSO

Mid thigh circumference (supine in infants)

NUMBER OF SOURCES: 2

source	reference	country	age
1	BSI 1990	UK	0-16
2	Snyder 1977	US	2-19



Section 1.5Static Anthropometry: Legs

Upper thigh circumference 118

source 1 of 2

BSI 1990

CountryUnited Kingdom

Ages0-16

Thigh circumference measured at the level of the crotch.

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
0-3mo	mf	163	19.88	2.80	15.6	24.5
3-6mo	mf	90	25.17	2.58	21.1	29.3
6-9mo	mf	82	26.62	2.57	23.2	31.0
9-12mo	mf	81	27.11	2.07	24.0	30.8
12-15mo	mf	99	27.85	2.07	24.0	31.0
15-18mo	mf	90	28.53	1.99	25.5	32.1
18-21mo	mf	87	29.10	2.42	25.1	33.0
21-24mo	mf	98	29.12	2.49	25.4	33.1
2-2.5	mf	164	29.07	2.41	25.6	33.4
2.5-3	mf	139	30.38	2.57	26.5	34.5
3	mf	342	31.97	2.92	27.4	36.7
4	mf	369	33.39	2.82	29.0	38.3
5	m	251	32.16	2.77	28.0	36.5
6	m	346	33.39	3.07	29.0	39.1
7	m	327	35.34	3.35	30.0	40.6
8	m	330	36.41	3.73	31.0	43.3
9	m	328	38.67	4.40	32.1	46.6
10	m	354	39.92	4.28	33.8	47.9
11	m	301	41.55	4.84	34.6	49.9
12	m	335	43.24	4.32	37.0	51.0
13	m	299	44.73	5.15	37.3	52.3
14	m	269	46.23	4.73	39.0	53.9
15	m	277	47.62	4.91	40.0	56.1
16	m	84	47.76	4.20	40.7	54.0

continued

source 1 of 2continued

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
5	f	365	35.25	3.21	30.3	41.3
6	f	358	36.67	3.29	32.0	43.0
7	f	349	39.05	4.07	33.5	46.3
8	f	384	40.81	4.15	34.7	48.0
9	f	368	42.74	4.21	36.0	49.1
10	f	348	44.58	4.47	38.0	53.0
11	f	332	46.29	4.77	39.1	54.3
12	f	373	47.90	4.72	40.9	55.9
13	f	376	51.03	5.12	43.6	60.4
14	f	389	53.12	4.85	45.5	61.5
15	f	393	53.56	4.25	46.7	60.9
16	f	250	55.27	4.83	47.8	63.7

Section 1.5 Static Anthropometry: Legs

Upper thigh circumference 118

source 2 of 2

Snyder 1977

Country United States
Ages 2-19

Thigh circumference measured at the level of the gluteal furrow (the lowest curve of the bottom).

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2-3.5	mf	209	29.10	2.50	25.50	33.40
3.5-4.5		226	30.90	2.60	26.80	34.90
4.5-5.5		259	32.50	2.90	28.50	37.20
5.5-6.5		217	34.00	3.10	30.20	40.30
6.5-7.5		223	36.40	3.90	31.80	44.10
7.5-8.5		189	38.50	4.60	32.80	47.20
8.5-9.5		248	40.30	4.50	34.10	49.10
9.5-10.5		250	42.10	5.30	34.90	50.90
10.5-11.5		276	44.50	5.70	36.80	55.50
11.5-12.5		281	45.60	5.30	38.30	55.10
12.5-13.5		309	48.00	5.40	40.10	57.90
13.5-14.5		269	49.90	5.10	41.60	59.00
14.5-15.5		258	52.10	5.60	43.70	61.40
15.5-16.5		196	53.50	5.10	45.60	62.00
16.5-17.5		221	54.40	5.10	47.40	64.00
17.5-19		155	55.30	5.00	48.10	64.60

Section 1.5 Static Anthropometry: Legs Mid thigh circumference (supine in infants) 119

DEFINITION

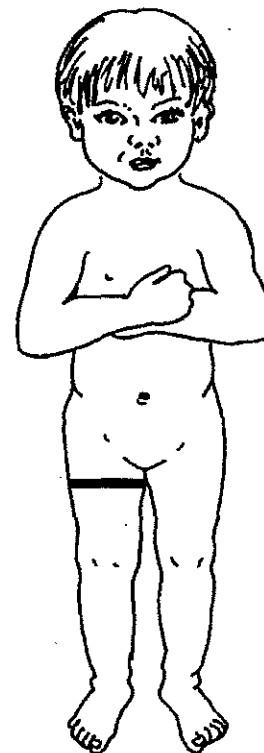
The circumference of the right leg midway between the abdomen-thigh crease and the knee is measured (centimetres).

APPLICATION AND SUMMARY OF THE DATA

See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and the validity of USA data for use with the current UK population. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different postures or the compression of soft tissue.

SEE ALSO

Upper thigh circumference, knee circumference



NUMBER OF SOURCES: 1

source	reference	country	age
1	Snyder 1977	US	0-2

Section 1.5

Static Anthropometry: Legs

Mid thigh circumference (supine in infants) 119

source 1 of 1

Snyder 1977

Country United States
Ages 0-2

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
0-2mo	mf	30	16.90	1.90	13.00	19.60
3-5		44	20.70	2.80	16.70	26.20
6-8		29	21.20	2.10	18.40	23.90
9-11		27	23.20	2.00	20.00	27.50
12-15		30	23.40	2.10	19.30	26.90
16-19		29	24.40	2.00	21.00	27.90
20-23		31	24.70	2.50	19.00	27.60

Section 1.5 Static Anthropometry: Legs

Knee height (seated) 120

DEFINITION

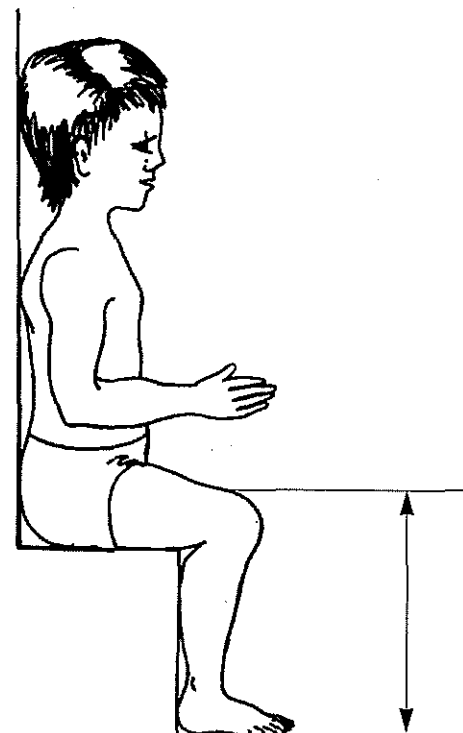
The subject sits erect with knees together and at 90 degrees. The vertical distance from the foot surface to the top of the right knee is measured just in and above the patella (knee cap) (centimetres).

APPLICATION AND SUMMARY OF THE DATA

Two sources of data have been included to allow comparison between different countries. Of the sources, Pheasant (1986) is probably more appropriate for use with the current UK population. Steenbekkers is the most recent data on European children and Dutch children are amongst the tallest in Europe. See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and choose between different sources. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different postures or the compression of soft tissue.

SEE ALSO

Lower leg length, knee to sole (supine)



NUMBER OF SOURCES: 2

source	reference	country	age
1	Pheasant 1988	UK	2-18
2	Steenbekkers 1989	NL	1-5

Section 1.5 Static Anthropometry: Legs

Knee height (seated) 120

source 1 of 2

Pheasant 1988

Country United Kingdom
Ages 2-18

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2	m		27.0	2.0	23.5	30.5
3	m		29.0	2.0	25.5	27.5
4	m		31.0	2.0	27.5	34.5
5	m		33.5	2.2	30.0	37.0
6	m		36.0	2.5	32.0	40.0
7	m		38.0	2.5	34.0	42.0
8	m		40.0	2.5	36.0	44.0
9	m		42.0	2.7	37.5	46.5
10	m		44.0	2.6	39.5	48.5
11	m		46.0	2.5	42.0	50.0
12	m		48.0	3.0	43.0	53.0
13	m		50.0	3.5	44.0	56.0
14	m		52.0	3.3	46.5	57.5
15	m		53.5	3.1	48.5	58.5
16	m		54.5	2.7	50.0	59.0
17	m		55.0	2.7	50.5	59.5
18	m		55.0	2.6	50.5	59.5

continued

source 1 of 2 *continued*

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2	f		26.0	1.7	23.0	29.0
3	f		28.5	2.0	25.0	32.0
4	f		31.0	2.3	27.0	35.0
5	f		33.0	2.1	29.5	36.5
6	f		35.5	2.1	32.0	39.0
7	f		37.5	2.3	33.5	41.5
8	f		39.5	2.4	35.5	43.5
9	f		42.0	2.7	37.5	46.5
10	f		44.0	2.8	39.5	48.5
11	f		45.5	3.0	40.5	50.5
12	f		47.0	2.9	42.0	52.0
13	f		48.5	2.7	44.0	53.0
14	f		49.5	2.7	45.0	54.0
15	f		49.5	2.6	45.0	54.0
16	f		49.5	2.6	45.0	54.0
17	f		50.0	2.6	45.5	54.5
18	f		50.0	2.6	45.5	54.5

Datasheet 120

Section 1.5 Static Anthropometry: Legs

Knee height (seated) 120

source 2 of 2

Steenbekkers 1989

Country Netherlands
Ages 1-5.5

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
1-1.5	mf	33	22.70	1.30	20.80	24.40
1.5-2		8	24.70	1.30	23.10	26.50
2-2.5		62	25.90	1.20	24.00	28.20
2.5-3		59	27.50	1.70	24.30	30.20
3-3.5		75	29.20	1.50	26.70	31.80
3.5-4		58	30.50	1.20	28.20	32.70
4-4.5		46	32.50	1.70	29.60	35.00
4.5-5		28	33.70	2.00	31.20	37.60
5-5.5		13	34.20	1.90	31.00	37.00

Section 1.5 Static Anthropometry: Legs

Popliteal height (seated) 121

DEFINITION

The subject sits with hips and knees at 90 degrees. The vertical distance from the floor to the popliteal angle (the underside of the knee where the tendon of the biceps femoris muscle inserts into the lower leg) is measured (centimetres).

APPLICATION AND SUMMARY OF THE DATA

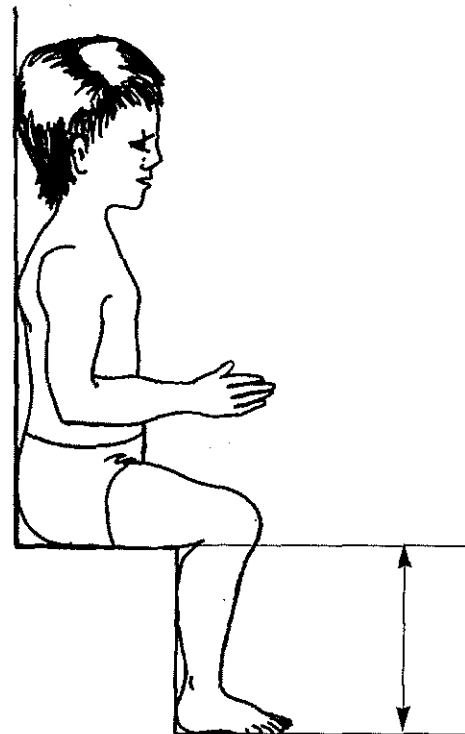
Two sources of data have been included to allow comparison between different countries. Of the sources, Pheasant (1986) is probably more appropriate for use with the current UK population. Steenbekkers is the most recent data on European children and Dutch children are amongst the tallest in Europe. See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and choose between different sources. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different postures or the compression of soft tissue.

SEE ALSO

Lower leg length, popliteal to sole (supine)

NUMBER OF SOURCES: 2

source	reference	country	age
1	Pheasant 1988	UK	2-18
2	Steenbekkers 1993	NL	2-12



Section 1.5 Static Anthropometry: Legs

Popliteal height (seated) 121

source 1 of 2

Pheasant 1988

Country United Kingdom
Ages 2-18

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2	m		20.5	2.9	15.5	25.5
3	m		23.0	2.1	19.5	32.5
4	m		25.5	1.3	23.5	27.5
5	m		27.0	1.8	24.0	30.0
6	m		29.5	2.2	26.0	33.0
7	m		31.5	1.9	28.5	34.5
8	m		32.5	1.8	29.5	35.5
9	m		34.0	2.3	30.0	38.0
10	m		36.0	1.9	33.0	39.0
11	m		37.5	2.6	33.0	42.0
12	m		39.0	2.3	35.0	43.0
13	m		40.5	3.0	35.5	45.5
14	m		42.5	2.8	38.0	47.0
15	m		43.0	2.8	38.5	47.5
16	m		44.0	2.8	39.5	48.5
17	m		44.5	2.5	40.5	48.5
18	m		44.5	2.5	40.5	48.5

continued

source 1 of 2 continued

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2	f		20.5	2.0	17.0	24.0
3	f		23.0	1.7	20.0	26.0
4	f		25.5	1.4	23.0	28.0
5	f		27.0	1.6	24.5	29.5
6	f		29.0	1.6	26.5	31.5
7	f		31.0	2.1	27.5	34.5
8	f		33.0	2.0	29.5	36.5
9	f		34.0	2.4	30.0	38.0
10	f		36.5	2.5	32.5	40.5
11	f		37.5	2.4	33.5	41.5
12	f		38.5	2.4	34.5	42.5
13	f		39.0	2.5	35.0	43.0
14	f		39.5	2.5	35.5	43.5
15	f		40.0	2.5	36.0	44.0
16	f		40.5	2.5	36.5	44.5
17	f		40.5	2.5	36.5	44.5
18	f		40.5	2.5	36.5	44.5

Section 1.5 Static Anthropometry: Legs

Popliteal height (seated) 121

source 2 of 2

Steenbekkers 1993

Country Netherlands
Ages 2-12

age	sex	n	mean (cm)	sd	3rd%ile	97th%ile
2	m	81	22.6	1.6	19.8	25.7
3	m	97	25.5	1.8	22.0	28.8
4	m	85	28.1	1.7	25.0	30.7
5	m	86	30.9	1.8	27.0	34.6
6	m	98	32.9	1.9	28.7	36.2
7	m	106	34.9	2.0	30.8	38.4
8	m	96	36.8	2.0	33.3	40.9
9	m	122	39.3	2.0	35.5	43.1
10	m	134	40.8	2.5	35.6	46.4
11	m	143	42.4	2.7	37.3	47.2
12	m	78	44.1	3.0	39.1	49.6
2	f	92	22.3	1.5	19.9	25.4
3	f	86	25.0	1.9	21.2	28.0
4	f	79	27.7	1.7	25.4	31.4
5	f	94	30.4	1.7	27.2	33.7
6	f	92	32.6	1.9	29.5	37.4
7	f	93	34.7	2.2	30.6	39.1
8	f	95	36.5	1.9	32.6	40.2
9	f	122	38.3	2.5	33.7	42.9
10	f	136	40.6	2.4	35.9	45.2
11	f	151	41.8	2.3	37.9	46.0
12	f	79	43.4	2.5	39.1	47.5

Section 1.5 Static Anthropometry: Legs

Knee breadth (seated) 122

DEFINITION

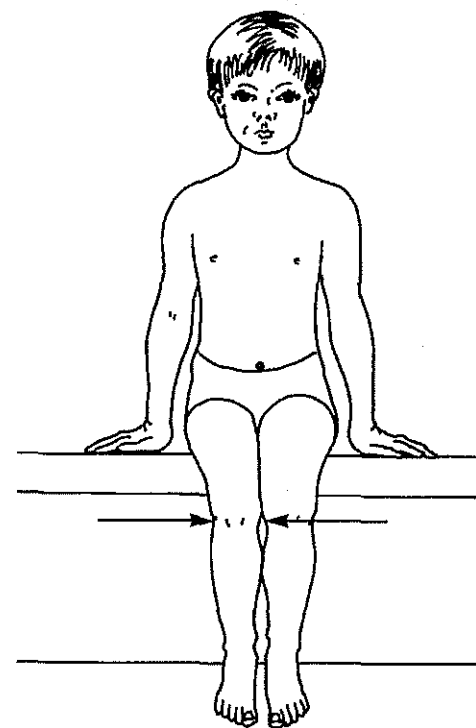
The subject sits erect with hips and knees at right angles. The distance across the right knee at the level of the condyles of the upper leg is measured (centimetres).

APPLICATION AND SUMMARY OF THE DATA

See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and the validity of Dutch data for use with the current UK population. Steenbekkers is the most recent data on European children and Dutch children are amongst the tallest in Europe. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different postures or the compression of soft tissue.

NUMBER OF SOURCES: 1

source	reference	country	age
1	Steenbekkers 1993	NL	2-12



Section 1.5 Static Anthropometry: Legs

Knee breadth (seated) 122

source 1 of 1

Steenbekkers 1993

Country Netherlands
Ages 2-12

age	sex	n	mean (cm)	sd	3rd%ile	97th%ile
2	m	81	6.3	0.4	5.6	7.1
3	m	97	6.7	0.4	6.0	7.5
4	m	85	6.8	0.4	6.0	7.4
5	m	86	7.3	0.3	6.7	8.0
6	m	98	7.4	0.3	6.7	8.1
7	m	106	7.8	0.4	7.0	8.5
8	m	96	7.9	0.4	7.2	8.7
9	m	122	8.2	0.5	7.3	9.1
10	m	134	8.4	0.5	7.4	9.3
11	m	143	8.7	0.5	7.8	9.5
12	m	78	8.8	0.5	7.9	9.6
2	f	92	6.2	0.4	5.6	7.2
3	f	86	6.4	0.4	5.5	7.1
4	f	79	6.7	0.3	6.1	7.3
5	f	94	6.9	0.4	6.3	7.7
6	f	92	7.1	0.4	6.4	7.9
7	f	93	7.4	0.4	6.7	8.2
8	f	95	7.5	0.5	6.7	8.7
9	f	122	7.8	0.5	6.8	8.7
10	f	136	8.2	0.5	7.2	9.3
11	f	151	8.2	0.5	7.2	9.2
12	f	79	8.3	0.7	6.9	9.6

DEFINITION

The subject stands erect with feet slightly apart. The circumference of the knee (centimetres) is measured at the level of the knee joint space such that the plane of the circumference is horizontal.

APPLICATION AND SUMMARY OF THE DATA

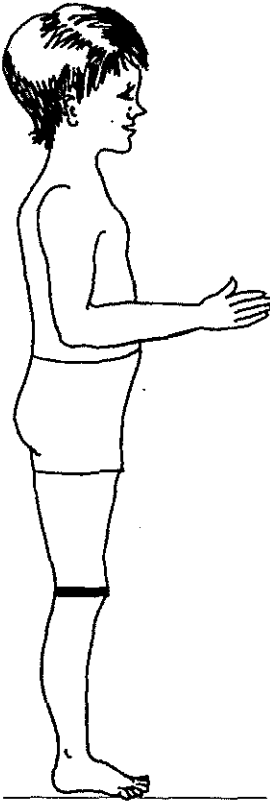
See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and the validity of these data for use with the current UK population. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different postures or the compression of soft tissue.

SEE ALSO

Mid thigh circumference (supine in infants), calf circumference.

NUMBER OF SOURCES: 1

source	reference	country	age
1	BSI 1990	UK	5-16 females only



Section 1.5 Static Anthropometry: Legs

source 1 of 1

BSI 1990

Country United Kingdom
Ages 5-16

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
5	f	35	23.79	1.97	20.8	27.6
6	f	35	24.28	1.62	21.7	26.8
7	f	36	26.14	2.69	22.6	30.5
8	f	35	26.85	2.28	23.4	30.4
9	f	36	27.73	1.98	24.3	30.3
10	f	36	29.12	2.34	25.1	32.9
11	f	33	30.19	2.57	26.3	35.0
12	f	34	31.35	2.84	26.7	35.7
13	f	36	32.19	2.47	28.2	35.6
14	f	37	33.20	3.07	27.6	37.2
15	f	40	33.32	2.26	29.0	36.8
16	f	22	34.61	2.32	29.6	37.5

Section 1.5 Static Anthropometry: Legs Lower leg length, knee to sole (supine) 124

DEFINITION

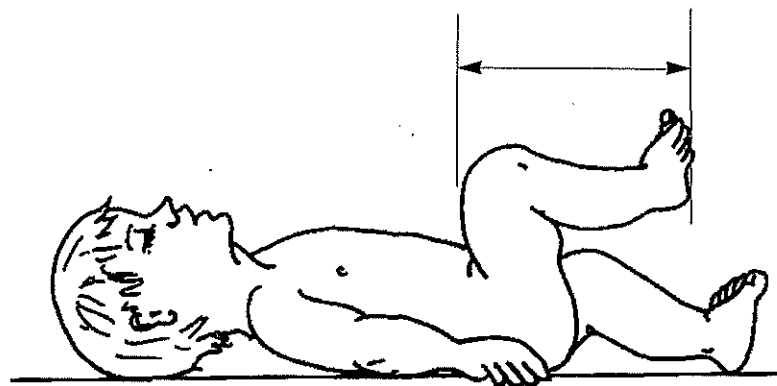
The subject lies on back with right knee flexed to 90 degrees. The distance from the superior (top) surface of the right knee to the heel of the right foot is measured (centimetres).

APPLICATION AND SUMMARY OF THE DATA

Two sources of data have been included to allow comparison between different countries. Of the sources, Snyder (1977) is probably more appropriate for use with the current UK population. Steenbekkers is the most recent data on European children and Dutch children are amongst the tallest in Europe. See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and choose between different sources. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different postures or the compression of soft tissue.

SEE ALSO

Knee height (seated), lower leg length popliteal to sole (supine)



NUMBER OF SOURCES: 2

source	reference	country	age
1	Snyder 1977	US	0-2
2	Steenbekkers 1993	NL	0-14 mo

Section 1.5 Static Anthropometry: Legs Lower leg length, knee to sole (supine) 124

source 1 of 2

Snyder 1977

Country	United States					
Ages	0-2					
age	sex	n	mean (cm)	sd	5th%ile	95th%ile
0	mf		13.5	0.7	12.0	14.5
0-6mo			16.0	1.9	12.5	19.0
6-12			19.0	1.3	17.0	21.0
12-18			19.5	1.2	17.5	21.5
18-24			23.0	1.3	21.0	25.5

source 2 of 2

Steenbekkers 1993

Country	Netherlands					
Ages	0- 14 months					
age	sex	n	mean (cm)	sd	3rd%ile	97th%ile
0-2mo	m	16	15.3	0.9	13.6	17.2
3-5	m	21	16.9	1.1	15.3	19.2
6-8	m	22	18.0	0.8	16.5	19.8
9-11	m	13	19.5	0.8	17.8	21.0
12-14	m	15	20.5	1.1	18.7	22.1
0-2mo	f	9	14.6	1.3	12.9	16.4
3-5	f	20	15.7	0.6	14.8	16.7
6-8	f	14	17.6	0.8	16.3	19.2
9-11	f	16	18.9	1.1	17.3	21.2
12-14	f	23	20.2	1.0	17.8	21.5

Section 1.5 Static Anthropometry: Legs Lower leg length, popliteal to sole (supine) 125

DEFINITION

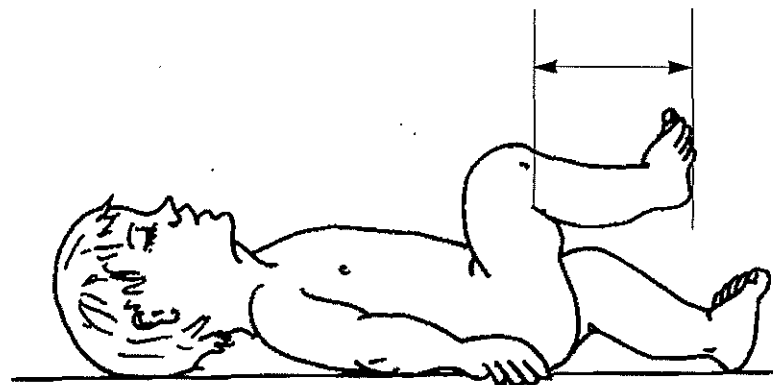
The subject lies on their back with the right leg raised and the hip and knee at 90 degrees. The distance between the sole of the foot and the inferior (underside) surface of the thigh at the posterior (rear) crease of the knee is measured (centimetres).

APPLICATION AND SUMMARY OF THE DATA

See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and the validity of Dutch data for use with the current UK population. Steenbekkers is the most recent data on European children and Dutch children are amongst the tallest in Europe. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different postures or the compression of soft tissue.

SEE ALSO

Popliteal height (seated), lower leg length knee to sole (supine)



NUMBER OF SOURCES: 1

source	reference	country	age
1	Steenbekkers 1993	NL	0-14mo

Section 1.5 Static Anthropometry:Legs Lower leg length, popliteal to sole (supine) 125

source 1 of 1

Steenbekkers 1993

Country Netherlands
Ages 0-14months

age	sex	n	mean (cm)	sd	3rd%ile	97th%ile
0-2mo	m	16	11.4	1.2	8.3	12.8
3-5	m	21	12.2	1.2	8.8	14.1
6-8	m	22	13.5	0.9	12.0	15.4
9-11	m	13	14.5	1.0	12.8	16.3
12-14	m	15	15.8	1.5	13.7	19.3
0-2mo	f	9	10.7	1.1	8.7	11.9
3-5	f	20	12.2	1.0	10.6	14.6
6-8	f	14	13.3	1.6	11.1	16.4
9-11	f	16	14.5	1.0	12.6	16.6
12-14	f	23	15.6	0.9	13.8	17.4

DEFINITION

The subject stands erect with feet together and weight evenly distributed. The vertical distance from the standing surface to the right calf at the level of the calf circumference measurement (the maximum calf circumference) is measured (centimetres).

APPLICATION AND SUMMARY OF THE DATA

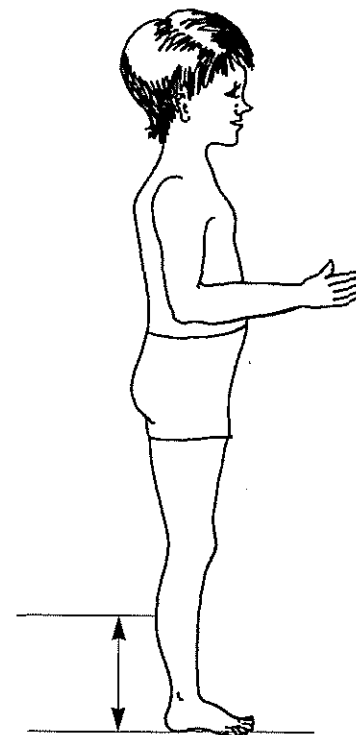
See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and the validity of USA data for use with the current UK population. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different postures or the compression of soft tissue.

SEE ALSO

Calf circumference

NUMBER OF SOURCES: 1

source	reference	country	age
1	Snyder 1977	US	2-19



Section 1.5Static Anthropometry: Legs

Calf height (at maximum circumference)126

source 1 of 1

Snyder 1977

CountryUnited States
Ages2-19

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2-3.5	mf	65	16.80	1.90	13.50	19.70
3.5-4.5	mf	77	18.60	1.90	14.90	21.50
4.5-5.5	mf	92	20.20	2.00	16.60	23.30
5.5-6.5	mf	79	21.90	2.10	18.40	25.40
6.5-7.5	mf	87	23.40	2.20	19.60	26.40
7.5-8.5	mf	68	25.20	2.10	21.20	27.70
8.5-9.5	mf	91	27.30	2.30	23.90	31.50
9.5-10.5	mf	85	27.80	2.60	22.60	32.10
10.5-11.5	mf	86	29.50	2.60	25.60	33.70
11.5-12.5	mf	97	31.40	2.70	27.60	35.40
12.5-13.5	mf	108	31.70	2.90	26.40	36.10
13.5-14.5	mf	89	32.90	3.50	25.60	37.50
14.5-15.5	mf	81	34.20	3.30	28.10	40.10
15.5-16.5	mf	79	34.00	3.40	26.50	39.00
16.5-17.5	mf	67	34.50	3.50	26.70	39.10
17.5-19	mf	63	35.40	4.10	28.30	41.60

DEFINITION

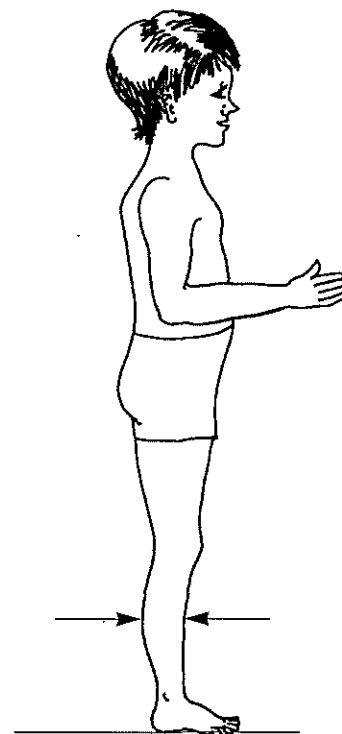
The subject stands erect with feet together, weight evenly distributed. The horizontal depth (anterior-posterior or front to back) of the right calf at the level of the maximum circumference measured (centimetres).

APPLICATION AND SUMMARY OF THE DATA

See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and the validity of USA data for use with the current UK population. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different postures or the compression of soft tissue.

NUMBER OF SOURCES: 1

source	reference	country	age
1	Snyder 1977	US	2-19



Section 1.5 Static Anthropometry: Legs

source 1 of 1

Snyder 1977

Country United States
Ages 2-19

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2-3.5	mf	67	6.20	0.50	5.40	6.90
3.5-4.5		77	6.50	0.50	5.60	7.30
4.5-5.5		92	6.80	0.40	6.10	7.60
5.5-6.5		80	7.10	0.60	6.10	8.10
6.5-7.5		86	7.60	0.60	6.60	8.50
7.5-8.5		68	8.00	0.70	6.80	9.30
8.5-9.5		91	8.40	0.70	7.20	9.60
9.5-10.5		85	8.70	0.90	7.40	10.20
10.5-11.5		86	8.90	0.80	7.60	9.90
11.5-12.5		97	9.40	0.80	7.80	10.60
12.5-13.5		108	10.00	0.90	8.60	11.60
13.5-14.5		89	10.50	0.90	8.90	12.10
14.5-15.5		81	10.60	0.90	8.90	12.10
15.5-16.5		79	11.00	1.00	9.40	12.60
16.5-17.5		67	10.90	1.00	9.30	12.40
17.5-19		63	11.40	1.20	9.20	13.40

DEFINITION

The subject stands erect, with feet together, weight evenly distributed. The maximum horizontal circumference of the right calf is measured (centimetres).

APPLICATION AND SUMMARY OF THE DATA

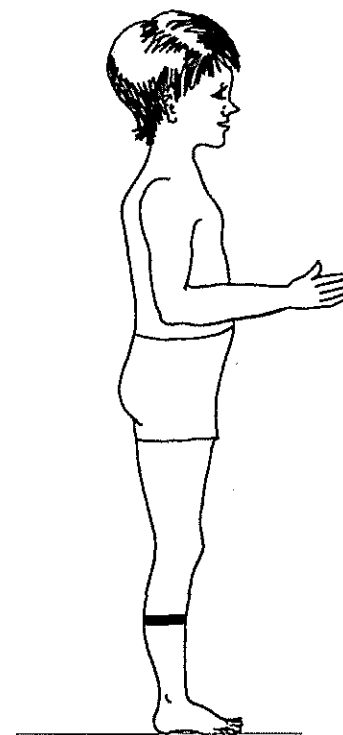
See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and the validity of USA data for use with the current UK population. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different postures or the compression of soft tissue.

SEE ALSO

Calf height (at maximum circumference)

NUMBER OF SOURCES: 1

source	reference	country	age
1	Snyder 1977	US	0-19



Section 1.5 Static Anthropometry: Legs

Calf circumference 128

source 1 of 1

Snyder 1977

Country United States
Ages 0-19

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
0-2mo	mf	31	13.70	2.10	10.40	17.40
3-5mo		44	15.60	1.50	13.50	17.50
6-8mo		31	16.90	1.30	14.30	19.10
9-11mo		27	18.10	1.20	16.40	20.30
12-15mo		32	18.10	1.30	15.90	20.30
16-19mo		29	18.40	1.20	16.30	20.40
20-23mo		31	19.00	1.30	16.00	20.70
2-3.5		212	20.60	1.50	17.90	23.00
3.5-4.5		227	21.20	1.50	19.00	23.60
4.5-5.5		263	22.10	1.50	19.70	24.50
5.5-6.5		218	23.00	1.60	20.50	26.20
6.5-7.5		224	24.40	2.00	21.50	27.70
7.5-8.5		190	25.60	2.40	22.00	29.80
8.5-9.5		251	26.60	2.40	23.10	30.60
9.5-10.5		253	27.70	2.60	23.60	32.00
10.5-11.5		279	28.90	2.70	24.80	33.70
11.5-12.5		287	29.70	2.70	25.70	34.50
12.5-13.5		313	31.30	2.90	26.90	36.30
13.5-14.5		271	32.50	2.70	28.30	36.80
14.5-15.5		264	33.60	2.90	28.90	38.40
15.5-16.5		198	34.60	2.90	30.20	39.40
16.5-17.5		221	34.80	2.70	30.90	40.20
17.5-19		155	35.60	3.10	30.40	41.10

DEFINITION

The subject stands erect with feet apart and weight evenly distributed. The vertical distance from the floor to the underside of the sphyron on the right leg (the protrusion on the inner side of the ankle) is measured (centimetres).

APPLICATION AND SUMMARY OF THE DATA

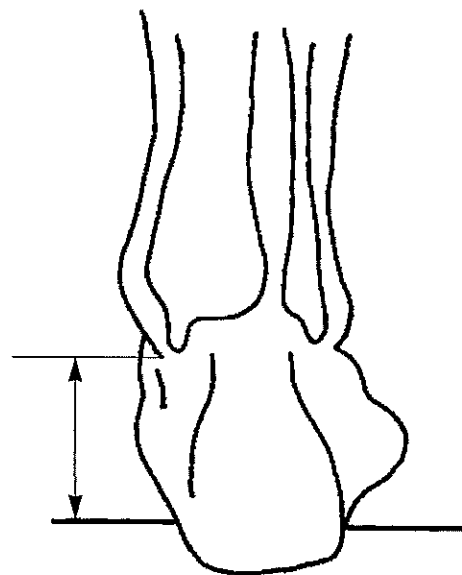
See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and the validity of USA data for use with the current UK population. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different postures or the compression of soft tissue.

SEE ALSO

Foot height

NUMBER OF SOURCES: 1

source	reference	country	age
1	Snyder 1977	US	2-19



Section 1.5 Static Anthropometry: Legs

Ankle Height 129

source 1 of 1

Snyder 1977

Country USA
Ages 2-19

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2-3.5	m	31	3.9	1.1	2.3	5.6
3.5-4.5	m	39	3.9	0.7	2.4	5.0
4.5-5.5	m	29	4.5	0.8	2.8	5.4
5.5-6.5	m	42	4.8	0.8	3.5	5.9
6.5-7.5	m	32	4.9	0.8	3.5	6.1
7.5-8.5	m	31	5.4	0.8	3.7	6.5
8.5-9.5	m	33	5.4	0.9	4.1	6.8
9.5-10.5	m	37	5.6	0.9	4.1	7.0
10.5-11.5	m	48	6.0	0.9	4.5	7.6
11.5-12.5	m	52	6.2	0.7	5.1	7.4
12.5-13.5	m	49	6.5	0.8	4.9	7.8
13.5-14.5	m	50	6.5	1.0	4.4	8.1
14.5-15.5	m	39	6.7	0.9	4.6	8.1
15.5-16.5	m	29	7.4	0.8	5.9	8.3
16.5-17.5	m	35	7.2	1.1	5.4	8.8
17.5-19	m	23	7.0	0.9	5.4	8.2

continued

source 1 of 1 continued

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2-3.5	f	29	3.5	0.8	2.1	4.8
3.5-4.5	f	33	4.1	0.7	2.9	5.3
4.5-5.5	f	40	4.4	0.9	2.7	5.6
5.5-6.5	f	33	4.6	0.7	3.5	5.9
6.5-7.5	f	40	4.7	0.6	2.9	5.3
7.5-8.5	f	30	4.9	0.8	3.4	6.0
8.5-9.5	f	48	5.0	0.7	3.9	6.2
9.5-10.5	f	37	5.2	0.8	3.7	6.3
10.5-11.5	f	47	5.6	0.8	4.3	6.7
11.5-12.5	f	40	5.7	0.7	4.7	7.1
12.5-13.5	f	46	5.8	0.9	4.2	7.4
13.5-14.5	f	26	6.0	0.7	4.8	7.0
14.5-15.5	f	44	6.0	0.8	4.3	7.1
15.5-16.5	f	31	6.3	0.8	4.7	7.2
16.5-17.5	f	34	6.5	0.6	5.5	7.3
17.5-19	f	23	6.1	0.8	4.8	7.2

DEFINITION

The subject stands erect with feet together and weight evenly distributed. The minimum breadth of the right ankle above the malleoli (the protusions on the inside & outside of the ankle) is measured (centimetres).

APPLICATION AND SUMMARY OF THE DATA

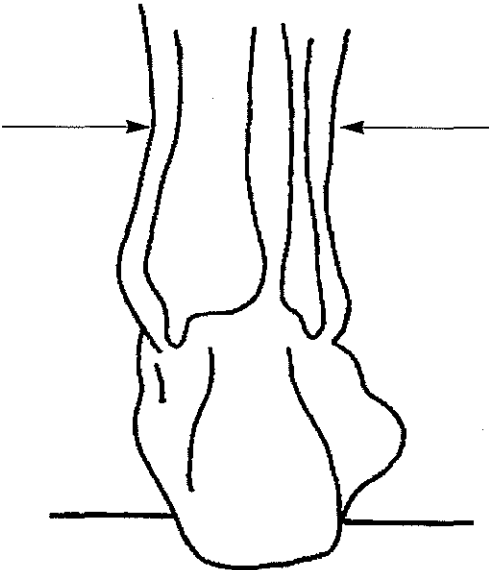
See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and the validity of USA data for use with the current UK population. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different postures or the compression of soft tissue.

SEE ALSO

Heel breadth

NUMBER OF SOURCES: 1

source	reference	country	age
1	Snyder 1977	US	2-19



Section 1.5 Static Anthropometry: Legs

Ankle breadth 130

source 1 of 1

Snyder 1977

Country United States
Ages 2-19

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2-3.5	mf	60	3.80	1.00	2.20	5.30
3.5-4.5		72	4.00	0.70	2.70	5.20
4.5-5.5		69	4.40	0.80	2.80	5.60
5.5-6.5		75	4.70	0.80	3.50	5.90
6.5-7.5		72	4.80	0.70	3.40	5.90
7.5-8.5		61	5.20	0.90	3.50	6.40
8.5-9.5		81	5.20	0.80	4.00	6.30
9.5-10.5		74	5.40	0.90	3.80	7.00
10.5-11.5		95	5.80	0.90	4.40	7.50
11.5-12.5		92	6.00	0.70	4.80	7.30
12.5-13.5		95	6.20	1.00	4.40	7.60
13.5-14.5		76	6.30	1.00	4.70	8.00
14.5-15.5		83	6.30	0.90	4.60	7.90
15.5-16.5		60	6.80	1.00	5.00	8.10
16.5-17.5		69	6.90	0.90	5.50	8.50
17.5-19		46	6.50	1.00	4.90	8.10

DEFINITION

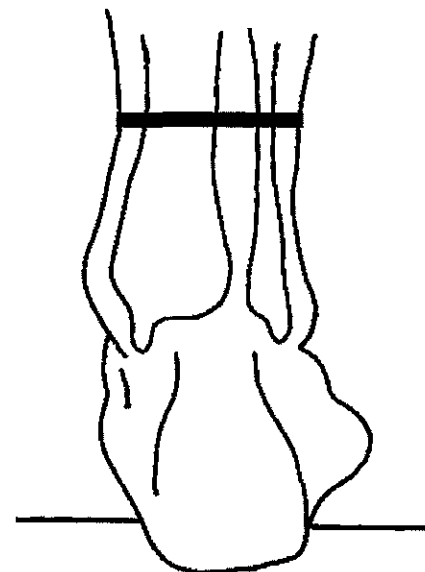
The subject stands erect, with feet together, weight evenly distributed. The minimum horizontal circumference (centimetres) of the right ankle just above the malleoli (ankle bones) is measured.

APPLICATION AND SUMMARY OF THE DATA

Two sources of data have been included to allow comparison between different countries. Of the sources, BSI (1990) is probably more appropriate for use with the current UK population. See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and choose between different sources. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different postures or the compression of soft tissue.

NUMBER OF SOURCES: 2

source	reference	country	age
1	BSI 1990	UK	5-16 females only
2	Snyder 1977	US	0-19



Section 1.5Static Anthropometry: Legs

Ankle circumference151

source 1 of 2

BSI 1990

CountryUnited Kingdom
Ages5-16 females only

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
0-3mo	mf	21	9.98	1.37	n/a	n/a
3-6mo	mf	13	12.16	1.23	n/a	n/a
6-9mo	mf	7	13.37	0.60	n/a	n/a
9-12mo	mf	10	13.91	0.57	n/a	n/a
12-15mo	mf	14	3.96	0.89	n/a	n/a
15-18mo	mf	6	4.28	0.96	n/a	n/a
18-21mo	mf	12	15.31	1.38	n/a	n/a
21-24mo	mf	10	14.29	0.80	n/a	n/a
2-2.5	mf	20	14.79	0.95	n/a	n/a
2.5-3	mf	15	15.17	0.87	n/a	n/a
3	mf	50	15.17	0.99	13.6	16.8
4	mf	49	15.39	0.92	13.6	16.7
5	f	35	16.33	1.59	13.4	18.8
6	f	35	16.61	1.18	14.8	18.9
7	f	36	17.61	1.48	15.5	20.2
8	f	35	17.79	1.38	15.7	20.1
9	f	36	18.10	1.21	15.9	19.8
10	f	36	18.74	1.32	16.5	20.7
11	f	33	19.49	1.64	16.9	22.2
12	f	34	19.85	1.62	17.3	22.6
13	f	36	20.48	1.28	18.2	22.5
14	f	37	20.86	1.08	19.2	22.8
15	f	39	21.11	1.16	19.0	22.9
16	f	22	21.82	1.22	20.1	23.8

source 2 of 2

Snyder 1977

CountryUnited States
Ages0-19

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
0-2mo	mf	31	10.20	1.50	7.30	12.90
3-5mo		44	11.60	1.00	9.80	13.00
6-8mo		31	12.30	0.90	10.90	13.70
9-11mo		27	12.90	1.00	11.30	14.50
12-15mo		32	13.20	1.00	11.60	14.90
16-19mo		29	13.30	1.10	11.20	15.00
20-23mo		31	13.60	0.90	11.80	14.80
2-3.5		67	14.80	1.00	13.10	16.40
3.5-4.5		77	14.90	0.90	13.40	16.70
4.5-5.5		93	15.50	0.90	13.90	17.00
5.5-6.5		80	16.00	1.10	14.50	17.60
6.5-7.5		86	16.60	1.40	14.50	19.20
7.5-8.5		68	17.30	1.40	15.40	20.10
8.5-9.5		91	17.90	1.50	15.50	20.10
9.5-10.5		85	18.50	1.90	15.60	21.40
10.5-11.5		85	18.50	1.60	15.70	20.90
11.5-12.5		97	19.50	1.60	16.60	22.20
12.5-13.5		108	20.40	1.70	17.70	23.30
13.5-14.5		90	21.30	1.70	18.50	24.00
14.5-15.5		81	21.10	1.50	18.50	23.40
15.5-16.5		79	21.80	1.90	18.90	24.70
16.5-17.5		67	21.50	1.60	18.70	24.10
17.5-19		63	22.10	2.00	18.80	26.10

DEFINITION

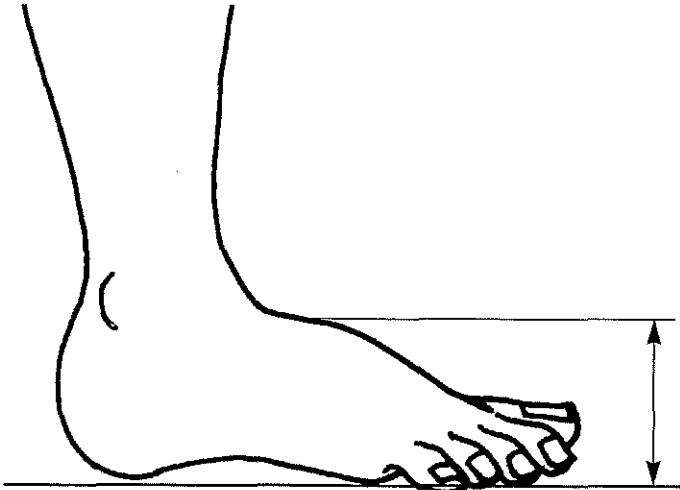
The maximum vertical distance from the surface underneath the foot to the top of the instep, at the junction of the lower leg and foot (centimetres).

APPLICATION AND SUMMARY OF THE DATA

See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and the validity of Dutch data for use with the current UK population. Steenbekkers is the most recent data on European children and Dutch children are amongst the tallest in Europe. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different postures or the compression of soft tissue.

SEE ALSO

Ankle height



NUMBER OF SOURCES: 1

source	reference	country	age
1	Steenbekkers 1993	NL	2-12

Section 1.5 Static Anthropometry: Legs

Foot height 132

source 1 of 1

Steenbekkers 1993

Country Netherlands
Ages 2-12

age	sex	n	mean (cm)	sd	3rd%ile	97th%ile
2	m	81	5.5	0.5	4.7	6.7
3	m	97	6.0	0.6	4.9	7.2
4	m	85	6.3	0.7	4.9	7.6
5	m	86	6.5	0.6	5.4	7.6
6	m	98	6.9	0.6	5.4	8.0
7	m	106	7.3	0.7	5.8	8.9
8	m	96	7.6	0.6	6.5	8.9
9	m	122	7.9	0.7	6.7	8.9
10	m	134	8.2	1.0	6.5	9.8
11	m	143	8.4	0.8	6.9	9.8
12	m	78	8.6	0.8	7.1	9.8
2	f	92	5.5	0.5	4.7	6.7
3	f	86	5.8	0.5	4.9	6.9
4	f	79	6.1	0.6	5.1	7.3
5	f	94	6.5	0.6	5.4	7.6
6	f	92	6.8	0.8	5.3	8.7
7	f	93	7.2	0.7	5.8	8.7
8	f	85	7.4	0.7	6.2	8.9
9	f	122	7.6	0.8	6.3	8.9
10	f	136	8.0	0.8	6.5	9.6
11	f	151	8.0	0.8	6.5	9.3
12	f	79	8.2	0.9	6.7	9.8

DEFINITION

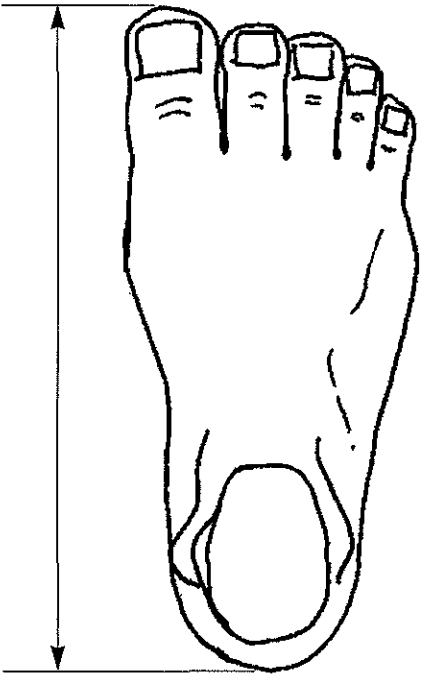
The subject stands erect, with feet together, weight evenly distributed. The distance from the heel to the longest toe of the right foot parallel to the long axis of the foot is measured (centimetres).

APPLICATION AND SUMMARY OF THE DATA

Two sources of data have been included to allow comparison between different countries. Of the sources, Pheasant (1986) is probably more appropriate for use with the current UK population. Steenbekkers is the most recent data on European children and Dutch children are amongst the tallest in Europe. See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and choose between different sources. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different postures or the compression of soft tissue.

NUMBER OF SOURCES: 2

source	reference	country	age
1	Pheasant 1988	UK	0-18
2	Steenbekkers 1993	NL	0-12



Section 1.5 Static Anthropometry: Legs

Foot length 133

source 1 of 2

Pheasant 1988

Country United Kingdom
Ages 0-18

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
0	mf		7.5	0.4	6.5	8.0
6mo	mf		8.5	1.2	7.0	10.5
6-12mo	mf		10.5	0.8	9.0	12.0
12-18mo	mf		11.5	0.8	10.0	12.5
18-24mo	mf		12.5	0.8	11.5	14.0
2	m		14.5	0.9	13.0	16.0
2	m		14.5	1.0	13.0	16.0
3	m		15.5	1.0	14.0	16.0
4	m		16.5	1.0	15.0	18.0
5	m		17.5	1.1	15.5	19.5
6	m		18.5	1.3	16.5	20.5
7	m		19.5	1.1	17.5	21.5
8	m		20.0	1.2	18.0	22.0
9	m		21.0	1.4	18.5	23.5
10	m		22.0	1.4	19.5	24.5
11	m		22.5	1.3	20.5	24.5
12	m		23.5	1.3	21.5	25.5
13	m		24.5	1.6	22.0	27.0
14	m		25.5	1.5	23.0	28.0
15	m		26.0	1.3	24.0	28.0
16	m		26.0	1.2	24.0	28.0
17	m		26.5	1.5	24.0	29.0
18	m		27.0	1.2	25.0	29.0

continued

source 1 of 2 continued

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
3	f		15.5	1.0	14.0	17.0
4	f		16.5	1.1	14.5	18.5
5	f		17.0	1.0	15.5	18.5
6	f		18.0	1.1	16.0	20.0
7	f		19.0	1.2	17.0	21.0
8	f		20.0	1.2	18.0	22.0
9	f		21.0	1.4	18.5	23.5
10	f		21.5	1.4	19.0	24.0
11	f		22.0	1.4	19.5	24.5
12	f		23.0	1.4	20.5	25.5
13	f		23.0	1.3	21.0	25.0
14	f		23.5	1.2	21.5	25.5
15	f		23.5	1.3	21.5	25.5
16	f		24.0	1.2	22.0	26.0
17	f		24.0	1.2	22.0	26.0
18	f		24.0	1.1	22.0	26.0

Section 1.5 Static Anthropometry: Legs

Foot length 133

source 2 of 2

Steenbekkers 1993

Country Netherlands
Ages 0-12

age	sex	n	mean (cm)	sd	3rd%ile	97th%ile
0-2mo	m	16	8.8	0.4	7.9	9.3
3-5mo	m	21	9.1	1.0	7.0	11.3
6-8mo	m	22	10.1	0.8	9.0	12.0
9-11mo	m	13	10.6	0.9	8.5	11.7
12-14mo	m	15	11.4	0.8	9.8	12.5
2	m	81	14.8	0.8	13.3	16.3
3	m	97	16.0	0.9	14.4	18.2
4	m	85	16.9	0.8	15.2	18.5
5	m	86	18.2	0.9	16.6	19.7
6	m	98	19.0	0.9	17.4	20.8
7	m	106	20.0	1.0	18.3	21.7
8	m	96	20.8	1.0	18.8	23.1
9	m	122	21.9	1.0	20.0	23.9
10	m	134	22.6	1.2	20.4	24.9
11	m	143	23.4	1.4	21.3	25.7
12	m	78	24.2	1.2	21.7	26.6

continued

source 2 of 2 *continued*

age	sex	n	mean (cm)	sd	3rd%ile	97th%ile
0-2mo	f	9	8.2	0.6	7.4	9.1
3-5mo	f	20	8.8	0.6	7.7	9.9
6-8mo	f	14	9.5	0.5	8.4	10.4
9-11mo	f	16	10.6	0.6	9.7	11.8
12-14mo	f	23	10.9	0.7	9.5	12.0
2	f	92	14.4	0.9	12.6	16.0
3	f	86	15.6	0.8	14.1	17.1
4	f	79	16.8	0.8	15.4	18.4
5	f	94	17.8	0.9	16.0	19.6
6	f	92	18.9	0.9	17.0	20.7
7	f	93	19.8	1.0	17.7	21.6
8	f	95	20.6	1.1	18.6	22.3
9	f	122	21.3	1.2	18.9	23.3
10	f	136	22.5	1.1	20.3	24.5
11	f	151	22.9	1.2	20.9	25.0
12	f	79	23.5	1.5	21.3	26.7

DEFINITION

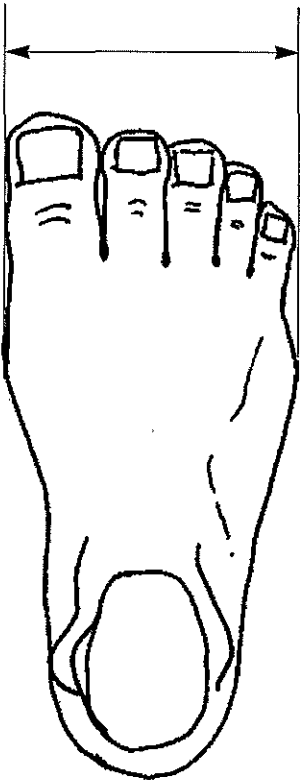
The subject stands erect, with feet together, weight evenly distributed. The maximum width across the ball of the right foot is measured (centimetres).

APPLICATION AND SUMMARY OF THE DATA

Two sources of data have been included to allow comparison between different countries. Of the sources, Pheasant (1986) is probably more appropriate for use with the current UK population. Steenbekkers is the most recent data on European children and Dutch children are amongst the tallest in Europe. See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and choose between different sources. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different postures or the compression of soft tissue.

NUMBER OF SOURCES: 2

source	reference	country	age
1	Pheasant 1988	UK	0-18
2	Steenbekkers 1993	NL	0-12



source 1 of 2

Pheasant 1988

Country United Kingdom
Ages 0-18

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
0	mf		3.0	0.2	3.0	3.5
0-6mo	mf		4.0	0.6	3.0	5.0
6-12mo	mf		4.5	0.4	4.0	5.0
12-18mo	mf		4.5	0.4	4.0	5.5
18-24mo	mf		5.5	0.4	4.5	6.0
2	m		6.5	0.4	6.0	7.0
3	m		6.5	0.4	6.0	7.0
4	m		6.5	0.4	6.0	7.0
5	m		7.0	0.5	6.0	8.0
6	m		7.5	0.6	6.5	8.5
7	m		7.5	0.5	6.5	8.5
8	m		8.0	0.5	7.0	9.0
9	m		8.0	0.5	7.0	9.0
10	m		8.5	0.5	7.0	9.5
11	m		8.5	0.7	7.5	9.5
12	m		9.0	0.7	8.0	10.0
13	m		9.0	0.7	8.0	10.0
14	m		9.5	0.7	8.5	10.5
15	m		9.5	0.7	8.5	10.5
16	m		10.0	0.6	9.0	11.0
17	m		10.0	0.5	9.0	11.0
18	m		10.0	0.5	9.0	11.0

continued

source 1 of 2 continued

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2	f		5.5	0.4	5.0	6.0
3	f		6.0	0.4	5.5	6.5
4	f		6.5	0.4	6.0	7.0
5	f		6.5	0.4	6.0	7.0
6	f		7.0	0.5	6.0	8.0
7	f		7.5	0.5	6.5	8.5
8	f		7.5	0.5	6.5	8.5
9	f		8.0	0.6	7.0	9.0
10	f		8.0	0.7	7.0	9.0
11	f		8.5	0.7	7.5	9.5
12	f		8.5	0.7	7.5	9.5
13	f		9.0	0.6	8.0	10.0
14	f		9.0	0.6	8.0	10.0
15	f		9.0	0.5	8.0	10.0
16	f		9.0	0.5	8.0	10.0
17	f		9.0	0.5	8.0	10.0
18	f		9.0	0.5	8.0	10.0

Section 1.5 Static Anthropometry: Legs

Foot breadth 134

source 2 of 2

Steenbekkers 1993

Country Netherlands
Ages 0-12

age	sex	n	mean (cm)	sd	3rd%ile	97th%ile
0-2mo	m	16	8.3	0.2	3.4	4.1
3-5mo	m	21	4.0	0.4	3.5	4.7
6-8mo	m	22	4.3	0.4	3.6	5.2
9-11mo	m	13	4.5	0.3	3.9	5.2
12-14mo	m	15	5.0	0.5	4.4	6.0
2	m	81	6.0	0.5	5.0	7.1
3	m	97	6.4	0.5	5.5	7.2
4	m	85	6.8	0.4	6.1	7.7
5	m	86	7.2	0.4	6.4	8.0
6	m	98	7.3	0.4	6.6	8.3
7	m	106	7.7	0.5	7.0	8.6
8	m	96	8.0	0.5	7.1	9.0
9	m	122	8.2	0.5	7.3	9.3
10	m	134	8.5	0.6	7.5	9.5
11	m	143	8.8	0.6	7.7	9.8
12	m	78	9.1	0.5	8.3	10.0

continued

source 2 of 2 continued

age	sex	n	mean (cm)	sd	3rd%ile	97th%ile
0-2mo	f	9	3.5	0.6	2.6	4.3
3-5mo	f	20	3.7	0.4	3.1	4.7
6-8mo	f	14	4.0	0.4	3.6	4.9
9-11mo	f	16	4.5	0.3	3.9	4.9
12-14mo	f	23	4.5	0.3	3.8	5.1
2	f	92	5.9	0.4	5.1	6.6
3	f	86	6.1	0.4	5.3	6.9
4	f	79	6.6	0.4	6.1	7.4
5	f	94	6.9	0.4	6.2	7.7
6	f	92	7.2	0.4	6.5	8.2
7	f	93	7.5	0.5	6.6	8.5
8	f	95	7.7	0.4	6.9	8.6
9	f	122	7.9	0.5	7.1	8.8
10	f	136	8.3	0.6	7.2	9.4
11	f	151	8.5	0.5	7.5	9.5
12	f	79	8.6	0.5	7.7	9.5

DEFINITION

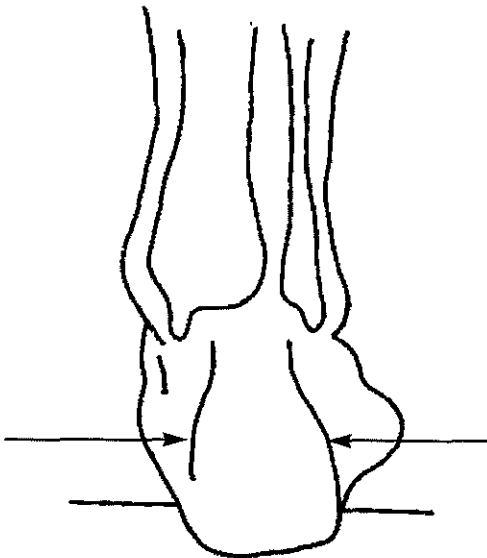
The maximum horizontal distance measured across the back of the heel (millimetres).

APPLICATION AND SUMMARY OF THE DATA

See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and the validity of German data for use with the current UK population. Static anthropometric measurements do not account for stretching, twisting or forcing the body into different postures or the compression of soft tissue.

SEE ALSO

Ankle breadth



NUMBER OF SOURCES: 1

source	reference	country	age
1	Din 1981	D	3-17

source 1 of 1

Din 1981

Country Germany
Ages 3-17

age	sex	n	mean (mm)	sd	5th%ile	95th%ile
3	m		45		31	55
4	m		46		32	56
5	m		49		35	59
6	m		48		35	59
7	m		50		36	60
8	m		51		38	62
9	m		53		40	62
10	m		57		40	65
11	m		57		48	67
12	m		60		51	70
13	m		62		51	73
14	m		63		54	70
15	m		64		55	71 ₊
16-17	m		67		61	71
3	f		45		31	55
4	f		46		32	56
5	f		49		35	59
6	f		48		35	59
7	f		50		36	60
8	f		51		38	62
9	f		53		40	62
10	f		57		40	65
11	f		57		41	65
12	f		58		42	67
13	f		58		43	67
14	f		57		46	67
15	f		60		52	68
16-17	f		62		53	70

Section 2.1 Functional Anthropometry: Reach

Overhead reach to grip (standing) 136

DEFINITION

The subject stands erect with feet together and with their right side against a wall. The right arm is extended to maximum vertical reach while grasping the handle of a grip device in the right hand. The distance from the floor to the centre of the grip device is measured (centimetres).

APPLICATION AND SUMMARY OF THE DATA

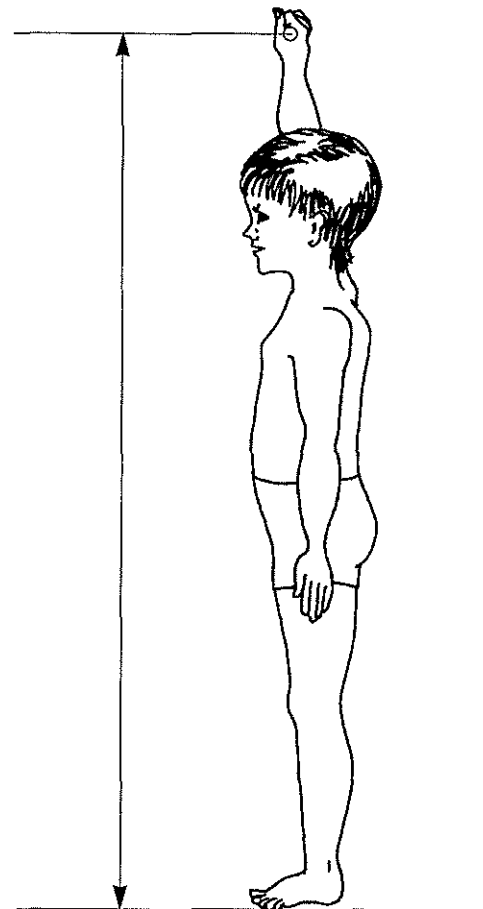
Two sources of data have been included to allow comparison between different countries. Of the sources, Pheasant (1986) is probably more appropriate for use with the current UK population. Steenbekkers is the most recent data on European children and Dutch children are amongst the tallest in Europe. See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and choose between different sources. Functional anthropometric measurements do not account for stretching, twisting or forcing the body into different postures or to achieve maximum reach.

SEE ALSO

Overhead reach to grip (seated), overhead reach to fingertip (on tiptoes), overhead reach to fingertip (jumping), height at which windows can be opened

NUMBER OF SOURCES: 2

source	reference	country	age
1	Pheasant 1988	UK	2-18
2	Steenbekkers 1993	NL	2-12



Section 2.1 Functional Anthropometry: Reach

Overhead reach to grip (standing) 130

source 1 of 2

Pheasant 1988

Country United Kingdom
Ages 2-18

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2	m		104.5	7.7	92.0	117.0
3	m		113.0	7.5	100.5	125.5
4	m		121.5	7.3	109.5	133.5
5	m		130.5	7.7	118.0	143.0
6	m		139.0	9.3	123.5	154.5
7	m		147.5	7.6	135.0	160.0
8	m		155.0	7.5	142.5	167.5
9	m		161.0	8.3	147.5	174.5
10	m		168.0	8.6	154.0	182.0
11	m		174.0	10.0	157.5	190.5
12	m		183.5	11.0	165.5	201.5
13	m		190.5	11.2	172.0	209.0
14	m		199.0	10.1	182.5	215.5
15	m		206.0	9.7	190.0	222.0
16	m		210.0	9.3	194.5	225.5
17	m		212.5	8.7	198.0	227.0
18	m		215.0	6.5	204.5	225.5

continued

source 1 of 2 *continued*

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2	f		104.5	4.9	96.5	112.5
3	f		112.5	6.1	102.5	122.5
4	f		120.5	7.3	108.5	132.5
5	f		129.0	7.2	117.0	141.0
6	f		138.0	7.6	125.5	150.5
7	f		145.5	7.9	132.5	158.5
8	f		153.5	7.8	140.5	166.5
9	f		161.5	9.4	146.0	177.0
10	f		170.5	10.1	154.0	187.0
11	f		176.0	11.1	157.5	194.5
12	f		183.5	11.2	165.0	202.0
13	f		189.0	11.4	170.0	208.0
14	f		193.0	10.1	176.5	209.5
15	f		196.0	9.1	181.0	211.0
16	f		196.5	8.8	182.0	211.0
17	f		197.0	8.5	183.0	211.0
18	f		197.0	8.5	183.0	211.0

Section 2.1

Functional Anthropometry: Reach

Overhead reach to grip (standing) 136

source 2 of 2

Steenbekkers 1993

Country Netherlands
Ages 2-12

age	sex	n	mean (cm)	sd	3rd%ile	97th%ile
2	m	81	106.5	6.5	95.3	118.3
3	m	97	118.0	6.7	107.1	133.6
4	m	85	126.2	5.9	114.5	136.4
5	m	86	137.0	6.5	125.4	149.6
6	m	98	144.4	6.4	129.7	156.5
7	m	106	152.0	7.1	138.2	163.4
8	m	96	159.7	6.6	146.1	172.1
9	m	122	169.6	7.4	157.3	184.6
10	m	134	175.6	9.0	158.0	193.1
11	m	143	182.1	9.0	167.6	199.1
12	m	78	188.5	10.3	169.4	203.7
2	f	92	105.3	6.1	94.4	116.7
3	f	86	116.0	6.0	103.6	126.3
4	f	79	124.8	5.9	115.7	135.5
5	f	94	135.4	6.8	123.7	148.0
6	f	92	144.4	6.1	133.7	158.1
7	f	93	153.1	7.9	137.9	166.6
8	f	95	159.5	7.3	146.0	172.2
9	f	122	167.0	8.4	151.9	179.0
10	f	136	176.7	8.9	161.7	194.0
11	f	151	181.9	8.6	165.9	199.3
12	f	79	188.5	9.8	168.1	205.0

Section 2.1 Functional Anthropometry: Reach Overhead reach to grip (seated) 137

DEFINITION

The subject sits so that the hips and knees are at 90 degrees. The subject grasps the handle of a grip device in the right hand extending the right arm to maximum vertical reach. The distance from the sitting surface to the centre of the grip device is measured (centimetres).

APPLICATION AND SUMMARY OF THE DATA

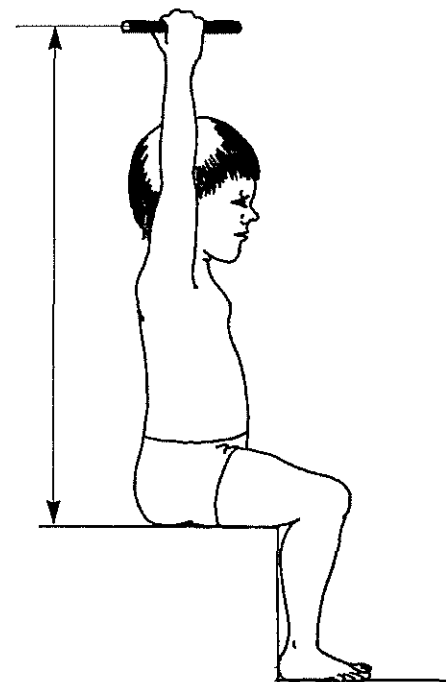
Two sources of data have been included to allow comparison between different countries. Of the sources, Pheasant (1986) is probably more appropriate for use with the current UK population. Steenbekkers is the most recent data on European children and Dutch children are amongst the tallest in Europe. See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and choose between different sources. Functional anthropometric measurements do not account for stretching, twisting or forcing the body into different postures to achieve maximum reach.

SEE ALSO

Overhead reach to grip (standing), overhead reach to fingertip (on tiptoes), overhead reach to fingertip (jumping), height at which windows can be opened

NUMBER OF SOURCES: 2

source	reference	country	age
1	Pheasant 1988	UK	2-18
2	Steenbekkers 1993	NL	2-12



Section 2.1 Functional Anthropometry: Reach

Overhead reach to grip (seated) 137

source 1 of 2

Pheasant 1988

Country United Kingdom
Ages 2-18

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2	m		67.5	4.2	60.5	74.5
3	m		70.5	4.1	64.0	77.5
4	m		73.5	4.0	67.0	80.5
5	m		77.5	4.5	70.0	85.0
6	m		80.5	5.2	72.0	89.0
7	m		85.0	4.8	77.0	92.5
8	m		89.0	5.2	80.5	97.5
9	m		92.0	5.4	83.0	101.0
10	m		95.5	5.2	87.0	104.5
11	m		99.0	5.6	89.5	108.0
12	m		103.5	6.7	92.5	114.5
13	m		108.0	7.8	95.5	121.0
14	m		114.0	7.7	101.5	127.0
15	m		119.0	7.1	107.5	131.0
16	m		122.5	5.8	113.0	132.0
17	m		124.0	5.7	114.5	133.0
18	m		125.0	5.2	117.0	133.5

continued

source 1 of 2 continued

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2	f		62.0	4.2	55.0	69.0
3	f		67.5	4.1	60.5	74.0
4	f		72.5	4.0	66.0	79.5
5	f		75.5	4.5	68.5	83.0
6	f		79.0	5.2	70.5	87.5
7	f		82.5	4.8	74.5	90.5
8	f		87.0	5.2	78.5	95.5
9	f		90.5	5.4	81.5	99.5
10	f		93.5	5.2	85.0	102.0
11	f		99.0	5.6	90.0	108.5
12	f		103.5	6.7	92.5	114.5
13	f		107.0	7.8	94.5	120.0
14	f		110.5	7.7	98.0	123.5
15	f		112.0	7.1	100.5	124.0
16	f		113.5	5.8	103.5	123.0
17	f		114.5	5.7	105.0	123.5
18	f		115.0	5.2	106.5	123.5

Section 2.1 Functional Anthropometry: Reach Overhead reach to grip (seated) 137

source 2 of 2

Steenbekkers 1993

Country Netherlands
Ages 2-12

age	sex	n	mean (cm)	sd	3rd%ile	97th%ile
2	m	81	68.7	4.2	61.6	77.7
3	m	97	74.5	4.6	66.7	83.0
4	m	85	79.0	4.2	70.8	87.1
5	m	86	85.2	4.1	77.6	92.6
6	m	98	86.5	4.3	81.7	98.2
7	m	106	93.5	4.9	85.0	103.6
8	m	96	97.4	4.3	89.2	104.5
9	m	122	102.8	4.7	94.3	113.8
10	m	134	106.0	5.7	95.3	116.5
11	m	143	109.5	5.9	96.0	121.7
12	m	78	113.1	6.6	100.9	125.2
2	f	92	68.0	4.3	60.3	76.1
3	f	86	73.5	4.2	66.3	81.6
4	f	79	78.2	4.2	69.6	86.4
5	f	94	84.1	4.3	76.8	94.0
6	f	92	89.2	3.6	82.4	96.4
7	f	93	94.4	5.1	84.1	104.0
8	f	95	97.6	4.3	90.0	105.6
9	f	122	101.0	5.1	91.1	109.8
10	f	136	106.4	5.6	97.0	118.5
11	f	151	109.9	5.7	98.4	121.1
12	f	79	113.5	7.1	100.4	126.1

Section 2.1 Functional Anthropometry: Reach Overhead reach to fingertip (on tiptoes) 138

DEFINITION

The vertical distance to the maximum overhead reach with the fingertips is measured with the subject with both feet on the floor, standing on tiptoe and stretching up with the left arm only (centimetres).

APPLICATION AND SUMMARY OF THE DATA

See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and the validity of German data for use with the current UK population. Functional anthropometric measurements do not account for stretching, twisting or forcing the body into different postures to achieve maximum reach.

SEE ALSO

Overhead reach to grip (standing), overhead reach to grip (seated), overhead reach to fingertip (jumping), height at which windows can be opened

NUMBER OF SOURCES: 1

source	reference	country	age
1	Jurgens 1974	D	3-14

Section 2.1 Functional Anthropometry: Reach Overhead reach to fingertip (on tiptoes) 138

source 1

Jurgens 1974

Country Germany
Ages 3-14

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
3	m		136.9	7.7		
4	m		146.8	6.0		
5	m		155.0	7.9		
6	m		163.0	9.1		
7	m		173.4	8.1		
8	m		177.9	9.3		
9	m		186.5	10.4		
10	m		194.8	8.2		
11	m		201.2	12.4		
12	m		208.2	10.4		
13	m		219.6	13.4		
14	m		228.2	15.0		
3	f		135.5	6.7		
4	f		147.1	7.8		
5	f		155.6	7.1		
6	f		161.8	7.1		
7	f		171.3	8.9		
8	f		178.0	8.1		
9	f		187.2	10.5		
10	f		199.1	9.4		
11	f		200.6	10.5		
12	f		211.1	11.7		
13	f		218.5	10.0		
14	f		221.3	9.6		

Section 2.1 Functional Anthropometry: Reach Overhead reach to fingertip (jumping) 139

DEFINITION

The vertical difference between the maximum standing overhead reach (to fingertip) and the maximum height that can be reached with one hand in one jump without stepping (inches).

APPLICATION AND SUMMARY OF THE DATA

See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and the validity of USA data for use with the current UK population.

SEE ALSO

Overhead reach to grip (standing), overhead reach to grip (seated), overhead reach to fingertip (on tiptoes), height at which windows can be opened

NUMBER OF SOURCES: 1

source	reference	country	age
1	Branta 1984	US	5-13

Section 2.1 Functional Anthropometry:Reach Overhead reach to fingertip (jumping) 139

source 1 of 1

Branta 1984

Country USA
Ages 5-13
Sample 170

These data should be added to data on maximum overhead reach to fingertip in order to represent maximum overhead reach from jumping. Note however, that data are available only on overhead reach to grip (measurement number 137) and to fingertip on tiptoes (measurement number 138).

age	sex	n	mean (inches)	sd	5th%ile	95th%ile
5	m		5.84	1.7		
6	m		7.38	1.6		
7	m		8.53	1.6		
8	m		9.79	1.8		
9	m		10.47	1.6		
10	m		11.58	2.0		
11	m		11.69	1.8		
12	m		12.65	1.9		
13	m		13.87	2.5		
5	f		6.03	1.6		
6	f		7.04	1.4		
7	f		8.42	1.6		
8	f		9.30	1.8		
9	f		10.39	1.6		
10	f		11.48	1.7		
11	f		11.25	2.1		
12	f		12.34	2.0		
13	f		13.37	1.9		

Section 2.1 Functional Anthropometry: Reach **Forward reach to grip (standing) 140**

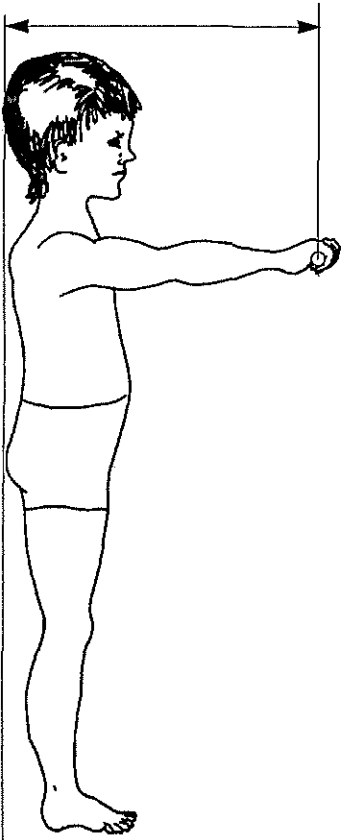
DEFINITION
The subject stands erect with feet together, back to a wall and grasping the handle of a grip device in the right hand. The right shoulder is held against the wall as the subject extends the right arm to maximum horizontal grip reach. The horizontal distance from the wall to either the centre or the most distal point on the handle of the grip device (away from the body) is measured (centimetres).

APPLICATION AND SUMMARY OF THE DATA
Two sources of data have been included to allow comparison between different countries. Of the sources, Pheasant (1986) is probably more appropriate for use with the current UK population. See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and choose between different sources. Functional anthropometric measurements do not account for stretching, twisting or forcing the body into different postures to achieve maximum reach.

SEE ALSO
Forward reach to grip (seated), forward reach to grip (stretching and seated), forward reach to fingertip (stretching and seated, legs outstretched), sideways reach to grip (standing), arm length to fingertip, arm length to grip

NUMBER OF SOURCES: 2

source	details	reference	country	age
1	centre of the grip device	Pheasant 1988	UK	2-18
2	distal point of the grip device	Snyder 1977	US	2-18



Section 2.1

Functional Anthropometry: Reach

Forward reach to grip (standing) 140

source 1 of 2

Pheasant 1988

Country United Kingdom
Ages 2-18

Reach measured to the centre of the grip device.

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2	m		40.0	3.5	34.0	46.0
3	m		42.0	3.5	36.0	48.0
4	m		44.0	3.5	38.0	50.0
5	m		47.0	3.0	42.0	52.0
6	m		49.5	3.5	43.5	55.5
7	m		52.0	3.1	47.0	57.0
8	m		53.5	3.5	47.5	59.5
9	m		55.5	3.6	49.5	61.5
10	m		58.0	3.3	52.5	63.5
11	m		59.5	3.7	53.5	65.5
12	m		62.0	4.2	55.0	69.0
13	m		65.5	4.8	57.5	73.5
14	m		68.0	4.1	61.5	74.5
15	m		70.0	4.0	63.5	76.5
16	m		72.0	4.2	65.0	79.0
17	m		73.0	4.6	65.5	80.5
18	m		74.0	4.1	67.5	80.5

continued

source 1 of 2 continued

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2	f		38.5	2.5	34.5	42.5
3	f		41.5	3.3	36.0	47.0
4	f		44.5	4.1	38.0	51.0
5	f		46.0	3.6	40.0	52.0
6	f		48.5	3.1	43.5	53.5
7	f		50.5	2.9	45.5	55.5
8	f		53.0	3.4	47.5	58.5
9	f		55.5	4.2	48.5	62.5
10	f		58.5	4.0	52.0	65.0
11	f		60.0	4.2	53.0	67.0
12	f		62.5	4.5	55.0	70.0
13	f		64.0	4.1	57.5	70.5
14	f		65.5	3.6	59.5	71.5
15	f		66.5	3.9	60.0	73.0
16	f		67.0	4.1	60.5	73.5
17	f		67.0	3.7	61.0	73.0
18	f		67.0	3.7	61.0	73.0

Section 2.1 Functional Anthropometry: Reach Forward reach to grip (standing) 140

source 2 of 2

Snyder 1977

Country US
Ages 2-19

Grip measured to the most distal point on the grip device (ie away from the body).

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2-3.5	mf	62	39.70	3.10	35.50	45.40
3.5-4.5		77	43.10	3.60	37.80	49.70
4.5-5.5		74	45.40	3.40	40.40	51.50
5.5-6.5		76	48.50	2.90	44.20	53.30
6.5-7.5		74	50.70	3.20	46.20	56.10
7.5-8.5		64	52.90	2.70	47.80	56.80
8.5- 9.5		80	55.50	4.10	49.20	64.10
9.5-10.5		74	57.70	3.30	52.80	64.00
10.5-11.5		94	59.90	3.80	53.40	66.60
11.5-12.5		91	62.10	3.80	56.30	67.70
12.5-13.5		97	64.90	4.50	57.60	71.60
13.5-14.5		80	67.00	4.30	59.40	74.10
14.5-15.5		87	67.70	3.80	61.30	73.40
15.5-16.5		63	69.60	5.10	60.90	76.40
16.5-17.5		74	70.60	5.00	62.00	78.70
17.5-19		44	70.70	5.40	63.00	80.90

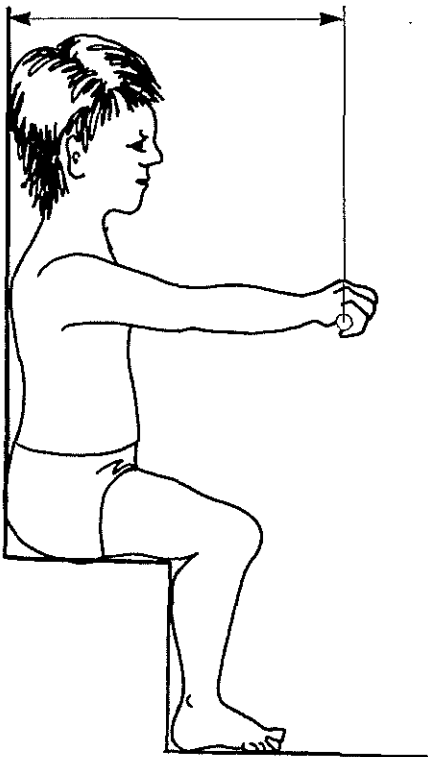
DEFINITION
The subject sits erect with feet together, hips and knees at right angles and with back supported. Grasping the handle of the grip device in the right hand the right arm is extended to maximum horizontal grip reach while the shoulder blades are held against the backrest. The horizontal distance from the backrest to the centre of the grip device is measured (centimetres).

APPLICATION AND SUMMARY OF THE DATA
See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and the validity of Dutch data for use with the current UK population. Steenbekkers is the most recent data on European children and Dutch children are amongst the tallest in Europe. Functional anthropometric measurements do not account for stretching, twisting or forcing the body into different postures to achieve maximum reach.

SEE ALSO
Forward reach to grip (standing), forward reach to grip (stretching and seated), forward reach to fingertip (stretching and seated, legs outstretched), arm length to fingertip, arm length to grip

NUMBER OF SOURCES: 1

source	reference	country	age
1	Steenbekkers 1993	NL	2-12



Section 2.1 Functional Anthropometry: Reach

Forward reach to grip (seated) 141

source 1 of 1

Steenbekkers 1993

Country Netherlands
Ages 2-12

age	sex	n	mean (cm)	sd	3rd%ile	97th%ile
2	m	81	40.1	3.5	34.3	46.9
3	m	97	43.2	3.6	36.8	49.9
4	m	85	45.0	3.3	37.7	51.6
5	m	86	48.6	3.2	42.6	54.9
6	m	98	49.9	3.2	42.9	56.3
7	m	106	52.0	3.1	46.7	58.5
8	m	96	54.7	3.2	48.9	60.9
9	m	122	57.6	3.8	51.1	65.2
10	m	134	59.3	4.2	51.1	66.9
11	m	143	61.6	4.1	53.8	69.6
12	m	78	64.6	5.6	55.4	77.0
2	f	92	38.7	3.1	33.4	45.6
3	f	86	42.0	3.2	36.2	48.4
4	f	79	44.3	3.6	38.6	51.8
5	f	94	47.4	3.1	41.8	53.3
6	f	92	49.6	3.1	44.2	56.9
7	f	93	52.2	3.4	45.3	60.1
8	f	95	54.0	2.8	48.4	60.1
9	f	122	55.9	3.8	49.8	62.9
10	f	136	59.3	4.0	52.2	67.2
11	f	151	61.4	4.4	53.6	70.5
12	f	79	63.6	4.2	56.4	72.3

Section 2.1 Functional Anthropometry: Reach Forward reach to grip (stretching and sitting on a chair) 142

DEFINITION

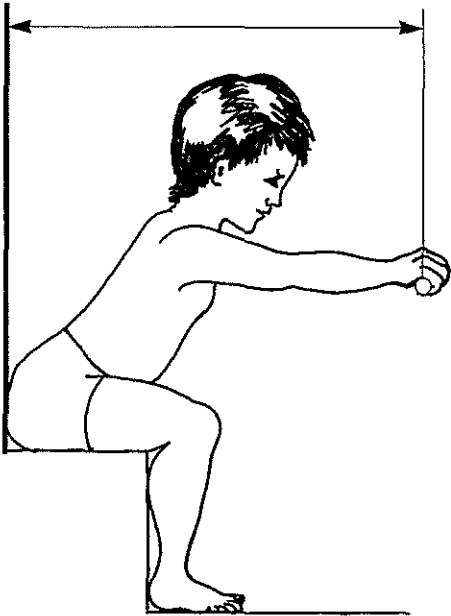
The subject sits so that the hips and knees are at 90 degrees, with feet hanging freely. The subject grasps the handle of a grip device in the right hand, extending the right arm and moving upper torso forwards (without moving the buttocks or knees) to maximum forward reach. The distance (centimetres) from the backrest to the mid-point on the handle of the grip device is measured.

APPLICATION AND SUMMARY OF THE DATA

See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and the validity of Dutch data for use with the current UK population. Steenbekkers is the most recent data on European children and Dutch children are amongst the tallest in Europe. Functional anthropometric measurements do not account for stretching, twisting or forcing the body into different postures to achieve maximum reach.

SEE ALSO

Forward reach to grip (seated), forward reach to fingertip (stretching and seated, legs outstretched), forward reach to grip (standing), arm length to fingertip, arm length to grip



NUMBER OF SOURCES: 1

source	reference	country	age
1	Steenbekkers 1993	NL	2-12

Section 2.1 Functional Anthropometry: Reach Forward reach to grip (stretching and sitting on a chair) 142

source 1 of 1

Steenbekkers 1989

Country Netherlands
ages 2-12

age	sex	n	mean (cm)	sd	3rd%ile	97th%ile
2	m	81	68.0	6.5	56.0	77.5
3	m	97	76.0	4.8	66.7	85.0
4	m	85	76.4	6.6	64.5	86.8
5	m	86	81.2	7.6	66.3	93.0
6	m	98	84.8	6.3	70.8	96.4
7	m	106	89.8	7.0	75.5	101.8
8	m	96	93.9	6.1	82.1	104.9
9	m	122	99.4	6.2	86.6	110.3
10	m	134	102.3	6.9	88.0	114.6
11	m	143	106.1	7.5	90.8	118.8
12	m	78	108.7	7.5	93.3	122.3
2	f	92	67.4	5.8	57.2	77.0
3	f	86	74.1	4.9	64.3	83.6
4	f	79	74.9	5.9	65.2	86.3
5	f	94	81.2	6.9	66.7	92.9
6	f	92	85.8	5.8	71.4	96.5
7	f	93	91.3	6.7	75.2	103.1
8	f	95	95.0	6.0	82.8	106.0
9	f	122	98.8	6.6	83.9	110.0
10	f	136	103.6	6.9	93.4	116.5
11	f	151	106.9	6.8	92.7	120.6
12	f	79	110.9	8.5	95.1	127.7

Section 2.1 Functional Anthropometry: Reach Forward reach (stretching and seated, legs outstretched) 143

DEFINITION

The subject sits on the floor with legs extended and feet in contact with the vertical surface of a bench, with hands palms down on top of each other, on top of the bench. The subject reaches forward as far as possible sliding both hands along the top of the bench. The maximum distance reached and held for 1 second on the fourth reach is recorded. This definition is according to source 1 and others may vary.

APPLICATION AND SUMMARY OF THE DATA

Three sources of data have been included to allow comparison between different countries and different age groups. Of the sources, Paliczka (1986) is probably more appropriate for use with the current UK population. See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and choose between different sources. Functional anthropometric measurements do not account for stretching, twisting or forcing the body into different postures to achieve maximum reach.

SEE ALSO

Forward reach to grip (seated), forward reach to grip (standing), forward reach to grip (stretching and seated), arm length to fingertip, arm length to grip

NUMBER OF SOURCES: 3

source	reference	country	age
1	Branta 1984	US	5-13
2	Kemper 1982	NL	12-13
3	Paliczka 1986	UK	12-13

Section 2.1 Functional Anthropometry: Reach Forward reach (stretching and seated, legs outstretched) 143

source 1 of 3

Branta 1984

Country USA
Ages 5-13
Sample 170

Data collected according to definition above. Results in inches.

age	sex	n	mean (inches)	sd	5th%ile	95th%ile
5	m		8.34	2.0		
6	m		8.24	1.9		
7	m		8.46	1.9		
8	m		8.39	2.0		
9	m		7.98	2.0		
10	m		7.71	2.1		
11	m		7.12	2.1		
12	m		6.75	2.3		
13	m		6.79	2.5		
5	f		8.59	2.3		
6	f		9.10	1.8		
7	f		9.23	1.8		
8	f		9.33	1.9		
9	f		9.31	2.0		
10	f		9.32	2.3		
11	f		8.88	2.1		
12	f		9.44	2.1		
13	f		10.10	2.3		

source 2 of 3

Kemper 1982

Country Netherlands
Ages 12-13
Sample 326

Defined as the distance that can be reached past the feet at arm level when sat with legs extended and feet against a vertical surface. Data collected from 1962 to 1964 (longitudinal study). The report states that females can reach approximately 5cm further than males at this age. Flexibility increases between ages 12 and 17. Results in centimetres.

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
12	m		27.0			
13	m		27.5			
13	f		34.0			
12	f		31.5			

source 3 of 3

Paliczka 1986

Country United Kingdom
Ages 12-13
Sample 2350

Data collected in Northern Ireland. The report states that the amount of pressure applied to the leg in order that the subject maintains the correct posture may vary between studies and will affect results. Results in centimetres.

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
12	m		14.6			
13	m		15.8			
13	f		21.6			
12	f		19.0			

Section 2.1 Functional Anthropometry: Reach Sideways reach to grip (standing) 144

DEFINITION

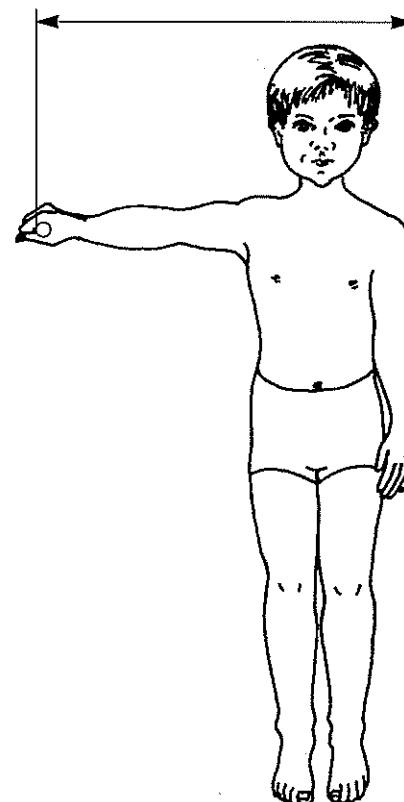
The subject stands erect with feet together, left shoulder against the wall, grasping the handle of the grip device in the right hand and abducts (lifts to the side of the body) the extended right arm to maximum lateral or sideways horizontal grip reach. The horizontal distance (centimetres) from the wall to the most distal point on the handle of the grip device (away from the body) is measured.

APPLICATION AND SUMMARY OF THE DATA

See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and the validity of USA data for use with the current UK population. Functional anthropometric measurements do not account for stretching, twisting or forcing the body into different postures to achieve maximum reach.

SEE ALSO

Forward reach to grip (standing), arm length to fingertip, arm length to grip, span



NUMBER OF SOURCES: 1

source	reference	country	age
1	Snyder 1977	US	2-19

Section 2.1

Functional Anthropometry: Reach

Sideways reach to grip (standing) 144

source 1 of 1

Snyder 1977

Country United States
Ages 2-19

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2-3.5	mf	60	52.90	3.40	48.00	57.60
3.5-4.5		75	56.30	3.80	50.30	62.50
4.5-5.5		72	59.70	3.90	52.50	66.00
5.5-6.5		76	63.50	4.00	56.70	69.20
6.5-7.5		73	67.00	4.10	60.40	73.50
7.5-8.5		64	70.00	3.60	63.00	74.90
8.5-9.5		79	73.60	4.50	66.30	79.90
9.5-10.5		74	76.00	4.10	70.30	84.20
10.5-11.5		93	79.30	5.30	71.30	88.20
11.5-12.5		91	82.30	5.30	74.20	90.70
12.5-13.5		97	86.50	5.40	78.90	96.00
13.5-14.5		80	89.40	5.30	81.10	97.50
14.5-15.5		87	91.50	4.60	84.10	99.10
15.5-16.5		63	94.00	6.20	84.60	104.30
16.5-17.5		74	95.30	6.20	84.70	106.10
17.5-19.0		43	96.00	6.90	85.70	108.00

DEFINITION

The maximum horizontal distance between the fingertips (centimetres) when both arms are stretched out sideways.

APPLICATION AND SUMMARY OF THE DATA

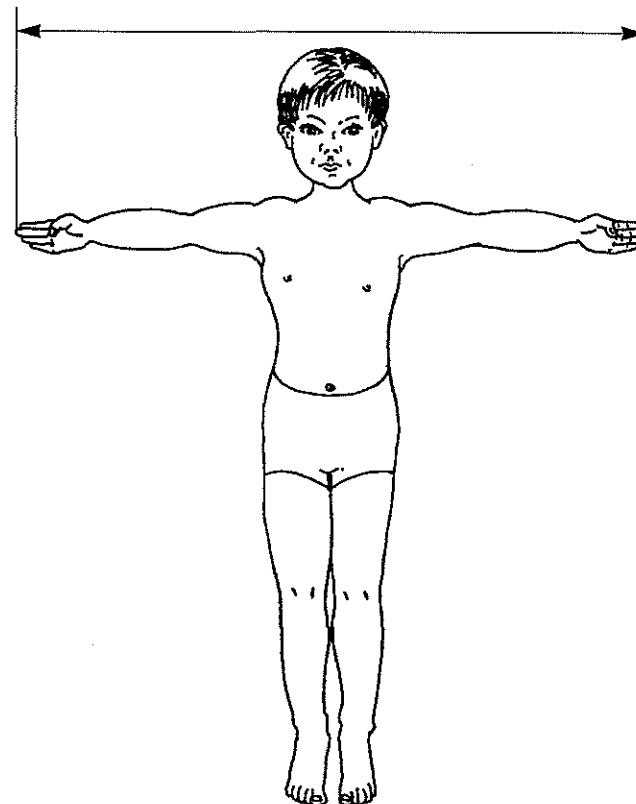
See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and the validity of these data for use with the current UK population. Functional anthropometric measurements do not account for stretching, twisting or forcing the body into different postures to achieve maximum reach.

SEE ALSO

Sideways reach to grip (standing), elbow span, arm length to grip, arm length to fingertip.

NUMBER OF SOURCES: 1

source	reference	country	age
1	Pheasant 1988	UK	2-18



source 1 of 1

Pheasant 1988

Country United Kingdom
Ages 2-18

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2	m		92.5	5.4	83.5	101.5
3	m		98.0	5.6	89.0	107.0
4	m		103.5	5.8	94.0	113.0
5	m		109.5	6.0	99.5	119.5
6	m		116.0	7.0	104.5	127.5
7	m		123.0	6.4	112.5	133.5
8	m		128.0	6.9	116.5	139.5
9	m		133.0	7.8	120.0	146.0
10	m		139.5	7.3	127.5	151.5
11	m		144.0	7.8	131.0	157.0
12	m		151.0	9.3	135.5	166.5
13	m		158.0	11.0	140.0	176.0
14	m		167.0	11.4	148.0	186.0
15	m		174.0	10.9	156.0	192.0
16	m		178.5	8.8	164.0	193.0
17	m		179.5	8.1	166.0	193.0
18	m		181.0	7.1	169.5	192.5

continued

source 1 of 1 continued

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2	f		86.5	4.9	78.5	94.5
3	f		94.0	5.6	85.0	103.0
4	f		101.5	6.3	91.0	112.0
5	f		106.0	6.4	95.5	116.5
6	f		112.0	6.8	101.0	123.0
7	f		119.5	6.2	109.5	129.5
8	f		125.0	6.0	115.0	135.0
9	f		130.0	7.4	118.0	142.0
10	f		136.5	7.7	124.0	149.0
11	f		141.5	8.7	127.0	156.0
12	f		148.0	9.6	132.0	164.0
13	f		154.0	9.3	138.5	169.5
14	f		158.0	7.9	145.0	171.0
15	f		160.0	6.7	149.0	171.0
16	f		161.0	6.7	150.0	172.0
17	f		161.5	6.4	151.0	172.0
18	f		162.0	6.2	152.0	172.0

DEFINITION

The subject stretches out both upper limbs sideways and flexes the elbows so that the fingertips touch the chest. The distance between the tips of the elbow is measured (centimetres).

APPLICATION AND SUMMARY OF THE DATA

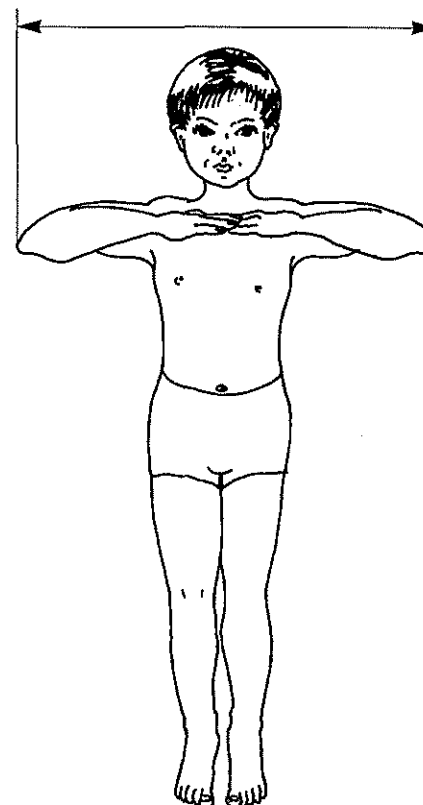
See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and the validity of these data for use with the current UK population. Functional anthropometric measurements do not account for stretching, twisting or forcing the body into different postures to achieve maximum reach.

SEE ALSO

Span, elbow breadth

NUMBER OF SOURCES: 1

source	reference	country	age
1	Pheasant 1988	UK	2-18



source 1 of 1

Pheasant 1988

Country_ United Kingdom
Ages 2-18

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2	m		49.0	3.1	43.5	54.0
3	m		51.5	3.2	46.5	107.0
4	m		54.5	3.3	49.0	60.0
5	m		57.5	3.4	52.0	63.5
6	m		61.0	4.0	54.5	67.5
7	m		65.0	3.6	59.0	71.0
8	m		67.5	3.9	61.0	74.0
9	m		70.0	4.4	63.0	77.5
10	m		73.5	4.1	66.5	80.5
11	m		76.0	4.4	68.5	83.0
12	m		79.5	5.3	71.0	88.5
13	m		83.5	6.2	73.0	93.5
14	m		88.0	6.5	77.5	98.5
15	m		91.5	6.2	81.5	102.0
16	m		94.0	5.0	86.0	102.5
17	m		94.5	4.6	87.0	102.0
18	m		95.5	4.0	89.0	102.0

continued

source 1 of 1 continued

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2	f		45.5	3.0	41.0	50.5
3	f		49.5	3.4	44.0	55.5
4	f		53.5	3.8	47.5	60.0
5	f		56.0	3.9	49.5	62.5
6	f		59.0	4.1	52.5	66.0
7	f		63.0	3.8	57.0	69.5
8	f		66.0	3.6	60.0	72.0
9	f		68.5	4.5	61.5	76.0
10	f		72.0	4.7	64.5	80.0
11	f		75.0	5.3	66.0	83.5
12	f		78.0	5.8	68.5	88.0
13	f		81.5	5.6	72.0	90.5
14	f		83.5	4.8	75.5	91.5
15	f		84.5	4.1	78.0	91.0
16	f		85.0	4.1	78.5	92.0
17	f		85.5	3.9	79.0	91.5
18	f		85.5	3.8	79.5	92.0

DEFINITION

The subject stands erect facing a wall with palms of hands resting lightly against the wall at shoulder level for balance. The subject raises the right foot to the maximum possible height from the floor. The maximum distance (centimetres) from the floor to the ball of the foot is measured.

APPLICATION AND SUMMARY OF THE DATA

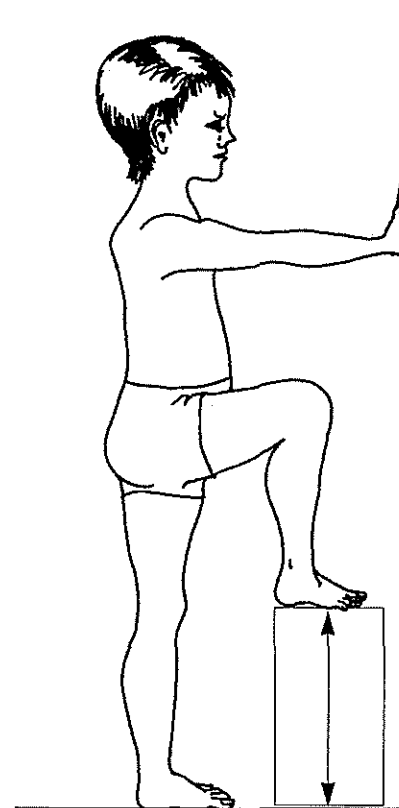
Three sources of data have been included to allow comparison between different countries and different age groups. Of the sources, Snyder (1977) is probably more appropriate for use with the current UK population. See sections 2 and 4 of the introduction to the databank for guidance on how to apply data and choose between different sources. Functional anthropometric measurements do not account for stretching, twisting or forcing the body into different postures to achieve maximum movement.

SEE ALSO

Jumping upwards, jumping over a barrier, climbing fences

NUMBER OF SOURCES: 3

source	reference	country	age
1	Snyder 1977	US	2-19
2	Steenbekkers 1989	NL	1-2
3	Steenbekkers 1993	NL	1-5.5



source 1 of 3

Snyder 1977

Country United States
Ages 2-19

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
2-3.5	mf	55	33.30	6.80	22.40	45.10
3.5-4.5		74	39.60	6.40	30.50	51.70
4.5-5.5		75	42.90	6.50	31.90	53.00
5.5-6.5		74	50.40	6.00	40.30	59.80
6.5-7.5		74	52.60	7.30	40.20	63.30
7.5-8.5		63	54.90	7.40	42.00	64.90
8.5-9.5		80	56.90	6.60	45.80	68.80
9.5-10.5		75	58.50	7.10	46.40	70.40
10.5-11.5		96	61.30	7.50	49.60	73.80
11.5-12.5		91	62.10	8.60	47.50	76.50
12.5-13.5		98	63.50	6.80	51.60	75.20
13.5-14.5		78	65.80	6.10	54.00	75.80
14.5-15.5		88	64.00	8.10	48.80	75.70
15.5-16.5		62	66.70	9.20	51.60	80.70
16.5-17.5		73	68.80	8.60	55.20	82.60
17.5-19		44	68.10	6.90	55.90	77.90

source 2 of 3

Steenbekkers 1989

Country Netherlands
Ages 1-2

age	sex	n	mean (cm)	sd	5th%ile	95th%ile
1-1.5	mf	33	24.50	4.10	18.00	32.50
1.5-2		80	26.60	4.40	20.80	35.10

source 3 of 3

Steenbekkers 1993

Country Netherlands
Ages 2-12

age	sex	n	mean (cm)	sd	3rd%ile	97th%ile
2	m	81	33.7	5.7	24.3	43.5
3		97	39.7	6.4	27.7	54.3
4		85	41.7	7.3	30.5	55.4
5		86	47.0	8.1	31.0	61.6
6		98	50.4	8.4	34.2	66.5
7		106	52.6	8.4	36.4	68.8
8		96	54.8	7.1	42.0	67.2
9		122	59.7	6.7	46.7	73.5
10		134	61.0	8.4	39.7	77.9
11		143	62.8	7.5	51.1	75.9
12		78	65.2	7.0	51.0	79.5
2	f	92	34.3	5.4	24.8	45.1
3		86	38.6	6.5	25.2	48.5
4		79	41.5	7.9	23.8	54.0
5		94	45.1	8.4	28.4	61.6
6		92	52.1	7.9	36.9	69.0
7		93	54.1	8.0	41.1	71.0
8		95	57.3	7.8	40.9	75.4
9		122	59.4	8.7	40.4	75.9
10		136	61.9	7.2	48.2	74.3
11		151	63.6	7.5	49.8	76.8
12		79	66.8	8.2	52.0	79.3

Section 3.1

Physical abilities: Strength

Pushing forwards 148

DEFINITION

The maximum static force that be exerted in a forwards direction with either the palm, one or two hands and against a variety of objects.

APPLICATION AND SUMMARY OF THE DATA

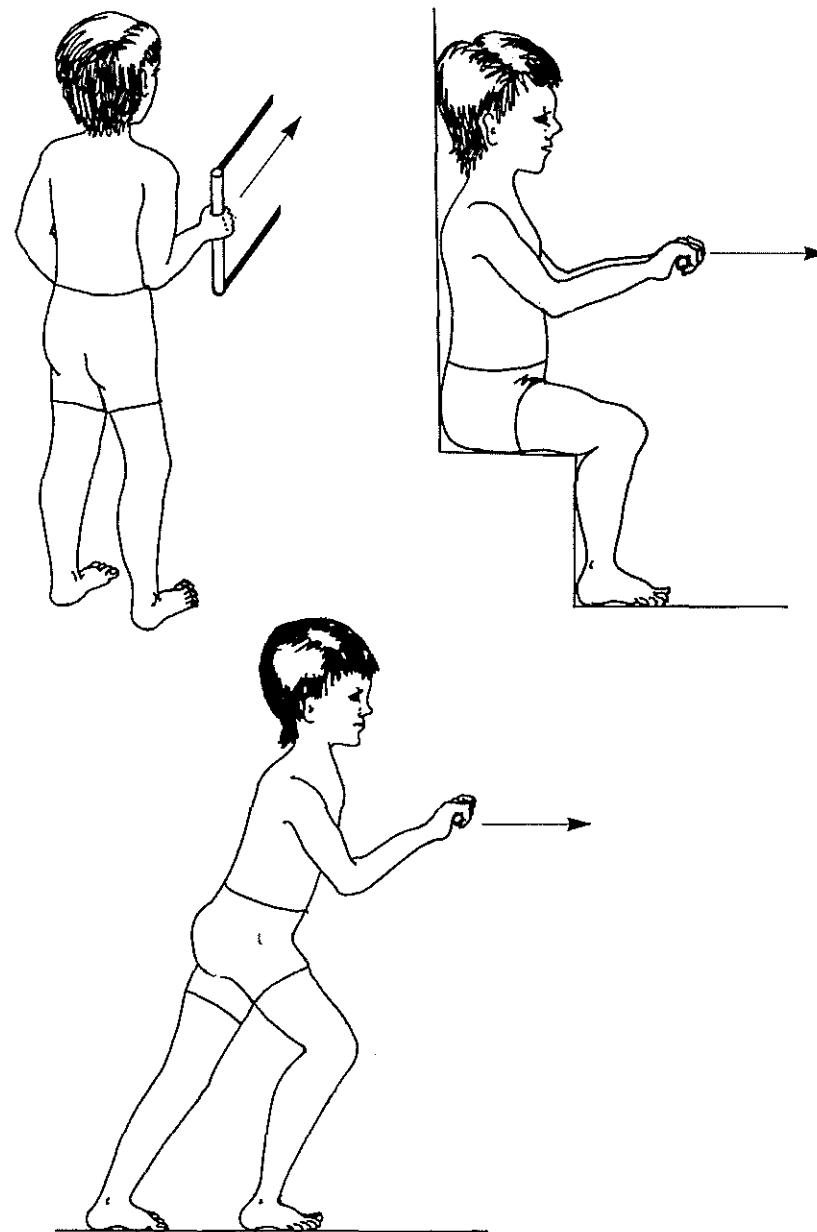
The eight sources of data compare pushing strength when applied to a variety of 'handles' and using different postures. These details should be used to select the data which most closely match the intended design application since posture, number of hands used and the height, size and shape of the handle will all affect the maximum strength that can be exerted. The data sources present results on children over two years only as maximum strength is difficult to measure on children younger than this.

SEE ALSO

pushing sideways, pushing downwards, pushing forwards with the feet

NUMBER OF SOURCES: 8

source	details	reference	country	age
1	On a horizontal bar, standing	DeWinter 1994	NL	4-12 yrs
2	On a horizontal bar, sitting	DeWinter 1994	NL	4-12 yrs
3	On a vertical handle	McClelland 1976	UK	5-13 yrs
4	On a circular 'Yale'-type door knob	McClelland 1976	UK	5-13 yrs
5	Spherical knob/rubber cylinder on a pivoted lever	Brown 1973	US	2-6 yrs
6	On a circular knob	Krogman 1971	US	3-6 yrs
7	Thrusting forward (object unknown)	Jones 1949	US	11-13 yrs
8	Object unknown	Malina, unpub.	US	6-13 yrs



source1 of 8

DeWinter 1994

Country Netherlands
Ages 4-12
Sample 203

Pushing forwards (Newtons) with two hands on a horizontal bar whilst standing. The bar was placed at elbow height and an equivalent distance away from the body. Maximum peak loads measured and the mean of the two highest recordings recorded.

age	sex	n	mean	sd	min	max
4	m	11	148	42.3	59	242
5	m	19	191	37.4	122	289
6	m	5	195	35.8	142	250
7	m	12	274	35.6	214	344
8	m	15	282	47.3	170	377
9	m	14	366	80.9	245	550
10	m	8	391	90.6	252	596
11	m	10	432	154.9	279	896
12	m	14	540	153.2	330	1019
4	f	9	120	27.5	80	167
5	f	16	151	37.8	59	225
6	f	8	184	36.3	96	246
7	f	13	275	52.5	205	413
8	f	9	265	51.1	173	340
9	f	14	319	71.1	196	544
10	f	5	479	67.8	375	583
11	f	13	386	56.1	289	504
12	f	8	420	99.8	320	622

source 2 of 8

DeWinter 1994

Country Netherlands
Ages 4-12
Sample 203

Pushing forwards (Newtons) with two hands on a horizontal bar whilst sitting. The bar was placed so that the lower arm is horizontal and with an angle of 135° between the lower and upper arm. Maximum peak loads measured and the mean of the two highest recordings recorded.

age	sex	n	mean	sd	min	max
4	m	11	193	55.2	100	264
5	m	19	245	86.5	37	413
6	m	5	299	46.7	236	367
7	m	12	379	56.8	228	494
8	m	15	378	72.7	226	497
9	m	14	502	115.3	330	778
10	m	8	532	78.1	392	639
11	m	10	518	119.1	266	673
12	m	14	674	174.6	351	981
4	f	9	215	78.9	102	362
5	f	16	221	109.8	52	443
6	f	8	296	57.1	173	360
7	f	13	331	99	160	583
8	f	9	416	89.7	222	535
9	f	14	477	104.5	262	687
10	f	5	603	84.4	501	756
11	f	13	490	93.9	324	648
12	f	8	498	95.5	361	657

SOURCE 4 of 8

McClelland 1976

Country UK
Ages 5-13
Sample 269
Pushing forward (Newtons) on a circular 'Yale'-type door knob with one (preferred) hand at a variety of heights. Report provides additional data at other handle heights.

age	sex	n	mean	sd	5th%ile	95th%ile
door knob height 660mm:						
5	m	3	85.00	10.0	68.00	
6	m	10	98.00	59.0	n/a	
7	m	3	89.00	12.0	70.00	
8	m	8	133.00	44.0	60.00	
9	m	8	229.00	49.0	148.00	
10	m	1	173.00	n/a	n/a	
11	m	4	156.00	82.0	21.00	
6	f	3	92.00	44.0	19.00	
7	f	8	118.00	51.0	34.00	
8	f	4	32.00	12.0	13.00	
9	f	4	92.00	42.0	22.00	
10	f	8	124.00	55.0	34.00	
door knob height 830mm:						
12	m	1	209.00	n/a	n/a	
13	m	9	297.00	65.0	191.00	
12	f	5	158.00	66.0	50.00	
13	f	5	188.00	72.0	71.00	

continued...

SOURCE 4 of 8 continued

age	sex	n	mean	sd	5th%ile	95th%ile
door knob height 1000mm:						
5	m	3	77.00	17.0	49.00	
6	m	10	58.00	26.0	15.00	
7	m	3	96.00	17.0	67.00	
8	m	8	115.00	30.0	66.00	
9	m	8	149.00	42.0	79.00	
10	m	1	138.00	n/a	n/a	
11	m	8	250.00	101.0	84.00	
6	f	3	70.00	24.0	30.00	
7	f	8	69.00	27.0	25.00	
8	f	4	39.00	11.0	20.00	
9	f	4	110.00	49.0	29.00	
10	f	8	144.00	64.0	39.00	
door knob height 1300mm:						
12	m	1	208.00	n/a	n/a	
13	m	9	348.00	137.00	123.00	
12	f	5	166.00	32.0	113.00	
13	f	5	150.00	17.0	121.00	

Section 3.1

Physical abilities: Strength

Pushing forwards 148

SOURCE 3 of 8

McClelland 1976

Country UK

Ages 5-13

Sample 269

Pushing forward (Newtons) on a vertical handle with one (preferred) hand at a range of heights, standing. Report provides additional data at other handle heights.

age	sex	n	mean	sd	5th%ile	95th%ile
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handle height 660mm:

5	m	15	96.00	18.0	66.00	
6	m	18	113.00	34.0	57.00	
7	m	16	124.00	35.0	66.00	
8	m	14	176.00	54.0	87.00	
9	m	14	180.00	62.0	78.00	
10	m	16	192.00	118.0	-2.00	
11	m	4	222.00	55.0	131.00	

5	f	13	71.00	21.0	37.00	
6	f	17	94.00	35.0	37.00	
7	f	15	110.00	32.0	57.00	
8	f	20	128.00	40.0	61.00	
9	f	15	157.00	47.0	79.00	
10	f	21	147.00	76.0	22.00	
11	f	8	141.00	34.0	85.00	

handle height 830mm:

12	m	13	275.00	55.0	185.00	
13	m	14	272.00	69.0	159.00	

12	f	10	193.00	47.0	116.00	
13	f	16	205.00	66.0	97.00	

continued...

SOURCE 3 of 8 *continued*

age	sex	n	mean	sd	5th%ile	95th%ile
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handle height 1000mm:

5	m	15	90.00	33.0	36.00	
6	m	18	109.00	40.0	43.00	
7	m	16	126.00	46.0	51.00	
8	m	14	150.00	33.0	96.00	
9	m	14	187.00	57.0	93.00	
10	m	16	178.00	50.0	95.00	
11	m	8	219.00	58.0	123.00	

5	f	13	73.00	27.0	29.00	
6	f	17	93.00	39.0	28.00	
7	f	15	116.00	38.0	54.00	
8	f	20	124.00	39.0	61.00	
9	f	15	149.00	41.0	82.00	
10	f	21	152.00	37.0	92.00	
11	f	14	191.00	51.0	106.00	

handle height 1300mm:

12	m	13	237.00	42.0	168.00	
13	m	14	297.00	93.0	145.00	

12	f	10	173.00	47.0	95.00	
13	f	16	177.00	50.0	95.00	

Section 3.1

Physical abilities: Strength

Pushing forwards 148

SOURCE 5 of 8

Brown 1973

Country USA

Ages 2-6

Sample 500

Pushing forward (Newtons) on a either a spherical knob or rubber cylinder attached to a pivoted vertical lever. Measured over three trials. No restrictions were placed on posture or procedure and subjects could use one or two hands. Sample described as consisting of 20% black subjects.

age	sex	n	mean	sd	5th%ile	95th%ile
2	m	50	62.00	30.00	105.00	
3	m	50	81.00	47.00	125.00	
4	m	50	145.00	71.00	252.00	
5	m	50	176.00	91.00	269.00	
6	m	50	209.00	131.00	281.00	
2	f	50	49.00	30.00	88.00	
3	f	50	74.00	18.00	131.00	
4	f	50	117.00	56.00	202.00	
5	f	50	153.00	95.00	235.00	
6	f	50	175.00	111.00	357.00	

SOURCE 6 of 8

Krogman 1971

Country USA

Ages 3-6

Sample 1803

Pushing forward (Pounds) with the palm of one (preferred) hand on a circular knob. Measurements were made before and after a demonstration of how to carry out the task, although no significant differences were found between the two. Results presented here are those before the demonstration. Report presents results according to geographical location and race. Results presented here are from white subjects living in California, the maximum data.

age	sex	n	mean	sd	5th%ile	95th%ile
3	m	53	12.40	8.0		
4	m	81	19.20	8.3		
5	m	79	27.00	12.3		
6	m	59	29.00	9.0		
3	f	60	11.50	6.5		
4	f	83	17.20	7.5		
5	f	55	22.30	9.3		
6	f	48	26.90	10.1		

Section 3.1

Physical abilities: Strength

Pushing forwards 148

SOURCE 7 of 8

Jones 1949

Country USA
Ages 11-13
Sample
Pushing forward (Kilogrammes) with the arm in a thrusting action. Californian children; ages are +/- 0.25 years.

age	sex	n	mean	sd	5th%ile	95th%ile
11	m		21.86	4.8		
12	m		22.14	5.0		
13	m		24.30	5.3		
11	f		21.00	5.8		
12	f		22.86	6.3		
13	f		24.39	6.4		

SOURCE 8 of 8

Malina, unpublished

Country USA
Ages 6-13
Sample 2844
Pushing forward (Pounds). Philadelphia children. Other details unknown.

age	sex	n	mean	sd	5th%ile	95th%ile
'white' subjects:						
6	m		22.13	9.7		
7	m		28.62	9.9		
8	m		32.70	10.1		
9	m		39.94	12.0		
10	m		46.80	12.2		
11	m		51.69	12.1		
12	m		56.55	12.8		
6	f		19.94	8.9		
7	f		24.13	9.3		
8	f		27.74	9.9		
9	f		33.74	9.8		
10	f		38.07	10.5		
11	f		39.84	11.0		
12	f		42.56	14.0		
'black' subjects:						
6	m		21.07	8.8		
7	m		26.73	9.1		
8	m		34.62	10.0		
9	m		43.83	11.6		
10	m		49.77	12.0		
11	m		53.83	12.8		
12	m		60.79	13.6		
13	m		61.16	9.6		
6	f		16.85	7.5		
7	f		21.97	8.1		
8	f		27.76	8.4		
9	f		31.75	8.9		
10	f		38.72	10.7		
11	f		42.45	13.3		
12	f		46.82	15.0		
13	f		54.39	12.8		

Section 3.1

Physical abilities: Strength

Pushing downwards 149

DEFINITION

The maximum static force that can be exerted in a downwards direction by one hand on a variety of objects.

APPLICATION AND SUMMARY OF THE DATA

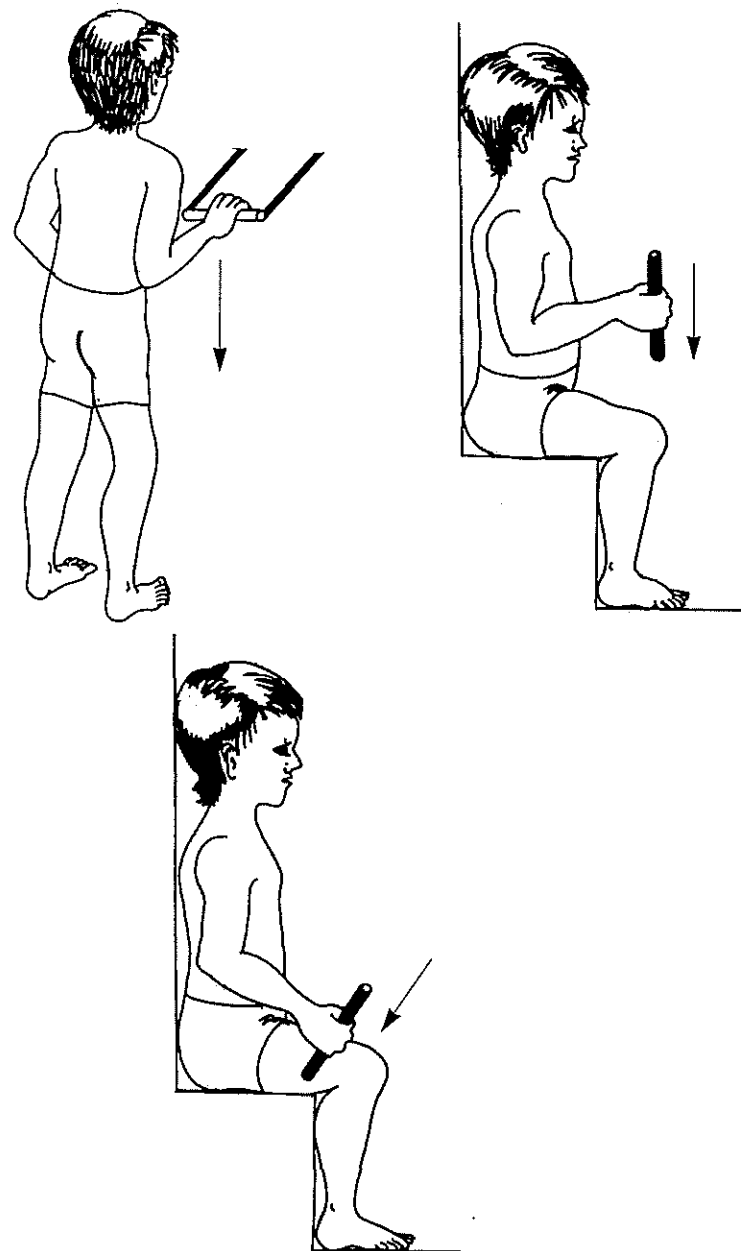
The three sources of data compare pushing strength when applied to a variety of 'handles' and using different postures. These details should be used to select the data which most closely match the intended design application since posture, number of hands used and the height, size and shape of the handle will all affect the maximum strength that can be exerted. Data from Owings are less functional and represent isolated elbow strength. The data sources present results on children over two years only as maximum strength is difficult to measure on children younger than this.

SEE ALSO

pushing forwards, pushing sideways

NUMBER OF SOURCES: 3

source	details	reference	country	age
1	On a horizontal handle	McClelland 1976	UK	5-13
2	On a door knob	McClelland 1976	UK	5-13
3	Static push with arm bent	Owings 1977	US	2-10



Section 3.1Physical abilities: StrengthPushing downwards 149

SOURCE 1 of 3

McClelland 1976

Country UK
Ages 5-13
Sample 269
Pushing down (Newtons) on a horizontal handle with one (preferred) hand, with palm on top surface of the handle, at a range of heights, standing. Report provides additional data at other handle heights.

age	sex	n	mean	sd	5th%ile	95th%ile
handle height 660mm:						
5	m	15	110.00	25.0	69.00	
6	m	18	121.00	36.0	62.00	
7	m	16	164.00	33.0	109.00	
8	m	14	188.00	23.0	150.00	
9	m	14	231.00	68.0	118.00	
10	m	16	240.00	51.0	156.00	
11	m	4	307.00	16.0	281.00	
5	f	13	72.00	22.0	36.00	
6	f	17	109.00	40.0	43.00	
7	f	15	143.00	18.0	114.00	
8	f	20	165.00	43.0	95.00	
9	f	15	199.00	39.0	135.00	
10	f	21	210.00	69.0	95.00	
11	f	8	301.00	49.0	221.00	
handle height 830mm:						
12	m	13	331.00	71.0	215.00	
13	m	14	418.00	105.0	245.00	
12	f	10	275.00	75.0	151.00	
13	f	16	335.00	70.0	219.00	

continued...

SOURCE 1 of 3 continued

age	sex	n	mean	sd	5th%ile	95th%ile
handle height 1000mm:						
5	m	15	90.00	24.0	50.00	
6	m	18	100.00	26.0	57.00	
7	m	16	122.00	25.0	81.00	
8	m	14	136.00	30.0	87.00	
9	m	14	147.00	31.0	95.00	
10	m	16	145.00	57.0	52.00	
11	m	8	248.00	38.0	185.00	
5	f	13	65.00	23.0	26.00	
6	f	17	85.00	31.0	35.00	
7	f	15	105.00	25.0	64.00	
8	f	20	108.00	32.0	55.00	
9	f	15	129.00	44.0	57.00	
10	f	21	121.00	55.0	31.00	
11	f	14	196.00	34.0	140.00	
handle height 1300mm:						
12	m	13	219.00	94.0	64.00	
13	m	14	395.00	125.0	189.00	
12	f	10	238.00	49.0	157.00	
13	f	16	248.00	80.0	116.00	

Section 3.1

Physical abilities: Strength

Pushing downwards 149

SOURCE 2 of 3

McClelland 1976

Country UK

Ages 5-13

Sample 269

Pushing (Newtons) down on an oval 'Yale'-type door knob with one (preferred) hand at a variety of heights, standing. Report provides additional data at other handle heights.

age	sex	n	mean	sd	5th%ile	95th%ile
door knob height 660mm:						
5	m	5	8.00	2.0	4.00	
6	m	7	12.00	3.0	7.00	
7	m	9	13.00	4.0	7.00	
8	m	2	16.00	5.0	7.00	
10	m	10	21.00	5.0	13.00	
5	f	4	5.00	1.0	3.00	
6	f	1	11.00	n/a	n/a	
7	f	7	10.00	3.0	5.00	
8	f	7	15.00	4.0	8.00	
10	f	10	18.00	3.0	13.00	

door knob height 830mm:

12	m	8	29.00	7.0	18.00	
13	m	4	39.00	9.0	24.00	
12	f	2	25.00	n/a	n/a	
13	f	7	28.00	5.0	20.00	

continued

SOURCE 2 of 3 continued

age	sex	n	mean	sd	5th%ile	95th%ile
door knob height 1000mm:						
5	m	5	9.00	4.0	3.00	
6	m	7	10.00	4.0	4.00	
7	m	9	11.00	2.0	7.00	
8	m	2	7.00	1.0	6.00	
10	m	10	15.00	6.0	5.00	
5	f	4	6.00	2.0	2.00	
6	f	1	7.00	n/a	n/a	
7	f	7	9.00	4.0	3.00	
8	f	7	12.00	3.0	6.00	
10	f	10	13.00	4.0	6.00	
door knob height 1300mm:						
12	m	8	21.00	5.0	13.00	
13	m	4	34.00	6.0	23.00	
12	f	2	19.00	2.0	15.00	
13	f	7	17.00	3.0	12.00	

SOURCE 3 of 3

Owings 1977
country USA
Ages 2-10
Sample 104
Right arm extension torque (Kgf-cm) was measured by pushing arm down whilst seated. The hand gripped a 2.5cm diameter handle, wrist in neutral position, with upper arm held at side of body, shoulder abducted 50 and with the elbow at a variety of angles. Report presents data recorded at angles additional to those presented here (135 and 157.5 degrees).

age	sex	n	mean	sd	5th%ile	95th%ile
67.5 degrees (measured between upper and lower arm - see illustrations)						
2.5-3.5	mf	7	72.3	35.8		
3.5-4.5	mf	9	72	18.3		
4.5-5.5	mf	15	90.7	31.3		
5.5-6.5	mf	23	82.4	21.9		
6.6-7.5	mf	13	93.9	37.8		
7.5-8.5	mf	15	123.7	29.6		
8.5-9.5	mf	14	140.5	43.1		
9.5-10.5	mf	8	158.3	62.3		
90 degrees						
2.5-3.5	mf	7	77	35.1		
3.5-4.5	mf	9	67.3	15		
4.5-5.5	mf	15	106	49.3		
5.5-6.5	mf	23	108.2	30.5		
6.6-7.5	mf	13	121.2	34.2		
7.5-8.5	mf	15	149.2	39.8		
8.5-9.5	mf	14	169.1	50.6		
9.5-10.5	mf	8	191.1	96.4		
continued						

SOURCE 3 of 3 continued

age	sex	n	mean	sd	5th%ile	95th%ile
112.5 degrees						
2.5-3.5	mf	7	108.4	28.3		
3.5-4.5	mf	9	91.7	21.2		
4.5-5.5	mf	15	133.6	43.2		
5.5-6.5	mf	23	138.1	48.3		
6.6-7.5	mf	13	176.3	57.2		
7.5-8.5	mf	15	208.8	58.7		
8.5-9.5	mf	14	231.1	55.6		
9.5-10.5	mf	8	245.1	92.6		

Section 3.1

Physical abilities: Strength

Pushing sideways 150

DEFINITION

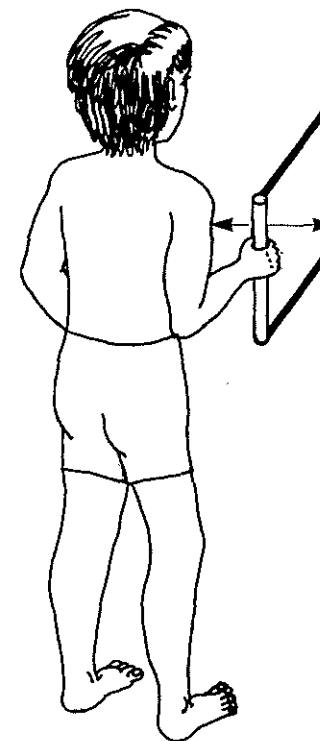
The maximum static force that can be exerted sideways, either to the left or right, with one hand on a vertical handle.

APPLICATION AND SUMMARY OF THE DATA

The data relate to pushing strength applied to a specific design of handle. The details of the measurement (eg posture, handle height) should be used to decide how applicable the data are to the intended design since posture, number of hands used, height, size and shape of the handle will all affect the maximum strength that can be exerted.

SEE ALSO

pushing downwards, pushing forwards



NUMBER OF SOURCES: 1

source	details	reference	country	age
1	push to left/right on vertical handle	McClelland 1976	UK	5-13

Section 3.1

Physical abilities: Strength

Pushing sideways 150

SOURCE 1 of 1

McClelland 1976

Country UK
Ages 5-13
Sample 239
Push (Newtons) to the left or right on a vertical handle with one (preferred) hand placed at a variety of heights, standing and facing forwards (ie not in the direction of the push). Report provides additional data at other handle heights.

PUSH TO THE LEFT

age	sex	n	mean	sd	5th%ile	95th%ile
handle height 660mm:						
5	m	15		64.00	33.0	9.00
6	m	18		54.00	23.0	16.00
7	m	16		47.00	21.0	13.00
8	m	14		80.00	23.0	42.00
9	m	14		64.00	32.0	12.00
10	m	16		90.00	42.0	21.00
11	m	4		114.00	18.0	85.00
5	f	13		50.00	30.0	2.00
6	f	17		56.00	19.0	25.00
7	f	15		63.00	16.0	36.00
8	f	20		58.00	29.0	10.00
9	f	15		65.00	26.0	22.00
10	f	21		73.00	23.0	34.00
11	f	8		103.00	41.0	36.00

handle height 830mm

12	m	13		90.00	17.0	62.00
13	m	14		115.00	49.0	35.00
12	f	10		66.00	26.0	22.00
13	f	16		76.00	30.0	27.00

continued...

SOURCE 1 of 1 continued

age	sex	n	mean	sd	5th%ile	95th%ile
handle height 1000mm:						
5	m	15		55.00	25.0	13.00
6	m	18		48.00	14.0	25.00
7	m	16		51.00	31.0	n/a
8	m	14		68.00	23.0	30.00
9	m	14		65.00	19.0	33.00
10	m	16		74.00	37.0	14.00
11	m	8		122.00	38.0	60.00
5	f	13		39.00	17.0	11.00
6	f	17		45.00	25.0	5.00
7	f	16		62.00	20.0	28.00
8	f	20		45.00	21.0	11.00
9	f	15		60.00	23.0	21.00
10	f	21		61.00	26.0	19.00
11	f	14		72.00	29.0	24.00
handle height 1300mm						
12	m	13		81.00	27.0	35.00
13	m	14		113.00	36.0	54.00
12	f	10		69.00	32.0	17.00
13	f	16		67.00	24.0	28.00

continued...

Section 3.1

Physical abilities: Strength

Pushing sideways 150

SOURCE 1 of 1 *continued*

PUSH TO THE RIGHT

age	sex	n	mean	sd	5th%ile	95th%ile
handle height 660mm:						
5	m	15		25.00	16.0	-1.00
6	m	18		34.00	17.0	5.00
7	m	16		31.00	11.0	12.00
8	m	14		34.00	13.0	13.00
9	m	14		31.00	12.0	12.00
13	m	16		34.00	18.0	5.00
10	m	4		49.00	27.0	4.00
11	m	13		78.00	29.0	31.00
5	f	13		19.00	12.0	-1.00
6	f	17		24.00	17.0	-4.00
7	f	15		23.00	8.0	9.00
8	f	20		24.00	8.0	11.00
9	f	15		25.00	11.0	7.00
10	f	21		36.00	20.0	4.00
11	f	8		27.00	8.0	14.00
handle height 830mm						
12	m	14		86.00	29.0	39.00
12	f	10		35.00	15.0	11.00
13	f	16		47.00	20.0	14.00

*continued...*SOURCE 1 of 1 *continued*

age	sex	n	mean	sd	5th%ile	95th%ile
handle height 1000mm:						
5	m	15		26.00	12.0	5.00
6	m	18		28.00	12.0	8.00
7	m	16		25.00	8.0	11.00
8	m	14		31.00	15.0	7.00
9	m	14		43.00	18.0	15.00
10	m	16		41.00	22.0	5.00
11	m	8		50.00	9.0	34.00
5	f	13		21.00	8.0	7.00
6	f	17		21.00	11.0	3.00
7	f	15		25.00	9.0	10.00
8	f	20		27.00	10.0	11.00
9	f	15		31.00	13.0	10.00
10	f	21		38.00	17.0	9.00
11	f	14		40.00	13.0	19.00
handle height 1300mm:						
12	m	13		62.00	26.0	19.00
13	m	14		81.00	41.0	14.00
12	f	10		40.00	16.0	14.00
13	f	16		45.00	18.0	15.00

Section 3.1

Physical abilities: Strength

Pulling 151

DEFINITION

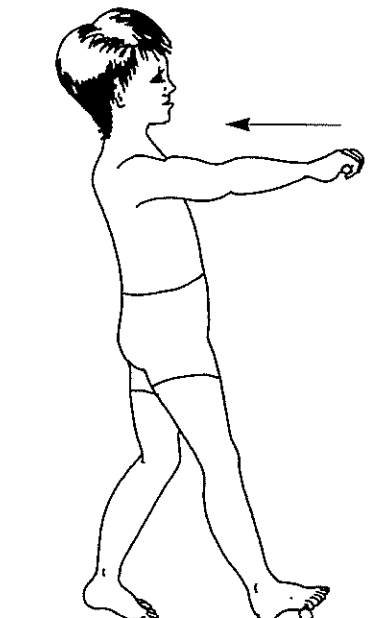
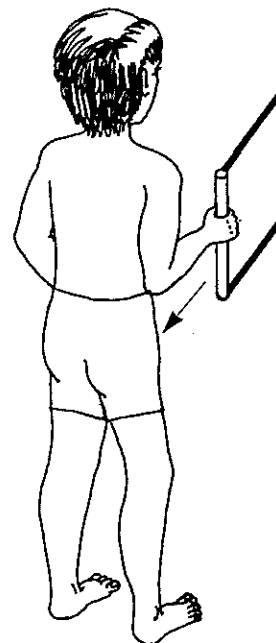
The maximum static force that can be exerted by pulling towards the body on a variety of objects with either one or two hands.

APPLICATION AND SUMMARY OF THE DATA

The five sources of data compare pulling strength when applied to a variety of 'handles' and using different postures. These details should be used to select the data which most closely match the intended design application since posture, number of hands used and the height, size and shape of the handle will all affect the maximum strength that can be exerted. The data sources present results on children over two years only as maximum strength is difficult to measure on children younger than this.

SEE ALSO

lifting strength, shear strength.



NUMBER OF SOURCES: 5

source	details	reference	country	age
1	Either spherical knob/rubber cylinder on a pivoted vertical lever	Brown 1973	US	2-6
2	On a horizontal bar	DeWinter 1994	NL	4-12
3	On a vertical handle	McClelland 1976	UK	5-13
4	On a circular door knob	McClelland 1976	UK	5-13
5	Details unknown	Malina, unpub	US	6-12

Section 3.1

Physical abilities: Strength

Pulling 151

SOURCE 1 of 5

Brown 1973
country USA
Ages 2-6
Sample 500

Pull (Newtons) on either spherical knob/rubber cylinder placed on a vertical pivoted lever. No restrictions were placed on posture or procedure and subjects could use either one or two hands. Sample described as consisting of 20% black children.

age	sex	n	mean	sd	5th%ile	95th%ile
2	m	50	103.00		40.00	171.00
3	m	50	122.00		56.00	191.00
4	m	50	180.00		107.00	269.00
5	m	50	220.00		126.00	282.00
6	m	50	250.00		171.00	296.00
2	f	50	90.00		53.00	167.00
3	f	50	121.00		78.00	176.00
4	f	50	160.00		85.00	258.00
5	f	50	204.00		107.00	269.00
6	f	50	224.00		145.00	282.00

SOURCE 2 of 5

DeWinter 1994
Country Netherlands
Ages 4-12
Sample 203

Tugging (Newtons) on a horizontal bar with two hands placed at elbow height, standing. The maximum peak load was measured and the mean of the two highest measurements were recorded.

age	sex	n	mean	sd	min	max
4	m	11	172	43.5	67	245
5	m	19	218	66.1	118	369
6	m	5	247	28.0	213	297
7	m	12	402	101.1	253	579
8	m	15	400	118.4	156	610
9	m	14	510	127.6	285	810
10	m	8	597	173.7	220	778
11	m	10	623	146	403	868
12	m	14	738	243.6	344	1274
4	f	9	144	43.2	49	204
5	f	16	182	69.4	97	396
6	f	8	246	96.4	115	475
7	f	13	351	109.5	216	693
8	f	9	400	127.6	193	670
9	f	14	433	118.2	267	705
10	f	5	538	106.1	428	717
11	f	13	582	152.5	297	869
12	f	8	566	160.5	249	832

Section 3.1

Physical abilities: Strength

Pulling 151

SOURCE 3 of 5

McClelland 1976

Country UK

Ages 5-13

Sample 269

Pull (Newtons) on a vertical handle with one (preferred) hand at a variety of heights, standing. Report presents additional data at other handle heights.

age	sex	n	mean	sd	5th%ile	95th%ile
handle height 660mm:						
5	m	15	113.00	29.0	65.00	
6	m	18	143.00	45.0	69.00	
7	m	16	159.00	43.0	89.00	
8	m	14	201.00	36.0	141.00	
9	m	14	242.00	58.0	146.00	
10	m	16	234.00	86.0	92.00	
11	m	4	394.00	64.0	289.00	
5	f	13	92.00	24.0	53.00	
6	f	17	117.00	38.0	54.00	
7	f	15	152.00	45.0	78.00	
8	f	20	152.00	45.0	79.00	
9	f	15	198.00	60.0	100.00	
10	f	21	189.00	76.0	64.00	
11	f	8	246.00	81.0	113.00	
handle height 830mm:						
12	m	13	300.00	58.0	203.00	
13	m	14	326.00	77.0	199.00	
12	f	10	251.00	70.0	137.00	
13	f	16	248.00	61.0	148.00	

continued

SOURCE 3 of 5 *continued*

age	sex	n	mean	sd	5th%ile	95th%ile
handle height 1000mm:						
5	m	15	120.00	26.0	77.00	
6	m	18	117.00	39.0	53.00	
7	m	16	135.00	30.0	86.00	
8	m	14	169.00	35.0	112.00	
9	m	14	215.00	58.0	120.00	
10	m	16	220.00	53.0	132.00	
11	m	8	310.00	73.0	189.00	
5	f	13	86.00	28.0	39.00	
6	f	17	106.00	29.0	58.00	
7	f	15	148.00	28.0	100.00	
8	f	20	143.00	28.0	97.00	
9	f	15	183.00	37.0	122.00	
10	f	21	184.00	49.0	104.00	
11	f	14	247.00	71.0	130.00	
handle height 1300mm:						
12	m	13	247.00	36.0	188.00	
13	m	14	286.00	65.0	179.00	
12	f	10	219.00	70.0	103.00	
13	f	16	232.00	63.0	129.00	

Section 3.1

Physical abilities: Strength

Pulling 151

SOURCE 4 of 5

McClelland 1976**Country** UK**Ages** 5-13**Sample** 269

Pull (Newtons) on a circular 'Yale'-type door knob with one (preferred) hand, standing. Report presents additional data at other handle heights.

age	sex	n	mean	sd	5th%ile	95th%ile
door knob height 660mm:						
5	m	3	62.00	15.0	37.00	
6	m	10	61.00	16.0	34.00	
7	m	3	61.00	13.0	39.00	
8	m	8	74.00	13.0	53.00	
9	m	8	87.00	13.0	66.00	
10	m	1	83.00	n/a	n/a	
11	m	4	110.00	34.0	54.00	
6	f	3	77.00	18.0	47.00	
7	f	8	66.00	12.0	47.00	
8	f	4	57.00	17.0	29.00	
9	f	4	80.00	24.0	40.00	
10	f	8	90.00	32.0	38.00	
door knob height 830mm:						
12	m	1	103.00	n/a	n/a	
13	m	9	126.00	40.0	61.00	
12	f	5	75.00	13.0	53.00	
13	f	5	91.00	9.0	76.00	

continued...

SOURCE 4 of 5 *continued*

age	sex	n	mean	sd	5th%ile	95th%ile
door knob height 1000mm:						
5	m	3	70.00	10.0	54.00	
6	m	10	55.00	19.0	24.00	
7	m	3	78.00	10.0	61.00	
8	m	8	70.00	15.0	44.00	
9	m	8	91.00	18.0	61.00	
10	m	1	77.00	n/a	n/a	
11	m	8	118.00	24.0	79.00	
6	f	3	60.00	21.0	25.00	
7	f	8	74.00	13.0	53.00	
8	f	4	55.00	23.0	17.00	
9	f	4	75.00	12.0	55.00	
10	f	8	98.00	31.0	47.00	
door knob height 1300mm:						
12	m	1	111.00	n/a	n/a	
13	m	9	101.00	29.0	53.00	
12	f	5	82.00	20.0	49.00	
13	f	5	94.00	26.0	52.00	

Section 3.1

Physical abilities: Strength

Pulling 151

SOURCE 5 of 5

Malina, unpublished

Country USA
 Ages 6-13
 Sample 1396

Pull strength (Pounds), other details unknown. Philadelphia children.

age	sex	n	mean	sd	5th%ile	95th%ile
'white' subjects:						
6	m		22.06	9.0		
7	m		26.31	8.5		
8	m		30.06	8.4		
9	m		36.20	10.5		
10	m		39.72	10.3		
11	m		42.45	9.7		
12	m		49.01	9.7		
6	f		19.80	9.0		
7	f		22.90	8.0		
8	f		24.19	9.1		
9	f		29.53	8.1		
10	f		33.68	8.2		
11	f		36.16	9.0		
12	f		37.50	8.6		

continued...

SOURCE 5 of 5 *continued*

age	sex	n	mean	sd	5th%ile	95th%ile
'black' subjects:						
6	m		21.13	7.5		
7	m		26.04	7.8		
8	m		30.57	9.1		
9	m		37.71	9.8		
10	m		41.84	12.8		
11	m		46.52	13.1		
12	m		49.74	12.3		
13	m		49.64	9.2		
6	f		17.40	6.4		
7	f		21.51	8.3		
8	f		26.56	7.4		
9	f		28.23	7.8		
10	f		32.25	9.2		
11	f		35.57	11.3		
12	f		39.99	11.4		
13	f		45.82	10.3		

Section 3.1

Physical abilities: Strength

Lifting 152

DEFINITION

The maximum static force that can be exerted by pulling up with one hand on a variety of objects.

APPLICATION AND SUMMARY OF THE DATA

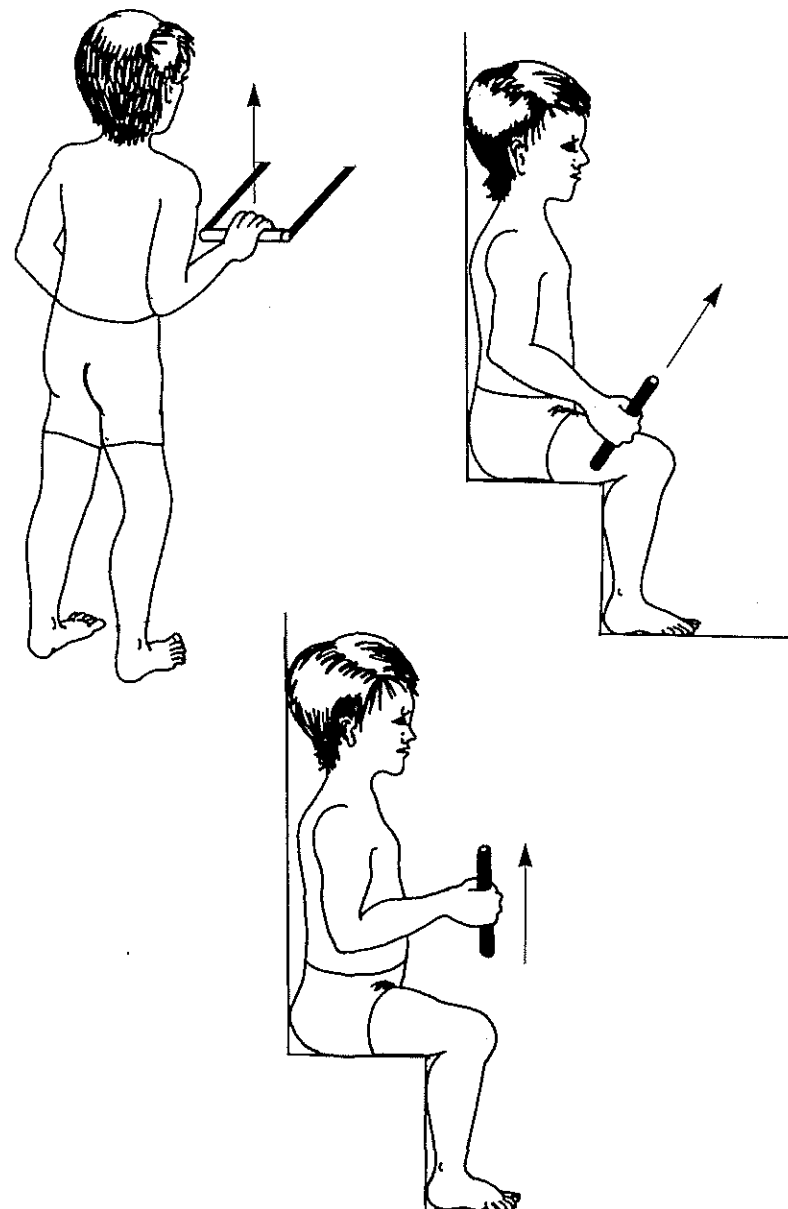
The three sources of data compare lifting strength when applied to a variety of 'handles' and using different postures. These details should be used to select the data which most closely match the intended design application since posture, number of hands used and the height, size and shape of the handle will all affect the maximum strength that can be exerted. Data from Owings are less functional and represent isolated elbow strength. The data sources present results on children over two years only as maximum strength is difficult to measure on children younger than this.

SEE ALSO

Pulling strength

NUMBER OF SOURCES: 3

source	details	reference	country	age
1	On a horizontal handle	McClelland 1976	UK	5-13
2	On an oval door knob	McClelland 1976	UK	5-13
3	Static lift with arm bent	Owings 1977	USA	2-10



Section 3.1

Physical abilities: Strength

Lifting 152

source 1 of 3

McClelland 1976

Country UK
Ages 5-13
Sample 269
Lifting strength (Newtons) on a horizontal handle using one (preferred) hand with the palm on the top surface of the handle, at a variety of heights, standing. Report presents additional data at other handle heights.

age	sex	n	mean	sd	5th%ile	95th%ile
handle height 660mm:						
5	m	15	115.00	34.0	59.00	
6	m	18	135.00	40.0	69.00	
7	m	16	212.00	53.0	125.00	
8	m	14	246.00	42.0	176.00	
9	m	14	308.00	77.0	182.00	
10	m	16	326.00	100.0	160.00	
11	m	4	502.00	73.0	382.00	
handle height 830mm:						
12	m	13	295.00	116.0	104.00	
13	m	14	455.00	181.0	156.00	
12	f	10	238.00	84.0	100.00	
13	f	16	269.00	127.0	60.00	

continued...

source 1 of 3 continued

age	sex	n	mean	sd	5th%ile	95th%ile
handle height 1000mm:						
5	m	15	56.00	21.0	21.00	
6	m	18	78.00	35.0	21.00	
7	m	16	107.00	43.0	36.00	
8	m	14	143.00	55.0	52.00	
9	m	14	175.00	53.0	88.00	
10	m	16	149.00	62.0	47.00	
11	m	8	291.00	95.0	135.00	
handle height 1300mm:						
5	f	13	36.00	22.0	n/a	
6	f	17	59.00	32.0	6.00	
7	f	15	77.00	25.0	35.00	
8	f	20	100.00	45.0	26.00	
9	f	15	123.00	46.0	48.00	
10	f	21	107.00	62.0	4.00	
11	f	14	167.00	56.0	74.00	
handle height 1300mm:						
12	m	13	179.00	105.0	6.00	
13	m	14	263.00	169.0	-14.00	
12	f	10	198.00	55.0	107.00	
13	f	16	161.00	123.0	-42.00	

Section 3.1

Physical abilities: Strength

Lifting 152

source 2 of 3

McClelland 1976

Country UK

Ages 5-13

Sample 269

Lifting strength (Newtons) on an oval 'Yale'-type door knob using one (preferred) hand at a variety of heights, standing. Report presents additional data at other handle heights.

age	sex	n	mean	sd	5th%ile	95th%ile
-----	-----	---	------	----	---------	----------

door knob height 660mm:

5	m	5	5.00	2.0	2.00	
6	m	7	9.00	2.0	6.00	
7	m	9	12.00	5.0	4.00	
8	m	2	10.00	3.0	6.00	
10	m	10	20.00	6.0	10.00	

5	f	4	4.00	1.0	2.00	
6	f	1	13.00	n/a	n/a	
7	f	7	7.00	3.0	3.00	
8	f	7	14.00	8.0	1.00	
10	f	10	16.00	6.0	7.00	

door knob height 830mm:

12	m	8	22.00	5.0	14.00	
13	m	4	32.00	9.0	17.00	

12	f	2	15.00	2.0	13.00	
13	f	7	19.00	1.0	17.00	

continued...

source 2 of 3 *continued*

age	sex	n	mean	sd	5th%ile	95th%ile
-----	-----	---	------	----	---------	----------

door knob height 1000mm:

5	m	5	5.00	2.0	1.00	
6	m	7	7.00	2.0	4.00	
7	m	9	9.00	3.0	4.00	
8	m	2	6.00	2.0	2.00	
10	m	10	12.00	8.0	-1.00	

5	f	4	2.00	1.0	2.00	
6	f	1	7.00	n/a	n/a	
7	f	7	6.00	3.0	2.00	
8	f	7	10.00	4.0	5.00	
10	f	10	9.00	4.0	2.00	

door knob height 1300mm:

12	m	8	19.00	6.0	10.00	
13	m	4	31.00	8.0	18.00	

12	f	2	13.00	1.0	11.00	
13	f	7	15.00	2.0	11.00	

source 3 of 3

Owings 1977

Country USA
Ages 2-10
Sample 104

Right arm flexion strength (torque in Kgf-cm) measured by trying to lift lower arm. Measured seated, with upper arm held at side of body, shoulder abducted 5° and with the elbow at a variety of angles, hand gripping a 2.5cm diameter handle, wrist neutral. The report presents data recorded at angles additional to those presented here (135 and 157.5 degrees).

age	sex	n	mean	sd	5th%ile	95th%ile
67.5 degrees (measured between upper and lower arm - see illustrations)						
2.5-3.5	mf	7	40.5	21.6		
3.5-4.5	mf	9	53.3	14.4		
4.5-5.5	mf	15	59.8	32.1		
5.5-6.5	mf	23	82.3	25.2		
6.6-7.5	mf	13	108.7	30.0		
7.5-8.5	mf	15	145.5	39.5		
8.5-9.5	mf	14	161.5	36.9		
9.5-10.5	mf	8	175.2	42.7		
90 degrees						
2.5-3.5	mf	7	54.6	24.8		
3.5-4.5	mf	9	76.6	8.9		
4.5-5.5	mf	15	84.9	28.2		
5.5-6.5	mf	23	113.1	29.6		
6.6-7.5	mf	13	135.2	34.9		
7.5-8.5	mf	15	172.5	48.4		
8.5-9.5	mf	14	189.8	39.2		
9.5-10.5	mf	8	237.5	36.7		

source 3 of 3 continued

age	sex	n	mean	sd	5th%ile	95th%ile
112.5 degrees						
2.5-3.5	mf	7	73.3	23.6		
3.5-4.5	mf	9	96.7	19.7		
4.5-5.5	mf	15	108.3	25.3		
5.5-6.5	mf	23	137.0	33.0		
6.6-7.5	mf	13	158.4	51.8		
7.5-8.5	mf	15	203.1	56.3		
8.5-9.5	mf	14	220.9	57.5		
9.5-10.5	mf	8	312.8	74.0		

DEFINITION

The maximum length of time that children are able to hang by the hands from an overhead horizontal bar with feet off the ground and arms either straight or bent.

APPLICATION AND SUMMARY OF THE DATA

The three sources of data compare strength from different countries and different age groups. The data sources present results on children over three years only as maximum strength is difficult to measure on children younger than this.

NUMBER OF SOURCES: 3

source	details	reference	country	age
1	arms straight	Gabbard 1980	US	3-5
2	arms bent	Branta 1984	US	5-13
3	arms bent	Paliczka 1986	UK	12-13

Section 3.1

Physical abilities: Strength

Hanging by the arms 153

SOURCE 1 of 3

Gabbard 1980

Country USA
Ages 3-5
Sample 103

Hanging time (in seconds) from a 0.5 inch diameter horizontal bar with arms straight, pronated grip (palms facing away) and feet at least 12cm from the ground. The best of two trials on seperate days.

age	sex	n	mean	sd	5th%ile	95th%ile
3	mf	38	45.50	21.8		
4	mf	34	70.00	24.2		
5	mf	31	90.40	22.3		

SOURCE 2 of 3

Branta 1984

Country USA
Ages 5-13
Sample 310

Hanging time (in seconds) with arms bent 90 degrees and palms facing away from the body. Subjects lifted onto a horizontal bar approximately 1 ft above their height. Hanging time was measured until the angle at the elbow became greater than 90 degrees.

age	sex	n	mean	sd	5th%ile	95th%ile
5	m		8.49	8.9		
6	m		11.34	8.6		
7	m		12.77	7.9		
8	m		17.43	13.5		
9	m		18.79	13.4		
10	m		20.64	14.2		
11	m		21.39	16.6		
12	m		23.24	18.1		
13	m		24.69	17.4		
5	f		16.57	18.1		
6	f		16.83	16.6		
7	f		15.75	9.7		
8	f		14.21	8.6		
9	f		13.55	9.0		
10	f		12.49	8.1		
11	f		11.25	8.4		
12	f		7.98	6.3		
13	f		18.95	10.5		

Section 3.1

Physical abilities: Strength

Hanging by the arms 153

SOURCE 3 of 3

Paliczka 1986
Country UK
Ages 12-13
Sample 2350

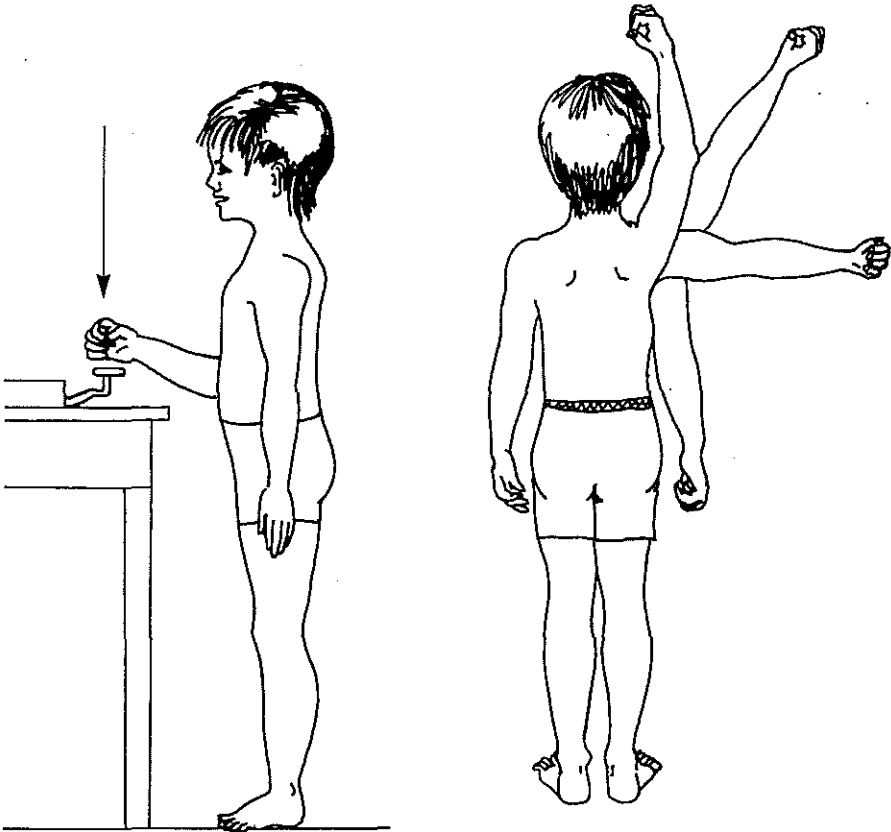
age	sex	n	mean	sd	5th%ile	95th%ile
Hanging time (in seconds) with arms bent						
12	m		263	18.00		
13	m		265	19.00		
12	f		295	9.00		
13	f		261	10.00		

DEFINITION
Striking force with the fist (kilogramme-force) at various positions and in different directions.

APPLICATION AND SUMMARY OF THE DATA
The data relate to the maximum striking force that can be applied in different positions around the body. The details of the measurement (eg posture, the part of the fist used to perform the strike) should be used to decide how applicable the data are to the intended design since these variables affect the maximum force that can be exerted. The maximum force that can be produced by using two hands plus body weight is likely to be higher than the results presented here.

NUMBER OF SOURCES: 1

source	details	reference	country	age
1		Gabbard 1985	USA	4-7



Section 3.1

Physical abilities: Strength

Hitting force 154

source 1 of 1

Gabbard 1985

Country USA
Ages 4-7
Sample 186

Striking force (kgf) was measured using one (dominant) fist onto a target padded with 1.25cm thick rubber. The best of two trials. No restrictions were made on posture or placement of feet, except that feet were kept within 25cm either side of target. Hitting force was measured in 5 in five different positions:

- 1 Downwards onto a table placed level with the waist. Contact was made with the radial (outside) surface of the hand using the little finger.
- 2 Horizontally into the wall directly above the head (with the arm fully abducted). Contact was made with radial (outside) surface of fist, using the little finger.
- 3 Horizontally into the wall with the arm above the head and out from the body (abducted 135 degrees). Contact was made with radial (outside) surface of the fist using the little finger.
- 4 Horizontally into the wall with the arm level with shoulder (abducted 90 degrees). Contact was made with the palm surface of fist and using the middle knuckles.
- 5 Horizontally into the wall with the arm level with the hips. Contact was made with the ulna (inside) surface of fist using the thumb and first finger.

source 1 of 1

age	sex	n	mean (kg)	sd	5th%ile	95th%ile
-----	-----	---	-----------	----	---------	----------

Downwards onto a table at waist level.

4	mf	41	35.81	11.99		
5	mf	49	40.79	12.41		
6	mf	51	60.08	20.06		
7	mf	47	66.14	18.89		

Horizontally into a wall directly above the head

4	mf	41	27.86	11.55		
5	mf	49	34.34	10.19		
6	mf	51	44.22	13.88		
7	mf	47	48.87	10.05		

Horizontally into a wall above the head and away from the body

4	mf	41	29.20	11.32		
5	mf	49	33.79	10.08		
6	mf	51	42.41	13.77		
7	mf	47	44.43	12.92		

Horizontally into a wall at shoulder level

4	mf	41	25.69	9.28		
5	mf	49	27.63	9.53		
6	mf	51	40.78	15.34		
7	mf	47	37.83	8.58		

Horizontally into the wall level at hip level

4	mf	41	12.18	4.91		
5	mf	49	17.58	8.06		
6	mf	51	21.40	9.25		
7	mf	47	27.00	9.73		

Section 3.1

Physical abilities: Strength

Wrist twisting strength 155

DEFINITION

The maximum force that can be exerted on an object by twisting an object with one hand in either direction. Usually measured as the force with which a circular knob can be turned.

APPLICATION AND SUMMARY OF THE DATA

The three sources of data compare wrist strength when applied to a variety of 'handles' and using different postures. These details should be used to select the data which most closely match the intended design application since posture and the height, size and shape of the handle will all affect the maximum strength that can be exerted. All of the measurements are taken with one hand and the results may be lower than when using two hands. The data sources present results on children over two years only as maximum strength is difficult to measure on children younger than this.

SEE ALSO:

Opening strength, grip/squeeze strength, pinch strength

NUMBER OF SOURCES: 3

source	details	reference	country	age
Source 1	On a 2 inch diameter grooved knob	Brown 1973	US	2-6
Source 2	Object unknown	Krogman 1971	US	3-6
Source 3	On a circular door knob	McClelland 1976	US	5-13

source 1 of 3

Brown 1973

Country USA
Ages 2-6
Sample 500

Wrist twisting strength (Newton-metres) was measured with one hand on a 2 inch diameter grooved knob placed vertically and horizontally, and turned clockwise and anticlockwise. The results presented are maximum strength recorded from all conditions (Newton-metres). The study also recorded strength on knobs of diameters 1 and 1.5 inches

age	sex	n	mean	sd	5th%ile	95th%ile
2	m	50	1.14		0.68	1.76
3	m	50	1.49		0.85	2.20
4	m	50	2.11		1.47	2.80
5	m	50	2.53		1.75	3.44
6	m	50	2.91		2.17	3.63
2	f	50	1.03		0.62	1.62
3	f	50	1.42		0.85	2.08
4	f	50	1.94		1.22	2.96
5	f	50	2.33		1.54	3.39
6	f	50	2.62		1.99	3.57

source 2 of 3

Krogman 1971

Country USA
Ages 3-6
Sample 1803

Wrist turning strength (Pounds) measured by turning a knob in either direction with one (preferred) hand. No information is available on the dimensions of the knob. Measurements were made before and after a demonstration of how to carry out the task, although no significant differences were found between the two. Results presented here are those before the demonstration. The report presents results according to geographical location and race. Results presented here are from white subjects living in Philadelphia, the maximum data.

age	sex	n	mean	sd	5th%ile	95th%ile
3	m		19.50	10.9		
4	m		45.60	13.2		
5	m		51.40	18.4		
6	m		61.10	19.1		
3	f		20.60	7.6		
4	f		38.70	12.0		
5	f		45.50	14.9		
6	f		55.50	14.5		

Section 3.1

Physical abilities: Strength

Wrist twisting strength 155

source 3 of 3

McClelland 1976

Country UK

Ages 5-13

Sample 269

Wrist twisting strength (Newton-metres) was measured with one (preferred) hand on a circular 'Yale'-type door knob turned clockwise and anticlockwise and placed at a variety of heights, with no restrictions on posture. The report presents additional data at other handle heights.

age	sex	n	mean	sd	5th%ile	95th%ile
-----	-----	---	------	----	---------	----------

CLOCKWISE

door knob placed at 660mm:

5	m	4	0.69	0.3	0.26	
7	m	4	0.92	0.2	0.56	
8	m	4	1.14	0.1	0.98	
9	m	6	1.07	0.3	0.58	
10	m	5	1.17	0.3	0.75	

5	f	9	0.53	0.2	0.19	
6	f	12	0.70	0.1	0.53	
8	f	9	0.93	0.2	0.62	
9	f	11	1.02	0.3	0.53	
10	f	3	0.62	0.1	0.45	
11	f	8	0.72	0.3	0.31	

door knob placed at 830mm:

12	m	4	1.25	0.2	0.90	
13	m	1	1.23	n/a	n/a	

12	f	3	1.31	0.2	0.95	
13	f	4	0.78	0.2	0.51	

door knob placed at 1000mm:

5	m	4	0.78	0.2	0.46	
7	m	4	0.65	0.1	0.49	
8	m	4	0.99	0.4	0.30	
9	m	6	0.69	0.2	0.41	
10	m	5	1.05	0.3	0.50	

continued...

source 3 of 3 *continued*

age	sex	n	mean	sd	5th%ile	95th%ile
-----	-----	---	------	----	---------	----------

5	f	9	0.68	0.3	0.28	
6	f	13	0.74	0.2	0.47	
8	f	9	0.73	0.3	0.31	
9	f	11	0.82	0.3	0.27	
10	f	3	0.73	0.0	0.67	
11	f	14	0.80	0.2	0.42	

door knob placed at 1300mm:

12	m	4	1.31	0.5	0.54	
13	m	1	1.18	n/a	n/a	

12	f	3	0.77	0.1	0.52	
13	f	4	0.92	0.1	0.78	

ANTICLOCKWISE

door knob placed at 660mm:

5	m	4	0.84	0.1	0.64	
6	n/a	n/a	n/a	n/a	n/a	
7	m	4	0.95	0.3	0.47	
8	m	4	1.10	0.2	0.76	
9	m	6	1.29	0.6	0.28	
10	m	5	1.00	0.2	0.67	

5	f	9	0.46	0.1	0.25	
6	f	12	0.77	0.4	0.18	
8	f	9	0.89	0.4	0.21	
9	f	11	1.06	0.8	-0.25	
10	f	3	0.66	n/a	0.65	
11	f	8	0.83	0.3	0.39	

door knob placed at 830mm:

12	m	4	1.55	0.4	0.94	
13	m	1	1.21	n/a	n/a	

12	f	3	1.25	0.3	0.72	
13	f	4	0.89	0.2	0.50	

continued...

source 3 of 3 continued

age	sex	n	mean	sd	5th%ile	95th%ile
door knob placed at 1000mm:						
5	m	4	0.80	0.4	0.21	
7	m	4	0.71	0.2	0.45	
8	m	4	1.08	0.3	0.62	
9	m	6	0.88	0.4	0.29	
10	m	5	0.82	0.4	0.23	
5	f	9	0.44	0.1	0.19	
6	f	13	0.62	0.2	0.24	
8	f	9	0.73	0.3	0.20	
9	f	11	0.79	0.3	0.29	
10	f	3	0.42	0.1	0.30	
11	f	14	0.84	0.3	0.33	
door knob placed at 1300mm:						
12	m	4	1.37	0.7	0.14	
13	m	1	1.58	n/a	n/a	
12	f	3	0.96	0.4	0.34	
13	f	4	0.93	0.3	0.37	

DEFINITION

The maximum force that can be exerted in trying to open the lid of a screw top jar or bottle.

APPLICATION AND SUMMARY OF THE DATA

The two sources compare opening strength when applied to the caps of carbonated drinks bottles. Rohles (1984) uses a cap fixed to a table top while Norris (1994) measures strength more realistically on a replica bottle. The posture, technique and size of cap used to record strength are likely to affect maximum strength and should be borne in mind if applying these data to similar but not identical products.

SEE ALSO

Wrist twisting strength, grip/squeeze strength, pinch strength

NUMBER OF SOURCES: 2

source	details	reference	country	age
1	On lids of diameters 27-123mm	Rohles 1984	US	4
2	On pop bottle lids, diameter 28mm	Norris 1994	UK	5-14

source 1 of 2

Rohles 1984

Country USA
Ages 4
Sample 200

Twisting strength (Newton metres) measured on lids of varying diameters. Lids held horizontally and secured to a torque tester which in turn was secured to a table. Results are the mean of two clockwise and two anticlockwise measurements; no significant differences found according to direction of twist but strength varied significantly according to lid size. Ages 44 to 58 months. Presumed one hand twisting strength.

ages	sex	n	mean	sd	min	max
123mm diameter lid						
4	m	100	1.39			
4	f	100	1.26			
86mm diameter lid						
4	m	100	1.41			
4	f	100	1.34			
67mm diameter lid						
4	m	100	1.37			
4	f	100	1.35			
48mm diameter lid						
4	m	100	1.26			
4	f	100	1.18			
27mm diameter lid						
4	m	100	0.63			
4	f	100	0.59			

source 2 of 2

Norris 1994

Country UK
Ages 5-14
Sample 10

Opening torque (Newton metres) measured on the lid of a 1.5 litre carbonated drinks bottle. The bottle could be held in any orientation in a realistic opening task. Peak strength recorded.

ages	sex	n	mean	sd	min	max
5-9	mf	5	1.55	0.24	1.23	1.81
10-14	mf	5	2.18	0.67	1.41	3.01

Section 3.1

Physical abilities: Strength

Grip/Squeeze strength 157

DEFINITION

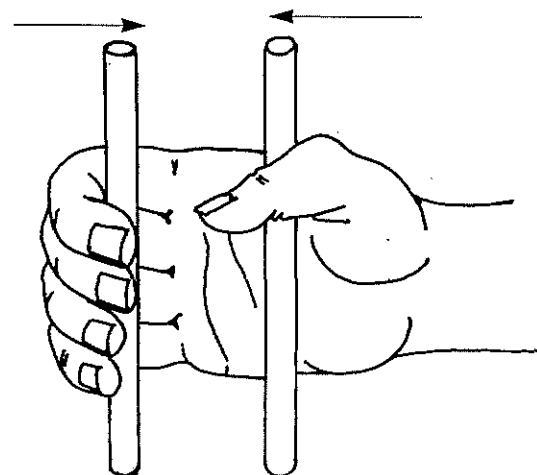
The maximum static force that can be exerted on an object placed in the hand by squeezing together the middle joint of the thumb in opposition to the middle joints of the four fingers. Usually measured with a dynamometer which consists of two parallel handles placed between the middle joints of the thumb and fingers which when squeezed measures the static force exerted. Note the difference between this and pinch strength where the force is measured at the pads of the fingers and thumbs.

APPLICATION AND SUMMARY OF THE DATA

Five sources of data are presented in order to compare grip strength between different countries, different age groups and using different measurement techniques. The results of Owings (1977) demonstrate how the distance between the thumb and fingers (ie different size products held in the hand) affects the maximum strength that can be exerted on those products. This should be remembered when applying these data. The sources present results on children over two years only as maximum strength is difficult to measure on children younger than this.

SEE ALSO

Wrist twisting strength, opening strength, pinch (pads of fingers), pinch (tips of fingers), pinch (lateral), shear strength.



NUMBER OF SOURCES: 5

source	details	reference	country	age
1	One hand with distance between the fingers of 2,3,4,5,6 & 7 cm	Owings 1977	US	2-10
2	One hand	Hebbelinck 1975	Bel	6-13
3	One hand	Paliczka 1986	UK	12-13
4	One hand (right hand)	Malina unpub.	US	6-13
5	Two hands	Brown 1973	US	2-6

Section 3.1

Physical abilities: Strength

Grip/Squeeze strength 157

source 1 of 5

Owings 1977

Country USA

Ages 2-10

Sample 350

'Squeeze' force (Kgf) measured by opposition of the thumb and four fingers gripping a dynamometer placed at the second joints of the fingers and thumbs. Measurements were made with varying distances of separation between those joints of the fingers and thumb.

age	sex	n	mean	sd	5th%ile	95th%ile
2cm between thumb and fingers:						
2.5-3.5	mf	31	3.10		1.40	4.60
3.5-4.5	mf	45	4.10		2.30	6.30
4.5-5.5	mf	44	5.00		2.50	7.10
5.5-6.5	mf	49	5.80		3.40	8.50
6.5-7.5	mf	46	6.70		4.00	10.20
7.5-8.5	mf	52	7.60		4.60	11.60
8.5-9.5	mf	42	8.90		4.20	14.10
9.5-10.5	mf	45	9.70		5.00	14.00

3cm between thumb and fingers:

2.5-3.5	mf		5.00		2.80	7.80
3.5-4.5	mf		6.70		4.30	9.60
4.5-5.5	mf		9.10		5.20	13.00
5.5-6.5	mf		10.10		5.60	13.40
6.5-7.5	mf		11.70		7.70	15.80
7.5-8.5	mf		13.20		8.60	18.20
8.5-9.5	mf		15.30		9.90	20.50
9.5-10.5	mf		16.10		10.30	21.10

continued...

source 1 of 5 *continued*

age	sex	n	mean	sd	5th%ile	95th%ile
4cm between thumb and fingers:						
2.5-3.5	mf		4.90		2.40	8.30
3.5-4.5	mf		6.70		3.80	9.60
4.5-5.5	mf		9.50		5.10	13.90
5.5-6.5	mf		11.00		6.30	14.70
6.5-7.5	mf		13.10		8.60	17.00
7.5-8.5	mf		15.00		10.90	20.00
8.5-9.5	mf		17.20		12.20	22.40
9.5-10.5	mf		19.10		13.10	25.00

5cm between thumb and fingers:

2.5-3.5	mf	8	4.30			
3.5-4.5	mf	31	6.00		2.80	8.80
4.5-5.5	mf	41	8.50		4.10	12.50
5.5-6.5	mf	47	9.90		5.60	13.20
6.5-7.5	mf	46	12.00		7.10	16.40
7.5-8.5	mf	52	14.20		9.30	19.40
8.5-9.5	mf	42	16.30		11.00	22.40
9.5-10.5	mf	45	19.50		15.20	23.90

6cm between thumb and fingers:

4.5-5.5	mf	7	8.80		n/a	n/a
5.5-6.5	mf	10	8.90		n/a	n/a
6.5-7.5	mf	28	10.70		7.10	13.70
7.5-8.5	mf	40	12.80		6.50	16.90
8.5-9.5	mf	39	15.20		10.60	20.90
9.5-10.5	mf	44	17.20		10.60	23.30

7cm between thumb and fingers:

6.5-7.5	mf	1	9.20		n/a	n/a
7.5-8.5	mf	3	12.40		n/a	n/a
8.5-9.5	mf	9	13.30		n/a	n/a
9.5-10.5	mf	18	16.80		n/a	n/a

Section 3.1

Physical abilities: Strength

Grip/Squeeze strength 157

source 2 of 5

Hebbelinck 1975

Country Belgium
Ages 6-13
Sample 2000+

Hand grip measured in Kilogrammes. Sample of French and Flemish speaking boys and Flemish speaking girls.

age	sex	n	mean	sd	5th%ile	95th%ile
6	mf	428	9.50		5.70	14.10
7	mf	1468	11.10		5.80	16.30
8	mf	1506	13.40		7.80	19.30
9	mf	1697	15.90		10.00	22.20
10	mf	1656	17.70		12.00	24.80
11	mf	2149	21.60		14.00	28.80
12	mf	1787	24.60		16.30	32.90
13	mf	377	27.60		17.60	37.50

source 3 of 5

Palizcka 1986

Country UK
Ages 12-13
Sample 2350
Hand grip measured in Kilogrammes.

age	sex	n	mean	sd	5th%ile	95th%ile
12	m	263	21.50			
13	m	265	26.00			
12	f	295	20.50			
13	f	261	23.00			

Section 3.1

Physical abilities: Strength

Grip/Squeeze strength 157

source 4 of 5

Malina, unpublished

Country USA

Ages 6-13

Sample 1396

Right hand grip strength (Pounds) from first of three trials using Narragansett dynamometer. Study tested white and black subjects but results presented here relate to white subjects only. No significant differences found according to sex, race or age.

age	sex	n	mean	sd	5th%ile	95th%ile
6	m		28.11	8.1		
7	m		32.65	8.2		
8	m		37.53	7.6		
9	m		42.86	8.4		
10	m		48.51	10.9		
11	m		52.18	10.7		
12	m		56.47	11.1		
6	f		25.45	8.0		
7	f		29.75	7.7		
8	f		32.64	7.9		
9	f		37.02	8.3		
10	f		40.15	7.7		
11	f		43.05	8.4		
12	f		44.63	7.7		

source 5 of 5

Brown 1973

Country USA

Ages 2-6

Sample 500

Two hand squeeze (Newtons) measured with the handles of a dynamometer adjusted so that the thumb and fingers were held apart a distance of approximately half that between the point where the thumb joins the hand and the tip of the middle finger. No restrictions were placed on posture. The test was demonstrated three times. Sample described as consisting of '20% black subjects'.

age	sex	n	mean	sd	5th%ile	95th%ile
2	m	50	61.00		29.00	88.00
3	m	50	75.00		39.00	113.00
4	m	50	118.00		64.00	166.00
5	m	50	146.00		83.00	215.00
6	m	50	179.00		117.00	235.00
2	f	50	57.00		20.00	98.00
3	f	50	70.00		29.00	117.00
4	f	50	107.00		59.00	152.00
5	f	50	141.00		88.00	196.00
6	f	50	156.00		93.00	206.00

DEFINITION

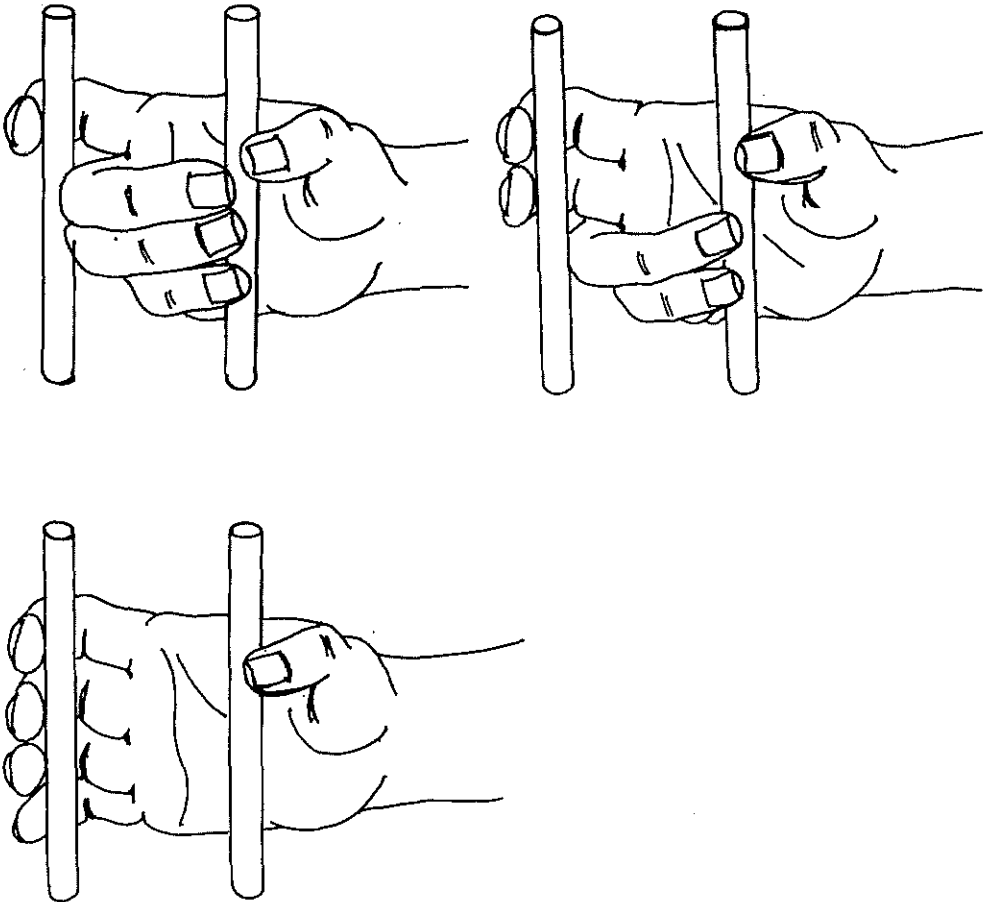
The maximum static force that can be exerted on an object placed in the hand by squeezing together the pad of the thumb in opposition to the pads of either the index finger, the index and middle finger or all four fingers. Usually measured with a dynamometer which consists of two parallel handles placed between the furthest pads of the thumb and fingers which when squeezed measures the static force exerted. Note the difference between this and grip strength where the force is measured at the middle joints of the fingers and thumbs.

APPLICATION AND SUMMARY OF THE DATA

Three sources of data are presented in order to compare pinch strength between different countries, different age groups and using different number of fingers. The results demonstrate how the number of fingers used in opposition to the thumb (ie how products are held in the hand) affects the maximum strength that can be exerted on those products. This should be remembered when applying these data. The data sources present results on children over two years only as maximum strength is difficult to measure on children younger than this.

SEE ALSO

Grip/squeeze strength, wrist twisting strength, opening strength, pinch strength (tips of fingers), pinch strength (lateral), shear strength



NUMBER OF SOURCES: 3

source	details	reference	country	age
1	thumb and index finger	Krogman 1971	US	3-6
2	thumb and two fingers	Owings 1977		US 2-10
3	thumb and four fingers	Owings 1977		US 2-10

source1 of 3

Krogman 1971

Country USA
Ages 3-6
Sample475

Pinch strength (pounds) between thumb and index finger.
3 year old children had difficulty using just index finger and used thumb in opposition to all four fingers. Measurements were made before and after a demonstration of how to carry out the task, although no significant differences were found between the two. Results presented here are those before the demonstration. The report presents results according to geographical location and race: Results presented here are from white subjects living in Philadelphia, the maximum data.

age	sex	n	mean	sd	5th%ile	95th%ile
3	m		14.00	6.6		
4	m		17.50	7.3		
5	m		24.40	8.6		
6	m		30.70	9.7		
3	f		11.80	4.4		
4	f		16.00	7.1		
5	f		20.50	6.5		
6	f		24.70	7.8		

source 2 of 3

Owings 1977

Country USA
Ages 2-10
Sample 350

Pinch strength (Kgf) measured between the furthest ends of the thumb and the first two fingers at varying distances of seperation.

age	sex	n	mean	sd	5th%ile	95th%ile
2cm between thumb and fingers:						
2.5-3.5	mf		2.10	0.4		
3.5-4.5	mf		2.60	0.5		
4.5-5.5	mf		3.10	0.6		
5.5-6.5	mf		3.60	0.8		
6.5-7.5	mf		4.00	0.7		
7.5-8.5	mf		4.40	1.0		
8.5-9.5	mf		5.00	0.9		
9.5-10.5	mf		5.20	1.0		
5cm between thumb and fingers:						
2.5-3.5	mf		2.40	0.6		
3.5-4.5	mf		2.90	0.7		
4.5-5.5	mf		3.40	0.7		
5.5-6.5	mf		3.60	0.7		
6.5-7.5	mf		4.00	0.7		
7.5-8.5	mf		4.40	0.8		
8.5-9.5	mf		4.80	1.1		
9.5-10.5	mf		5.30	1.0		
9cm between thumb and fingers:						
3.5-4.5	mf		3.70	n/a		
4.5-5.5	mf		4.60	0.2		
5.5-6.5	mf		4.70	1.0		
6.5-7.5	mf		4.70	1.2		
7.5-8.5	mf		5.30	1.1		
8.5-9.5	mf		5.50	1.1		
9.5-10.5	mf		6.00	1.1		

Section 3.1

Physical abilities: Strength

Pinch strength 158

source 3 of 3

Owings 1977

Country USA

Ages 2-10

Sample 350

Pinch strength (Kgf) measured between the furthest ends of the thumb and the four fingers at varying distances of separation.

age	sex	n	mean	sd	5th%ile	95th%ile
-----	-----	---	------	----	---------	----------

2cm between thumb and fingers:

2.5-3.5	mf		2.50	0.7		
3.5-4.5	mf		2.90	0.5		
4.5-5.5	mf		3.60	0.9		
5.5-6.5	mf		4.00	0.8		
6.5-7.5	mf		4.40	1.0		
7.5-8.5	mf		5.00	0.9		
8.5-9.5	mf		5.80	1.2		
9.5-10.5	mf		6.50	1.4		

5cm between thumb and fingers:

2.5-3.5	mf		2.80	0.8		
3.5-4.5	mf		3.20	0.9		
4.5-5.5	mf		3.80	0.9		
5.5-6.5	mf		3.90	0.8		
6.5-7.5	mf		4.40	0.8		
7.5-8.5	mf		4.90	0.9		
8.5-9.5	mf		5.50	1.1		
9.5-10.5	mf		5.90	0.9		

9cm between thumb and fingers:

5.5-6.5	mf		5.20	n/a		
7.5-8.5	mf		6.30	0.7		
8.5-9.5	mf		6.00	1.7		
9.5-10.5	mf		7.00	1.5		

Section 3.1

Physical abilities: Strength

Pinch force (tips of fingers) 159

DEFINITION

Force exerted between the tip of the thumb and the tip of the other fingers whilst in opposition. Also referred to as pulp pinch.

APPLICATION AND SUMMARY OF THE DATA

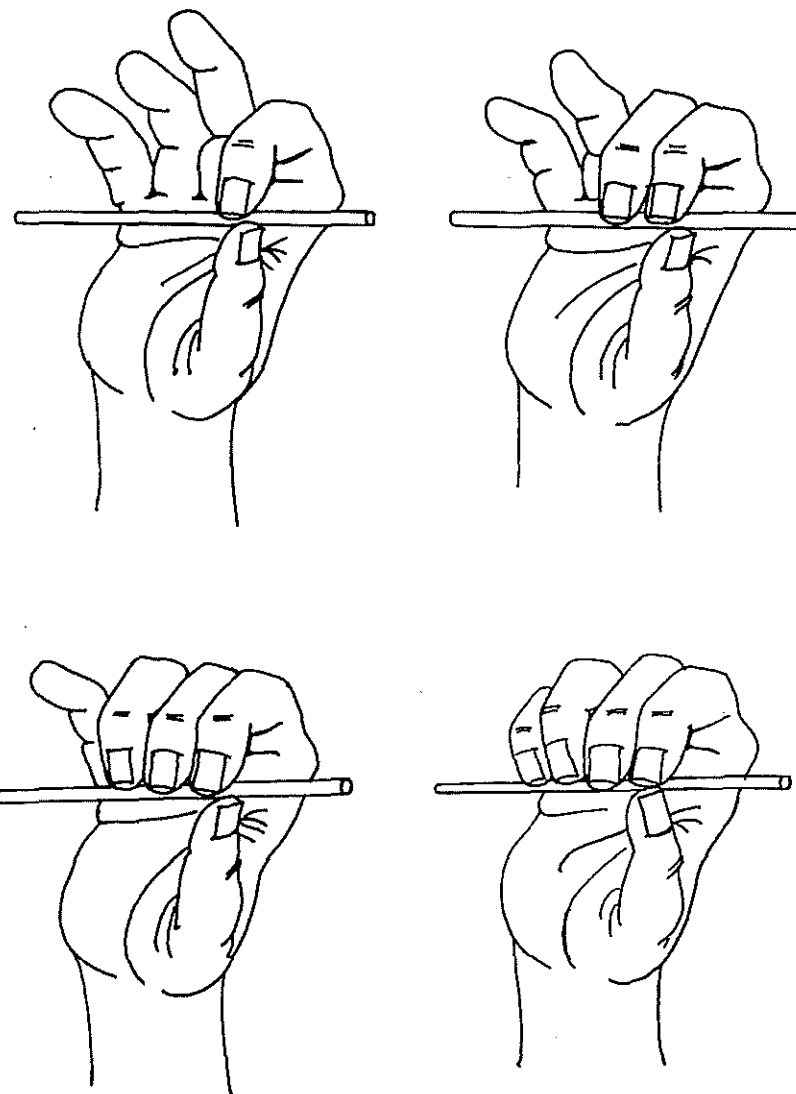
Three sources of data are presented in order to compare pinch strength between different countries, different age groups and using different fingers. The results of Imrhan (1989) demonstrate how strength depends on which fingers are being used and this should be remembered when applying these data.

SEE ALSO

Grip/squeeze, pinch strength (pads of fingers), pinch strength (lateral), shear strength

NUMBER OF SOURCES: 3

source	details	reference	country	age
1	thumb and index finger, right hand	Ager 1984	US	5-12
2	thumb and each finger, right hand	Imrhan 1989	US	5-12
3	thumb and index finger, both hands	Jain 1985	UK	10-17



source 1 of 3

Ager 1984

Country USA
Ages 5-12
Sample 474

Right hand pinch force (pounds) measured between the tips of the thumb and index finger, on right-handed subjects only. Left hand strength and left-handed subjects were also recorded but are not shown here. Subjects were seated.

age	sex	n	mean (lbs)	sd	5th%ile	95th%ile
5	m	27	3.7	1.6		
6	m	29	3.1	2.5		
7	m	29	4.3	2.1		
8	m	23	5.6	2.2		
9	m	28	6.0	1.7		
10	m	36	7.1	2.3		
11	m	31	8.0	2.2		
12	m	21	9.4	2.7		
5	f	27	3.0	1.8		
6	f	27	2.4	1.5		
7	f	27	2.7	1.6		
8	f	19	4.5	2.1		
9	f	27	4.8	2.5		
10	f	21	7.1	1.7		
11	f	29	6.9	2.4		
12	f	23	9.3	2.1		

source 2 of 3

Imrhan 1989

Country USA
Ages 5-12
Sample 62

Right hand pinch force (kilogrammes) was measured between the tip of the thumb in opposition with each of the four fingers.

age	sex	n	mean (kg)	se	5th%ile	95th%ile
Thumb and index finger						
5-12	m	32	2.7	0.15		
5-12	f	30	2.4	0.17		
Thumb and middle finger						
5-12	m	32	2.7	0.16		
5-12	f	30	2.4	0.15		
Thumb and third finger						
5-12	m	32	1.9	0.12		
5-12	f	30	1.7	0.12		
Thumb and fourth (little) finger						
5-12	m	32	1.2	0.07		
5-12	m	30	1.1	0.07		

Section 3.1

Physical abilities: Strength

Pinch force (tips of fingers) 159

source 3 of 3

Jain 1985

Country UK
Ages 10-17
Sample 14

Pinch force (kilogrammes) was measured between the tip of the thumb and the tip of the index finger of the right and left hands.

age	sex	n	mean (kg)	5th%ile	95th%ile
Right hand					
10-17	mf		3.59		
Left hand					
10-17	mf		3.15		

DEFINITION

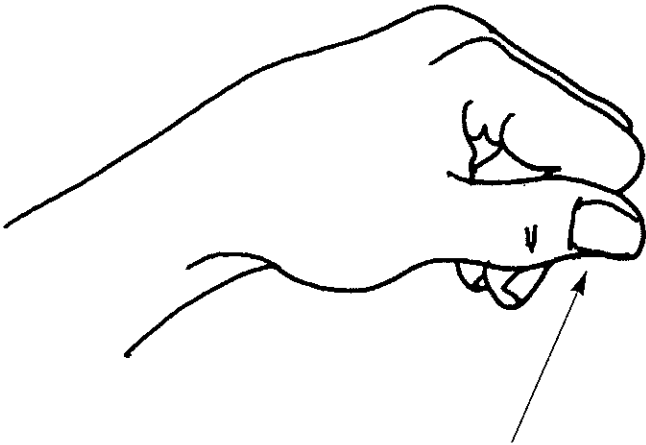
The force exerted between the thumb and the medial side of the index finger (the side nearest the thumb) at the level of the distal (end or furthest) joint.

APPLICATION AND SUMMARY OF THE DATA

Three sources of data are presented in order to compare pinch strength between different countries, different age groups and using different hands. The distance between the thumb and index finger (ie the size and shape of the product in the hand) will affect the force that can be exerted and this should be considered when applying these data.

SEE ALSO

Grip/squeeze, pinch strength (pads of fingers), pinch strength (tips of fingers), shear strength



NUMBER OF SOURCES: 3

source	details	reference	country	age
1	right hand for right-handed subjects	Ager 1984	US	5-12
2	right hand	Imrhan 1989	US	5-12
3	right and left hand	Jain 1985	UK	10-17

source 1 of 3

Ager 1984

Country USA
Ages 5-12
Sample 474

Right hand lateral pinch force (pounds) measured on the right hand of right-handed subjects only. Left hand strength and left-handed subjects were also recorded but are not shown here. Subjects were seated.

age	sex	n	mean (lbs)	sd	5th%ile	95th%ile
5	m	28	6.5	2.1		
6	m	29	6.0	2.9		
7	m	29	6.8	2.3		
8	m	23	10.0	2.6		
9	m	28	9.8	2.5		
10	m	36	10.8	2.8		
11	m	31	12.3	2.7		
12	m	21	14.4	4.1		
5	f	27	5.5	2.9		
6	f	27	4.7	2.3		
7	f	27	5.4	2.1		
8	f	19	8.2	2.5		
9	f	27	8.4	2.6		
10	f	21	10.2	2.4		
11	f	29	10.1	2.1		
12	f	23	12.4	2.6		

source 2 of 3

Imrhan 1989

Country USA
Ages 5-12
Sample 62

Right hand lateral pinch force (kilogrammes).

age	sex	n	mean (kg)	sd	5th%ile	95th%ile
5-12	m	32	4.2	0.2		
5-12	f	30	3.6	0.18		

source 3 of 3

Jain 1985

Country UK
Ages 10-17
Sample 14

Lateral pinch force (kilogrammes) was measured in the right and left hands.

age	sex	n	mean (kg)	sd	5th%ile	95th%ile
Right hand						
10-17	mf	14	5.24			
Left hand						
10-17	mf	14	5.09			

DEFINITION

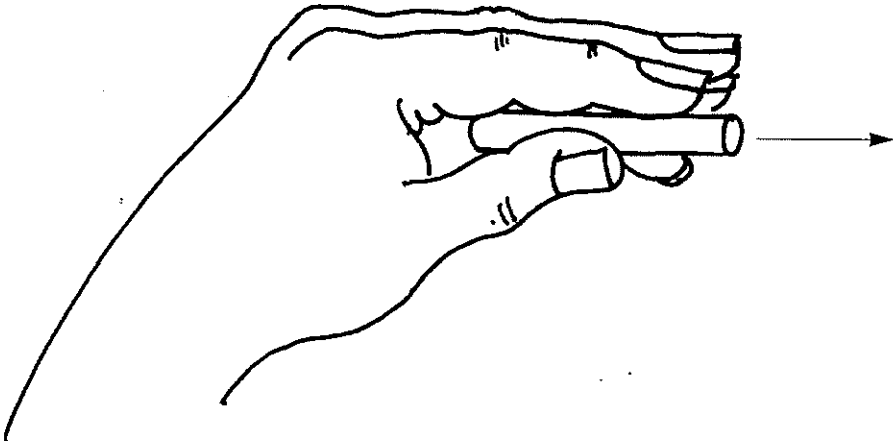
Shear force is measured as the ability to resist a pulling force (kilogrammes) caused by removing a smooth metal cylinder held by all four fingers and the thumb, drawing the cylinder away along the long axis of the hand.

APPLICATION AND SUMMARY OF THE DATA

The distance between the fingers (ie the size and shape of the product in the hand) plus the material from which the product is made will affect the force that can be exerted and this should be considered when applying these data.

SEE ALSO

Pulling, grip/squeeze, pinch strength (pads of fingers), pinch strength (tips of fingers), pinch strength (lateral)



NUMBER OF SOURCES: 1

source	details	reference	country	age
1	right and left hand	Jain 1985	UK	10-17

source 1 of 1

Jain 1985

Country UK
Ages 10-17
Sample 14

Shear force was measured in the right and left hands.

age	sex	n	mean (kg)	sd	5th%ile	95th%ile
Right hand						
10-17	mf	14	4.03			
Left hand						
10-17	mf	14	3.89			

Section 3.1

Physical abilities: Strength

Pushing forwards with feet 162

DEFINITION

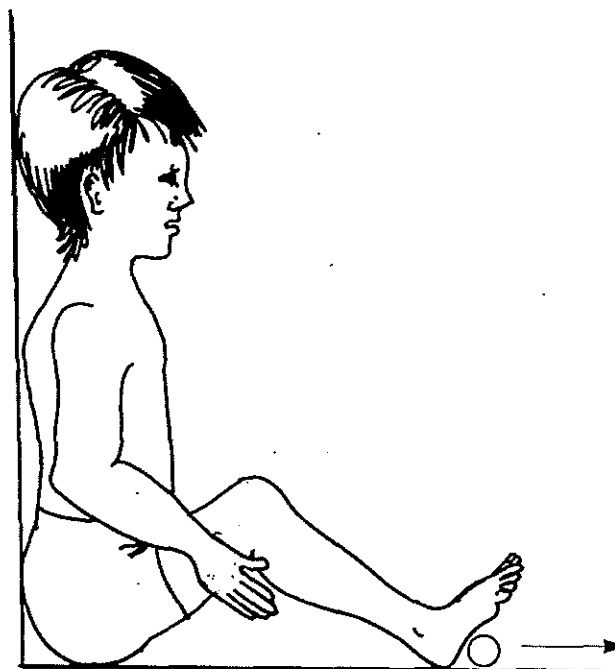
The maximum static force that can be exerted by both feet on a horizontal bar whilst seated and with the back against a support.

APPLICATION AND SUMMARY OF THE DATA

Posture affects the maximum strength that can be exerted onto a product and the details of how these data were collected should be compared to those of the intended design application.

SEE ALSO

pushing forwards with the arms



NUMBER OF SOURCES: 1

source	details	reference	country	age
1	sitting	De Winte 1994	NL	4-12

source1 of 1

De Winter 1994

Country Netherlands
Ages 4-12
Sample 204

Pushing force (Newtons) measured whilst seated with feet pushing on a horizontal bar placed level with the seat of the chair and with legs outstretched and lower leg 18° to horizontal. The seat was secured so that the back was supported. It was noted that the maximum measuring capacity of the system was 2000N and some children could push in excess of this. Maximum peak loads measured and mean of two highest recordings taken.

age	sex	n	mean	sd	min	max
4	m	11	370	214.6	144	958
5	m	19	470	287.9	76	1039
6	m	5	372	39.2	312	431
7	m	12	718	285.8	307	1118
8	m	15	660	364.6	282	1933
9	m	14	1024	427.1	449	1932
10	m	8	1207	455.9	417	1793
11	m	10	1007	572.2	350	1996
12	m	14	1291	515.9	471	1999
4	f	9	309	145.3	110	643
5	f	16	408	228.5	88	837
6	f	8	516	257	169	940
7	f	13	600	332.5	173	1249
8	f	9	793	378.2	368	1528
9	f	14	997	435.7	318	1926
10	f	5	1321	383.4	735	1916
11	f	13	809	353.7	396	1465
12	f	8	740	222.8	382	1179



DEFINITION

The maximum force that can be exerted on a object placed between the teeth.

APPLICATION AND SUMMARY OF THE DATA

The size, shape and material of the object placed in the mouth will affect the maximum force that can be exerted onto it with the teeth.

SEE ALSO

Lip strength.

NUMBER OF SOURCES: 4

source	details	reference	country	age
1	front and/or back teeth	Krogman 1971	US	3-6
2	details unknown	Garner 1973	US	10-14
3	vertical biting force	Wu 1978	US	0-8
4	bite force on a feeding teat	CEN 1992	Fr	* 2-3

source1 of 4
Krogman 1971

Country USA
Ages 3-6
Sample 475

Bite force (pounds) was measured by asking children to bite down as hard as possible on two bakelite levers. In some of the tests these were covered with rubber, yielding higher bite forces and suggesting that hard material could be used to discourage maximum biting force. The report notes that the younger children (3-4 years) used mainly an incisal (front teeth) bite while the older children turned their head and used buccal (cheek) teeth. The report presents results according to geographical location and race. Results presented here are from black subjects living in California, the maximum data.

age	sex	n	mean	sd	5th%ile	95th%ile
3	m		24.00	15.7		
4	m		32.20	18.8		
5	m		49.40	23.5		
6	m		58.40	30.9		
3	f		19.30	8.5		
4	f		24.10	13.4		
5	f		39.10	23.1		
6	f		47.50	25.2		

source 2 of 4
Garner 1973

Country USA
Ages 10-14
Sample ?

Incisive biting force (with the front teeth) (pounds) measured in Indiana children.

age	sex	n	mean	sd	5th%ile	95th%ile
10	m		27.34	10.6		
11	m		23.72	8.1		
12	m		35.10	11.3		
13	m		25.09	16.1		
14	m		29.31	7.1		
10	f		24.13	6.6		
11	f		29.98	13.9		
12	f		33.37	10.5		
13	f		34.64	16.3		
14	f		34.43	11.6		

Section 3.1

Physical abilities: Strength

Biting 163

source 3 of 4

Wu 1978

Country USA

Ages 0-8

Sample

Estimates of maximum vertical biting force (Newtons) based on literature. Data given for age ranges. Report suggests that the duration of maximum biting force appears to be 1 second.

age	sex	n	mean	sd	5th%ile	95th%ile
age ranges						
18 months	mf		111.00			
36 months	mf		222.00			
3-8 years	mf		445.00			

source 4 of 4

CEN 1992

Country France

Ages 2-3

Sample 20

Biting force (Newtons) was measured on an instrumented teat of a feeding bottle. Maximum of two measurements, whilst standing, on two separate days.

ages	sex	mean	max
2.5-3.5 years	mf	43.3	90.4

DEFINITION
The force exerted between lips (grams).

APPLICATION AND SUMMARY OF THE DATA
The size, shape and material of the object placed in the mouth will affect the maximum force that can be exerted onto it with the lips.

SEE ALSO
Bite

NUMBER OF SOURCES: 1

source	details	reference	country	age
1		Fogel 1984	Can	4-15

source 1 of 1

Fogel 1984

Country Canada
Ages 4-15
Sample 81

Lip strength (grams) was measured by exerting pressure with the lips only onto a measuring device placed between the lips. Data represent the results from children aged from 4 to 15 years. Male lip strength was greater than female on all ages up to over 75 years. Data have been estimated from graphs.

age	sex	n	mean (grams)	se	5th%ile	95th%ile
4-15	m	41	215	17		
4-15	f	40	192	15		

DEFINITION

The maximum time that be endured whilst running on a controlled treadmill.

APPLICATION AND SUMMARY OF THE DATA

Specific conditions were used to collect these data and these should be considered when applying the data.

SEE ALSO

running distance, running speed

NUMBER OF SOURCES: 1

source	details	reference	country	age
1		Houlsby 1986	UK	5-9

source1 of 1

Houlsby 1986

Country UK
Ages 5-9
Sample ?

The maximum time (seconds) for which children could run on a treadmill, the speed and gradient of which increased every two minutes, from 3 to 6.8 km/h and from 10 to 22% gradient. Children were measured in the first six months of each age band.

age	sex	n	mean	sd	5th%ile	95th%ile
5	m		7.60			
6	m		9.65			
7	m		11.50			
8	m		12.70			
9	m		13.75			
5	f		8.00			
6	f		8.80			
7	f		10.30			
8	f		11.00			
9	f		12.10			

DEFINITION

The maximum distance that can be run in a specified amount of time.

SEE ALSO

running endurance, running speed

NUMBER OF SOURCES: 2

source	details	reference	country	age
1	in 9 minutes	AAHPER 1976	USA	10-12
2	in 6 seconds	Dinucci 1977	USA	6-8

source1 of 2

AAHPER 1976

Country USA
Ages 10-12
Sample 7477
The maximum distance (yards) that can be run in 9 minutes.

age	sex	n	mean	sd	5th%ile	95th%ile
10	m		1717		1140	2294
11	m		1779		1202	2356
12	m		1841		1264	2418
10	f		1514		1069	1969
11	f		1537		1082	1992
12	f		1560		1105	2015

source2 of 2

Dinucci 1977

Country USA
Ages 6-8
Sample 90
The maximum distance (yards) that can be run in 6 seconds. Females only.

age	sex	n	mean	sd	5th%ile	95th%ile
6	f		29.1			
7	f		29.87			
8	f		31.67			

Section 3.2

Physical abilities: Movement

Maximum running speed 167

DEFINITION

The minimum time taken to run a specified distance.

SEE ALSO

running endurance, running distance

NUMBER OF SOURCES: 3

source	details	reference	country	age
1	25 metres	Hebbelinck 1975	Bel	6-13
2	100 metres	Telford 1986	Aust	12
3	1 mile	AAHPER 1976	USA	10-12

source1 of 3

Hebbelinck 1975

Country Belgium
Ages 6-13
Sample 1553
The minimum time (seconds) taken to run 25 metres. The sample consisted of Flemish speaking males and females living in Belgium.

age	sex	n	mean	sd	5th%ile	95th%ile
6	m		6.80		8.30	6.00
7	m		6.40		7.40	5.70
8	m		6.10		6.90	5.30
9	m		5.70		6.50	5.20
10	m		5.50		6.40	5.10
11	m		5.40		6.10	5.00
12	m		5.40		6.00	4.90
13	m		5.30		6.30	4.90
6	f		6.30		7.80	5.30
7	f		6.00		6.90	5.10
8	f		5.70		6.60	5.00
9	f		5.50		6.40	4.80
10	f		5.20		6.10	4.60
11	f		5.10		5.80	4.40
12	f		4.90		5.70	4.40
13	f		5.00		5.60	4.40

source 2 of 3

Telford 1986

Country Australia
Ages 12
Sample 310
The minimum time (seconds) taken to run 100 metres. The sample consisted of trained (n=170) and untrained (n=140) athletes.

age	sex	n	mean	sd	5th%ile	95th%ile
trained athletes:						
12	m		15.50			
12	f		15.90			
untrained athletes:						
12	m		17.20			
12	f		17.60			

Section 3.2

Physical abilities: Movement

Maximum running speed 167

source3 of 3

AAHPER 1976

Country USA

Ages 10-12

Sample 7477

The minimum time (seconds) taken to run 1 mile.

age	sex	n	mean	sd	5th%ile	95th%ile
10	m		547.00		739.00	355.00
11	m		524.00		716.00	332.00
12	m		501.00		693.00	309.00
10	f		629.00		810.00	448.00
11	f		598.00		779.00	417.00
12	f		564.00		744.00	383.00

Section 3.2

Physical abilities: Movement

Jumping forwards 168

DEFINITION

The maximum distance that can be jumped in front of the body from either a standing or a running start.

APPLICATION AND SUMMARY OF THE DATA

The conditions of the measurement (eg running or standing start, the floor surface, weather conditions - if outside - and shoes) are likely to affect the maximum distance that can be jumped and should be considered when applying the data.

SEE ALSO

jumping sideways, jumping upwards, jumping over a barrier, walking across a ladder.

NUMBER OF SOURCES: 3

source	details	reference	country	age
1	standing start	Branta 1984	USA	5-13
2	standing start	Hardin 1972	USA	6-11
3	running start	Cureton 1964	USA	7-13

source1 of 3

Branta 1984

Country USA
Ages 5-13
Sample 170

The maximum distance (inches) that can be jumped in front of the body from a standing start, taking off from both feet placed behind a starting line and landing on two feet on a 2 inch thick mat.

age	sex	n	mean	sd	5th%ile	95th%ile
5	m		36.05	8.3		
6	m		42.44	7.0		
7	m		48.85	7.8		
8	m		54.14	6.9		
9	m		58.07	7.8		
10	m		61.83	6.9		
11	m		62.44	7.3		
12	m		65.27	7.3		
13	m		69.21	6.9		
5	f		34.70	7.7		
6	f		41.80	6.2		
7	f		47.79	6.5		
8	f		52.25	6.4		
9	f		56.56	6.2		
10	f		60.60	6.2		
11	f		60.12	7.3		
12	f		64.15	7.1		
13	f		68.25	8.3		

source2 of 3

Hardin 1972

Country USA
Ages 6-11
Sample 1130

Maximum distance (inches) that can be jumped in front of the body from a standing start. Texas children. No other details.

age	sex	n	mean	sd	5th%ile	95th%ile
6	m		40			
7	m		42			
8	m		49			
9	m		51			
10	m		54			
11	m		55			
6	f		34			
7	f		38			
8	f		42			
9	f		47			
10	f		49			
11	f		50			

Section 3.2

Physical abilities: Movement

Jumping forwards 168

source3 of 3

Cureton 1964

Country USA

Ages 7-13

Sample 707

The maximum distance (inches) in front of the body that can be jumped from a running start. Illinois children; males only. No other details.

age	sex	n	mean	sd	5th%ile	95th%ile
7	m		27			
8	m		28			
9	m		31			
10	m		34			
11	m		36			
12	m		37			
13	m		38			

DEFINITION

The maximum distance that can be jumped sideways from a standing start.

APPLICATION AND SUMMARY OF THE DATA

The conditions of the measurement (eg running or standing start, the floor surface, weather conditions (if outside) and shoes) are likely to affect the maximum distance that can be jumped and should be considered when applying the data.

SEE ALSO

Jumping forwards, jumping upwards, jumping over a barrier, walking sideways.

NUMBER OF SOURCES: 2

source	details	reference	country	age
1	standing start	Hebbelinck 1975	Bel	6-13
2	standing start	Paliczka 1986	UK	12-13

source1 of 2

Hebbelinck 1975

Country Belgium
Ages 6-13
Sample 1739
The maximum distance (metres) that can be jumped sideways from a standing start. Sample consisted of Flemish speaking males and females living in Belgium.

age	sex	n	mean	sd	5th%ile	95th%ile
6	m	166	1.05		0.73	1.34
7	m	437	1.11		0.83	1.42
8	m	507	1.24		1.00	1.55
9	m	562	1.38		1.07	1.63
10	m	550	1.47		1.12	1.69
11	m	881	1.52		1.20	1.78
12	m	731	1.58		1.31	1.84
13	m	121	1.59		1.17	1.90
6	f	185	1.03		0.74	1.32
7	f	753	1.11		0.83	1.40
8	f	728	1.24		0.93	1.50
9	f	88	1.31		1.01	1.58
10	f	765	1.41		1.07	1.68
11	f	858	1.48		1.16	1.79
12	f	607	1.54		1.21	1.86
13	f	68	1.52		1.10	1.82

source 2 of 2

Paliczka 1986

Country UK
Ages 12 & 13
Sample 2350
The maximum distance (centimetres) that can be jumped sideways from a standing start.

age	sex	n	mean	sd	5th%ile	95th%ile
12	m	154				
13	m	167				
12	f	142				
13	f	145				

Section 3.2

Physical abilities: Movement

Jumping upwards 170

DEFINITION

The maximum vertical distance that can be cleared by jumping upwards from either a standing or running start. Also the maximum number of vertical jumps that can be performed.

APPLICATION AND SUMMARY OF THE DATA

The conditions of the measurement (eg running or standing start, the floor surface, weather conditions (if outside) and shoes) are likely to affect the maximum distance that can be jumped and should be considered when applying the data.

SEE ALSO

jumping over a barrier, overhead reach while jumping, climbing over fences, jumping forwards, jumping sideways, step height

NUMBER OF SOURCES: 3

source	details	reference	country	age
1	standing high jump	Kemper 1984	NL	12-13
2	running high jump	Cureton 1964	USA	7-11
3	maximum number of jumps	Cureton 1964	USA	7-12

source1 of 3

Kemper 1984

Country Netherlands
Ages 12-13
Sample 307

The maximum vertical distance (cm) that can be cleared by jumping upwards from a standing start. Results are from the first of a series of longitudinal studies. The report identified that there is no significant difference in male/female performance until age 15; from 15, males perform significantly better than females.

age	sex	n	mean	sd	5th%ile	95th%ile
12	m		41			
13	m		42.5			
12	f		42			
13	f		45			

source 2 of 3

Cureton 1964

Country USA
Ages 7-11
Sample 707

The maximum vertical distance (inches) that can be jumped from a running start.

age	sex	n	mean	sd	5th%ile	95th%ile
7	m		27			
8	m		28			
9	m		31			
10	m		34			
11	m		36			

Section 3.2

Physical abilities: Movement

Jumping upwards 170

source3 of 3

Cureton 1964

Country USA

Ages 7-12

Sample 707

Described as a vertical high jump. The maximum number of vertical jumps that can be performed. Illinois children; males only.

age	sex	n	mean	sd	5th%ile	95th%ile
7	m		8			
8	m		9.50			
9	m		10.40			
10	m		11.00			
11	m		11.30			
12	m		12.70			

DEFINITION

The maximum height of a barrier (hurdle) that can be cleared by jumping from a standing start.

APPLICATION AND SUMMARY OF THE DATA

The conditions of the measurement (eg running or standing start, the floor surface, weather conditions (if outside) and shoes) are likely to affect the maximum distance that can be jumped and should be considered when applying the data.

SEE ALSO

jumping upwards, overhead reach while jumping, climbing over fences, jumping forwards, jumping sideways, step height

NUMBER OF SOURCES: 1

source	details	reference	country	age
1		Keogh 1965	USA	5-9

source1 of 1

Keogh 1965

Country USA
Ages 5-9
Sample 509

The maximum height hurdle (inches) that can be cleared by jumping from a standing start. California children.

age	sex	n	mean	sd	5th%ile	95th%ile
5	m		14.40	2.9		
6	m		17.80	2.8		
7	m		19.00	2.2		
8	m		21.50	2.6		
9	m		22.90	2.5		
5	f		14.40	2.7		
6	f		17.80	2.4		
7	f		20.10	2.6		
8	f		21.20	2.8		
9	f		22.10	2.5		

DEFINITION

The ability of children to swim a minimum distance of 10 metres.

APPLICATION AND SUMMARY OF THE DATA

Water temperature and conditions will affect swimming ability and should be considered when using these data.

NUMBER OF SOURCES: 1

source	details	reference	country	age
1		Nixon 1979	Australia	5-12

source 1 of 1

Nixon 1979

Country Australia
Ages 5-12
Sample 4128

The percentage of children at each age able to swim at least 0 metres. This was tested by questionnaire only and not demonstrated. The median age for the ability to swim was reported as 6.5 years. No significant differences were noted between the sexes ($p>0.05$)

age	sex	n	mean	sd	5th%ile	95th%ile
5	mf		33			
6	mf		46			
7	mf		65			
8	mf		74			
9	mf		84			
10	mf		90			
11	mf		95			
12	mf		95			

DEFINITION

The ability to walk across a horizontal ladder measured by the distance travelled.

APPLICATION AND SUMMARY OF THE DATA

Specific conditions were used to collect these data and these should be considered when applying the data to other situations.

SEE ALSO

jumping forwards, hopping, walking sideways, dynamic balance.

NUMBER OF SOURCES: 1

source	details	reference	country	age
1		Govatos 1966	USA	7-11

source1 of 1

Govatos 1966

Country USA

Ages 7-11

Sample 48

The distance walked (feet) across a ladder placed horizontally. Report classified subjects according to school grades 2 to 6. No description of the ladder available.

age	sex	n	mean	sd	5th%ile	95th%ile
7	m		24.38	10.5		
8	m		28.33	9.4		
9	m		28.98	10.4		
10	m		31.22	9.3		
11	m		33.40	9.1		
7	f		22.21	10.5		
8	f		27.84	9.4		
9	f		28.11	9.8		
10	f		29.67	10.8		
11	f		31.64	9.9		

DEFINITION

The number of steps completed while walking sideways.

APPLICATION AND SUMMARY OF THE DATA

Specific conditions were used to collect these data and these should be considered when applying the data to other situations.

SEE ALSO

jumping sideways, walking across a ladder, dynamic balance.

NUMBER OF SOURCES: 1

source	details	reference	country	age
1		Seils 1951	USA	6-8

source1 of 1

Seils 1951

Country USA
Ages 6-8
Sample 493

age	sex	n	mean	sd	5th%ile	95th%ile
6	m		9.10	1.5		
7	m		9.60	1.3		
8	m		11.00	1.5		
6	f		8.90	1.4		
7	f		9.79	2.7		
8	f		10.59	1.5		

DEFINITION

Ability to move by hopping on one foot.

APPLICATION AND SUMMARY OF THE DATA

Specific conditions were used to collect these data and these should be considered when applying the data to other situations.

SEE ALSO

walking across a ladder, dynamic balance.

NUMBER OF SOURCES: 2

source	details	reference	country	age
1	maximum number of hops that can be made	Cureton 1964	USA	7-13
2	time taken to hop 50 feet	Keogh 1965	USA	5-11

source1 of 2

Cureton 1964

Country USA
Ages 7-13
Sample 707

The maximum number of hops that can be made. Mean data represented by 50th percentile. Illinois children; males only.

age	sex	n	mean	sd	5th%ile	95th%ile
7	m		297			
8	m		304			
9	m		343			
10	m		440			
11	m		462			
12	m		449			
13	m		567			

source 2 of 2

Keogh 1965

Country USA
Ages 5-11
Sample 509

The minimum time (seconds) taken to travel 50 feet by hopping on one foot.

age	sex	n	mean	sd	5th%ile	95th%ile
5	m		10.60			
6	m		7.40			
7	m		7.00			
8	m		6.10			
9	m		6.00			
10	m		4.90			
11	m		4.80			
5	f		10.20			
6	f		7.30			
7	f		5.90			
8	f		5.70			
9	f		5.20			
10	f		4.70			
11	f		4.50			

DEFINITION

The maximum time for which children can stand on a narrow beam.

APPLICATION AND SUMMARY OF THE DATA

Specific conditions were used to collect these data and these should be considered when applying the data to other situations.

SEE ALSO

dynamic balance, walking across a ladder, walking sideways.

NUMBER OF SOURCES: 2

source	details	reference	country	age
1	feet parallel to the beam	Dinucci 1977	USA	6-8
2	feet across the beam	Dinucci 1977	USA	6-8

source1 of 2

DinuCCI 1977

Country USA
Ages 6-8
Sample 90
The time (seconds) for which children can stand balanced on a narrow beam with their feet lengthwise (parellel) to the beam.
Louisiana children; females only.

age	sex	n	mean	sd	5th%ile	95th%ile
6	f		11.40			
7	f		15.70			
8	f		17.00			

source 2 of 2

DinuCCI 1977

country USA
ages 6-8
sample 90
The time (seconds) for which children can stand balanced on a narrow beam with their feet crosswise (across) the beam.
Louisiana children; females only.

age	sex	n	mean	sd	5th%ile	95th%ile
6	f		4.70			
7	f		6.10			
8	f		7.10			



Section 3.2

Physical abilities: Movement

Dynamic balance 177

DEFINITION

Maximum distance that can be walked, either on a narrow beam or heel to toe on the floor.

APPLICATION AND SUMMARY OF THE DATA

Specific conditions were used to collect these data and these should be considered when applying the data to other situations.

SEE ALSO

static balance, walking across a ladder, walking sideways, hopping.

NUMBER OF SOURCES: 2

source	details	reference	country	age
1	walking on a narrow beam	Govatos 1966	USA	7-11
2	walking heel to toe on the floor	Pissanos 1983	USA	6-8

source1 of 2

Govatos 1966

Country USA
Ages 7-11
Sample 48
'balance beam performance' assumed to be the maximum distance (feet) that can be walked on a narrow beam. Report classified subjects as school grades 2 - 6.

age	sex	n	mean	sd	5th%ile	95th%ile
7	m		8.84	4.7		
8	m		17.74	4.5		
9	m		17.37	4.3		
10	m		19.35	3.5		
11	m		21.23	3.1		
7	f		12.43	5.5		
8	f		18.15	4.6		
9	f		19.80	4.1		
10	f		20.32	4.5		
11	f		21.02	2.9		

source 2 of 2

Pissanos 1983

Country USA
Ages 6-8
Sample 80
The maximum number of steps that can be made while walking heel to toe with hands on hips. A maximum score of 6 awarded if the subject made 6 conseqetive steps.

age	sex	n	mean	sd	5th%ile	95th%ile
6	m		4.80	1.2		
7	m		5.10	1.1		
8	m		5.10	0.9		
6	f		4.50	1.4		
7	f		5.60	0.6		
8	f		5.40	1.0		

Section 3.3 Physical abilities: Specific Performance **Height at which windows can be opened 178**

DEFINITION

The maximum height at which a window peg stay can be operated, with heels on the ground.

APPLICATION AND SUMMARY OF THE DATA

The conditions under which these data were collected were strictly controlled (eg children were told to keep their heels on the ground). This and factors such as whether or not children can climb onto furniture to extend their reach should be considered when using these results.

SEE ALSO:

overhead reach to grip (standing), overhead reach to fingertip (on tiptoes), overhead reach to fingertip (jumping)

NUMBER OF SOURCES: 2

source	details	reference	country	age
1	access across a worktop	McClelland 1976	UK	5-13
2	unrestricted access	McClelland 1976	UK	5-13

Section 3.3 Physical abilities:Specific Performance Height at which windows can be opened 1 / 8

source 1 of 2

McClelland 1976

Country UK
Ages 5-13
Sample 239

Maximum height the window peg stay could be operated (mm) with access restrict-
ed by worktop 900mm high x 600mm deep. Of the 5 year olds, only one male and
one female, and of the 6 year olds only one female and none of the males were
able to operate the window peg stay with the worktop in the way.

age	sex	n	mean	sd	5th%ile	95th%ile
5	m	15	1050	n/a		
6	m	18	n/a	n/a		
7	m	16	1120	278		
8	m	14	1137	126		
9	m	14	1269	212		
10	m	16	1457	117		
11	m	8	1549	180		
12	m	13	1689	112		
5	f	13	970	n/a		
6	f	17	1111	n/a		
7	f	15	1057	89		
8	f	20	1192	169		
9	f	15	1333	145		
10	f	21	1436	160		
11	f	14	1559	98		
12	f	10	1715	116		

source 2 of 2

McClelland 1976

Country UK
Ages 5-13
Sample 239

Maximum height the window peg stay could be operated (mm) with unrestricted
access.

age	sex	n	mean	sd	5th%ile	95th%ile
5	m	15	1324	81		
6	m	18	1369	66		
7	m	16	1481	98		
8	m	14	1554	55		
9	m	14	1621	92		
10	m	16	1731	80		
11	m	8	1791	98		
12	m	13	1892	88		
5	f	13	1299	85		
6	f	17	1399	101		
7	f	15	1496	80		
8	f	20	1540	81		
9	f	15	1645	82		
10	f	21	1726	112		
11	f	14	1793	108		
12	f	10	1905	86		

DEFINITION

Ability of children to climb garden/pool safety fences of different heights.

APPLICATION AND SUMMARY OF THE DATA

Design features such as the rigidity of the material and possible foot holds will affect fence climbing ability and should be considered when applying these data to other fences and barriers.

SEE ALSO

jumping over a barrier, jumping upwards, step height

NUMBER OF SOURCES: 2

source	details	reference	country	age
1	% able to climb	Nixon 1979	Austral	2-8
2	time to climb	Nixon 1979	Austral	2-8

source1 of 2

Nixon 1979

Country Australia

Ages 2-8

Sample 493

The percentage of children able to climb fences of heights 0.6, 0.9, 1.2 and 1.4 metres high was recorded. The fences were all vertically ribbed. The study found no differences in the 'climbability' of different commercial brands of fencing and no significant differences between the sexes ($p>0.1$).

age	sex	n	mean	sd	5th%ile	95th%ile
% able to climb 0.6 metre high fence						
2	mf		21.00			
3	mf		88.00			
4	mf		94.00			
5	mf		100.00			
6	mf		100.00			
7	mf		100.00			
8	mf		100.00			
% able to climb 0.9 metre high fence						
2	mf		0			
3	mf		53			
4	mf		81			
5	mf		88			
6	mf		98			
7	mf		100			
8	mf		100			
% able to climb 1.2 metre high fence						
2	mf		0			
3	mf		20			
4	mf		62			
5	mf		78			
6	mf		76			
7	mf		82			
8	mf		95			

continued...

source1 of 2 continued

age	sex	n	mean	sd	5th%ile	95th%ile
% able to climb 1.4 metre high fence						
2	mf		0			
3	mf		0			
4	mf		52			
5	mf		79			
6	mf		85			
7	mf		95			
8	mf		85			

Section 3.3

Physical abilities: Specific Performance

Climbing fences 179

source 2 of 2

Nixon 1979

Country Australia

Ages 2-8

Sample 493

Mean time taken (seconds) to climb fences.

age	sex	n	mean	sd	5th%ile	95th%ile
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Time to climb 0.6 metre high fence.

3	mf		8			
4	mf		4			
5	mf		3			

Time to climb 0.9 metre high fence

4	mf		10			
5	mf		10			
6	mf		7			
7	mf		-			
8	mf		4			
9	mf		3			

Time to climb 1.2 metre high fence

4	mf		16			
5	mf		12			
6	mf		11			
7	mf		10			
8	mf		8			
9	mf		9			

Time to climb 1.4 metre high fence

4	mf		18			
5	mf		17			
6	mf		15			
7	mf		9			
8	mf		9			

Section 3.3

Physical abilities: Specific Performance

Throwing distances 180

DEFINITION

The maximum distance an object can be thrown.

APPLICATION AND SUMMARY OF THE DATA

The size and weight of the object being thrown will affect results and should be considered when applying these data to other products.

NUMBER OF SOURCES: 4

source	details	reference	country	age
1	medicine ball	Hebbelinck 1975	Bel	6-13
2	hockey ball	Hebbelinck 1975	Bel	6-13
3	3 lb shot put	Cureton 1964	USA	7-12
4	8lb shot put	Cureton 1964	USA	8-10

Section 3.3

Physical abilities: Specific Performance

Throwing distances 180

source1 of 4

source 2 of 4

Hebbelinck 1975

Hebbelinck 1975

Country Belgium

Ages 6-13

Sample 1704

The maximum distance (metres) a medicine ball can be thrown. Sample consisted of Flemish speaking children living in Belgium.

Country Belgium

Ages 6-13

Sample 1704

The maximum distance (metres) a hockey ball can be thrown. Sample consisted of Flemish speaking children living in Belgium.

age	sex	n	mean	sd	5th%ile	95th%ile
6	m	166	1.80		1.05	2.59
7	m	425	2.21		1.40	3.31
8	m	487	2.81		1.90	4.17
9	m	548	3.37		2.24	4.72
10	m	537	4.01		2.59	5.33
11	m	865	4.51		2.95	6.14
12	m	715	4.98		3.63	6.56
13	m	117	5.25		3.37	7.13
6	f	137	1.43		0.84	2.23
7	f	682	1.72		1.08	2.52
8	f	645	2.05		1.30	3.10
9	f	732	2.52		1.65	3.70
10	f	707	2.95		1.97	4.27
11	f	839	3.52		2.32	4.91
12	f	600	3.95		2.71	5.56
13	f	65	4.24		2.81	6.19

age	sex	n	mean	sd	5th%ile	95th%ile
6	m	106	6.26		3.10	12.59
7	m	319	8.97		4.49	16.28
8	m	389	12.11		6.05	20.06
9	m	418	14.86		7.82	23.90
10	m	441	18.31		9.15	28.70
11	m	554	21.23		11.70	31.45
12	m	553	23.14		13.43	34.47
13	m	88	25.77		13.71	37.49
6	f	102	4.65		2.75	8.19
7	f	580	5.75		3.43	9.16
8	f	577	7.12		4.13	11.12
9	f	694	8.21		5.01	13.25
10	f	622	10.04		6.10	15.98
11	f	752	11.52		7.01	18.40
12	f	550	12.71		7.95	20.18
13	f	58	13.69		9.78	22.53

Section 3.3

Physical abilities: Specific Performance

Throwing distances 180

source 3 of 4

Cureton 1964

Country USA

Ages 7-12

Sample 70

The maximum distance (inches) a 3lb shot put can be thrown. Illinois children; males only.

age	sex	n	mean	sd	5th%ile	95th%ile
7	m		98			
8	m		111			
9	m		130			
10	m		160			
11	m		206			
12	m		237			

source 4 of 4

Country USA

Ages 8-10

Sample 70

The maximum distance (inches) a 8lb shot put can be thrown. Illinois children; males only.

age	sex	n	mean	sd	5th%ile	95th%ile
8	m		111			
9	m		130			
10	m		160			

DEFINITION

The average volume of liquid that is swallowed in a single swallow during drinking.

APPLICATION AND SUMMARY OF THE DATA

These results represent 'normal' drinking; the volume of liquid that could be forcibly swallowed may be greater than that indicated by these data.

NUMBER OF SOURCES: 1

source	details	reference	country	age
1		Jones 1961	USA	1-3

source 1 of 1

Jones 1961

Country USA
Ages 1-3
Sample 10

Subjects drank between 60 and 120cc of water from a cup and the number of swallows required to consume that volume was recorded and used to calculate the volume of one swallow (cc). Ages are 1.25 to 3.5 years (six males).

age	sex	n	mean	sd	5th%ile	95th%ile
1-3	mf	10	4.9	1.9		

DEFINITION

The time taken to react to a visual stimulus.

APPLICATION AND SUMMARY OF THE DATA

These data are presented as only a guide to children's attention. Specific conditions were used to collect these data and these should be considered when applying the data to other situations.

SEE ALSO

reaction time to a visual and auditory stimulus, reaction time to an auditory stimulus.

NUMBER OF SOURCES: 2

source	details	reference	country	age
1	to a cross on a VDU screen	Guttentag 1985	Can	4,7
2	details unknown	Cureton 1964	USA	6-13

source1 of 2

Guttentag 1985

Country USA
Ages 4 & 7
Sample 16

The subjects were presented with either a visual stimulus (a 6.5mm cross in a 50 x 50mm border on a VDU screen) or an auditory stimulus (a 45 dbA/240Hz tone). The reaction time to the visual stimulus was measured (milliseconds) via a push button placed 1100mm from the subject. Two conditions were used; the subjects were told which stimulus - auditory or visual - was coming next (precue) or were given no information on which to expect (no precue).

age	sex	n	mean	sd	5th%ile	95th%ile
no precue						
4	mf		895			
7	mf		607			
precue						
4	mf		844			
7	mf		551			

source 2 of 2

Cureton 1964

Country USA
Ages 6-13
Sample 707

Reaction time (milliseconds) measured to a vertical jump. No further details available. Male subjects only.

age	sex	n	mean	sd	5th%ile	95th%ile
6	m		510			
7	m		460			
8	m		450			
9	m		420			
10	m		410			
11	m		390			
12	m		390			
13	m		380			

DEFINITION

The time to react to an auditory stimulus.

APPLICATION AND SUMMARY OF THE DATA

These data are presented only as a guide to children's perceptual abilities. Specific conditions were used to collect these data and these should be considered when applying the data to other, and realistic, situations.

SEE ALSO

reaction time to a visual and auditory stimulus, reaction time to a visual stimulus.

NUMBER OF SOURCES: 3

source	details	reference	country	age
1	75dB/905Hz	Andersson 1984	USA	5-13
2	45 dB/240 HZ	Guttentag 1985	Can	4,7
3	no details	Cureton 1964	USA	6-13

Section 4

Perceptual abilities

Reaction times to auditory stimuli 183

source 1 of 3

Andersson 1984

Country USA
Ages 5-13
Sample 56
Reaction time (milliseconds) to a continuous sound of 75 dB and 905 Hz via a contact pressed with the thumb.

age	sex	n	mean	sd	5th%ile	95th%ile
5	mf		465		337	642
7	mf		353		256	487
9	mf		287		208	397
11	mf		244		176	337
13	mf		213		154	294

source 2 of 3

Guttentag 1985

Country Canada
Ages 4 & 7
Sample 16
The subjects were presented with either a visual stimulus (a 6.5mm cross in a 50 x 50mm border on a VDU screen) or an auditory stimulus (a 45 dbA/240Hz tone). The reaction time to the start and end of the auditory stimulus was measured (milliseconds) via a push button placed 1100mm from the subject. Two conditions were used; the subjects were told which stimulus - auditory or visual - was coming next (precue) or were given no information on which to expect (no precue).

age	sex	n	mean	sd	5th%ile	95th%ile
reaction time to onset of stimuli with no precue						
4	mf		811			
7	mf		578			
reaction time to onset of stimuli with precue						
4	mf		743			
7	mf		538			
reaction time to offset of stimuli with no precue						
4	mf		812			
7	mf		636			
reaction time to offset of stimuli with precue						
4	mf		748			
7	mf		595			

Section 4 Perceptual abilities

Reaction times to auditory stimuli 183

source3 of 3

Cureton 1964

Country USA

Ages 6-13

Sample 707

Reaction time (milliseconds) measured to a vertical jump.No further details available. Male subjects only.

age	sex	n	mean	sd	5th%ile	95th%ile
6	m		480	80		
7	m		450	90		
8	m		430	80		
9	m		390	60		
10	m		390	60		
11	m		380	80		
12	m		360	60		
13	m		350	90		

DEFINITION

Time to react to either a visual or auditory stimulus.

APPLICATION AND SUMMARY OF THE DATA

These data are presented only as a guide to children's perceptual abilities. Specific conditions were used to collect these data and these should be considered when applying the data to other, and realistic, situations.

SEE ALSO

reaction time to a visual stimulus, reaction time to an auditory stimulus.

NUMBER OF SOURCES: 1

source	details	reference	country	age
1		Guttentag 1985	Can	4-7

Section 4

Perceptual abilities

Reaction times to visual & auditory stimuli 184

source1 of 1

Guttentag 1985

Country Canada

Ages 4 & 7

Sample 16

The reaction time (milliseconds) to either a visual stimulus (a 6.5mm cross in a 50 x 50mm border on a VDU screen) or an auditory stimulus (a 45 dbA/240Hz tone). The subjects were not told which stimulus to expect. Response was measured via a push button placed 1100mm from the subject.

age	sex	n	mean	sd	5th%ile	95th%ile
4	mf		781			
7	mf		543			

DEFINITION

Children's preference for colours, and in particular, with respect to safety symbols and packaging.

APPLICATION AND SUMMARY OF THE DATA

Specific conditions were used to collect these data and these should be considered when applying the data to other situations. The understanding and preference for colour is likely to be affected by other design features such as size, shape and luminance.

SEE ALSO

understanding of safety symbols.

NUMBER OF SOURCES: 4

source	details	reference	country	age
1	discrimination of red/green	Fagan 1977	USA	4-7 (months)
2	understanding of red=danger	Nixon 1980	Aust	4-5
3	packaging (household bottles)	Ball 1979	UK	3-5
4	packaging	Wheeler 1978	UK	3-4

Section 5 Cognitive abilities

Understanding colour 185

source 1 of 4

Fagan 1977

Country USA

Ages 4-7 months

Sample 536

Infants aged 16 to 22 weeks can discriminate red and green. Infants aged 22 to 30 weeks appear to rely on colour as a basis for recognising visual stimuli sooner than they rely on shape or form.

source 2 of 4

Nixon 1980

Country Australia

Ages 4-5

Sample 260

Children's understanding of the red = danger convention was tested using a series of pictograms.

Children were presented with a series of three buttons. The buttons were either blank or covered with a pictogram intended to convey a message of 'danger' and 'do not touch'. These were:

- 1 a black skull and crossbones in a black triangular frame
- 2 a red skull and crossbones in a red triangular frame
- 3 a black serpent in a red triangle
- 4 a pointing finger in a red circular frame with a red slash through it.

Two conditions were used:

- a free play situation in which the children were given no instructions on whether to touch or play with the buttons
- a forced choice situation where the children were asked to choose and press just one of the buttons.

Both the red and black skull and crossbones pictogram were equally popular indicating that children of this age are not aware of the the adult conventions of colour associated meaning, and in particular, red = danger.

source 3 of 4

Ball 1979

Country UK

Ages 3-5

Sample 51

Children's preference for colour was tested with bottles used to package household products.

The children were presented with a range of household bottles, identical except for colour. The children were asked to choose their favourite bottle. The most popular colours were, in descending order:

yellow
blue
red
green
white
black
orange
purple
brown
grey.

There were significant differences between the responses of children and adults indicating a difference in the appeal of different colours to adults and children. However, when presented with real bottles of household products, the choices of adults and children were similar, indicating that packaging designed to appeal to the consumer also appeals to children.



source4 of 4

Wheeler 1978

Country UK

Ages 3-4

Sample 44

Children's preference for colour was tested with various types of packages.

Children were presented with six unlabelled packages of different colours. The children were asked to choose their favourite package. The most popular colours were, in descending order:

- purple/blue (Munsell value 2.5)

- yellow (Munsell value 5, 7.5)

- red (Munsell value 5)

- blue/green (Munsell value 5)

- red (Munsell value 7.5)

However, when other aspects of the packages were varied (eg size, shape, labelling) children's preference for colour was inconsistent.

DEFINITION

Children's comprehension of safety symbols conveying 'danger' or 'do not touch'.

APPLICATION AND SUMMARY OF THE DATA

Specific experimental conditions were used to collect these data and these should be considered when applying the data to other, and realistic, situations. The understanding and attractiveness of symbols is likely to be affected by other design features such as size, shape colour and previous exposure.

SEE ALSO

understanding of colour.

NUMBER OF SOURCES: 1

source	details	reference	country	age
1		Nixon 1980	Australia	4-5

source1 of 1

Nixon 1980

Country Australia
Ages 4-5
Sample 260

Children's understanding of the safety conventions conveyed by safety symbols was tested using a series of pictograms.

Children were presented with a series of three buttons. The buttons were either blank or covered with a pictogram intended to convey a message of 'danger' and 'do not touch'. These were:

- 1 a black skull and crossbones in a black triangular frame
- 2 a red skull and crossbones in a red triangular frame
- 3 a black serpent in a red triangle
- 4 a pointing finger in a red circular frame with a red slash through it.

Two conditions were used:

- a free play situation in which the children were given no instructions on whether to touch or play with the buttons
- a forced choice situation where the children were asked to choose and press just one of the buttons.

In both conditions, the children pressed the buttons with symbols 1,2 and 3 significantly more often than the blank button. Only symbol 4 produced no significant differences compared to a blank button. The results suggest that symbols are attractive to children at this age and that their safety message is not necessarily understood by children.

A follow up study tested the learning and retention of safety messages conveyed by symbols. In this study, children were presented with two blank buttons and one with symbol 4, 'do not touch'. In a free play situation, 34.5% of all contact with the buttons was to the button with the symbol. After children were told not to touch the button with the symbol, contact with it reduced to 8%. Retention was tested a week later and 17% of contact was with the button with symbol. These results suggest that the meaning of symbols can be learnt and converted into appropriate behaviour. Retention is possible, at least over short periods of time.



DEFINITION

The maximum time for which children are likely to pay attention to a particular object or activity.

APPLICATION AND SUMMARY OF THE DATA

These data are presented only as a guide to children's attention characteristics. Specific experimental conditions were used to collect these data and these should be considered when applying the data to other, and realistic, situations.

NUMBER OF SOURCES: 4

source	details	reference	country	age
1	attention without a stimulus	Hill 1975	USA	3-4
2	attention with varied visual stimuli	Lewis 1973	UK	3
3	attention to varied activities	Wilkinson 1983	UK	4
4	attention to a toy	Hutt 1973	UK	7(mo)

source 1 of 4

Hill 1975**Country** USA**Ages** 3-4**Sample** ?

The attention span of children ages 3-4 without a given stimulus is quoted as 15 to 20 seconds.

source 2 of 4

Lewis 1973**Country** UK**Ages** 3**Sample** 10

Attention at age 3 can be sustained for up to 30 minutes by varying the visual inputs.

source 3 of 4

Wilkinson 1983**Country** UK**Ages** 4**Sample** 29

Children's attention span was measured by the rate at which each child moved between four given types of activities. This was measured over 64 two hour play periods. The activities were:

- 1 cognitive eg stories, painting, dressing up, table games
- 2 physical eg climbing frames
- 3 personal/social eg playing together, eating
- 4 other ie not at any of the provided activities.

The children changed activity on average once every 4 minutes (standard deviation 0.3 minutes).

source 4 of 4

Hutt 1973**Country** UK**Ages** 7 months**Sample** ?

Attention span was measured by the rate at which a child dropped a toy. A different but relatively similar toy was presented to the child every three minutes. Measurements were carried out over three sessions lasting thirty minutes each.

Attention, measured as the mean rate of 'toy dropping', decreased during the thirty minute session. The toy was dropped, on average, once during the first three minutes and this increased to nine times during the last (tenth) 3 minute measurement period. Attention dropped as the session proceeded since the objects were similar. When a completely novel object was introduced halfway through the session, attention increased again and the rate of toy dropping decreased to the original rate.

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Further reading or sources of information are listed under the following headings:

- 8.1 Anthropometry
- 8.2 Strength
- 8.3 Ergonomics and design
- 8.4 Designing for children/Child Safety
- 8.5 Child development

8.1 Anthropometry

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9 Further contacts

Institute for Occupational Ergonomics

Department of Manufacturing Engineering
University of Nottingham

University Park

Nottingham

NG7 2RD

Telephone: (+44) (0) 115 9514039/951 4004

Consumer Safety Unit

Department of Trade and Industry

10-18 Victoria Street

London

SW1H 0NN

Telephone: (+44) (0)171 215 3474

Child Accident Prevention Trust

Clerks Court

18-20 Farringdon Lane

London

EC1R 3AU

UK

Telephone: (44) (0) 171 608 3828

Consumer Safety Institute (and European Consumer Safety Association)

Rijswijkstraat 2

PO Box 75169

1070 AD Amsterdam

The Netherlands

Telephone: (+31) 20 511 4511

Royal Society for the Prevention of Accidents

Cannon House

The Priory Queensway

Birmingham

B4 6BS

UK

Telephone: (+44) (0) 121 200 2461

Consumer Product Safety Commission

Washington DC 20207

USA

British Standards Institute

2 Park Street

London

W1A 2BS

Telephone: (+44) (0) 171 629 9000

The Ergonomics Society

Devonshire House

Devonshire Square

Loughborough

Leicestershire

LE11 3DW

UK

Telephone: (+44) (0) 1509 234904

Ergonomics Information Analysis Centre

The University of Birmingham

School of Manufacturing and Mechanical Engineering

Edgbaston

Birmingham

B15 2TT

UK

Telephone: (+44) (0) 121 414 4239



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Appendix1

p and z values of the normal distribution

p	z	p	z	p	z	p	z
1	-2.33	26	-0.64	51	0.03	76	0.71
2	-2.05	27	-0.61	52	0.05	77	0.74
3	-1.88	28	-0.58	53	0.08	78	0.77
4	-1.75	28	-0.55	54	0.10	79	0.81
5	-1.64	30	-0.52	55	0.13	80	0.84
6	-1.55	31	-0.50	56	0.15	81	0.88
7	-1.48	32	-0.47	57	0.18	82	0.92
8	-1.41	33	-0.44	58	0.20	83	0.95
9	-1.34	34	-0.41	59	0.23	84	0.99
10	-1.28	35	-0.39	60	0.25	85	1.04
11	-1.23	36	-0.36	61	0.28	86	1.08
12	-1.18	37	-0.33	62	0.31	87	1.13
13	-1.13	38	-0.31	63	0.33	88	1.18
14	-1.08	39	-0.28	64	0.36	89	1.23
15	-1.04	40	-0.25	65	0.39	90	1.28
16	-0.99	41	-0.23	66	0.41	91	1.34
17	-0.95	42	-0.20	67	0.44	92	1.41
18	-0.92	43	-0.18	68	0.47	93	1.48
19	-0.88	44	-0.15	69	0.50	94	1.55
20	-0.84	45	-0.13	70	0.52	95	1.64
21	-0.81	46	-0.10	71	0.55	96	1.75
22	-0.77	47	-0.08	72	0.58	97	1.88
23	-0.74	48	-0.05	73	0.61	98	2.05
24	-0.71	49	-0.03	74	0.64	99	2.33
25	-0.67	50	0	75	0.67		2.5
p	z	p	z				
0.5	-2.58	99.5	2.58				
0.1	-3.09	99.9	3.09				
0.01	-3.72	99.99	3.72				
0.001	-4.26	99.999	4.26				
-1.96	97.5	1.96					

z = standard deviate or z score

p = percentile

Appendix 2

Assessment of validity of anthropometric sources - international differences and secular trend

1 Current UK stature and weight data

The current UK stature and weight data used for the assessment of validity were estimates used to construct the new Growth Reference Curves for stature and weight produced by Freeman et al [19]. These replace the growth curves in use since the 1960s [20]. The new curves are based primarily on the latest available data from the annual National Study of Health and Growth, a survey of 10,992 children aged 5 to 12 measured in England during 1990 and in Scotland in 1989-1990 [21]. These were combined with other sources (including the BSI data) to extend the age ranges from birth to 18 and to construct the reference curves. The GRC data represent Caucasian children only.

2 Use of stature to estimate international anthropometric differences

Differences in anthropometric measurements between countries are usually only reported in terms of height, weight, Body Mass Index (BMI) or skinfold measurements, as these are considered the most useful indicators of children's growth. For the designer however, comparison of other key measurements such as head breadth, finger diameter and overhead reach would be more useful. One such study comparing head circumference found a difference between UK and Japanese children (UK children's head circumference being greater than that of Japanese children), and suggested that this primarily reflected the differences in stature; the ratio of head circumference to stature was almost identical in UK, North American and Japanese children) [23]. It has been suggested that differences in stature can be used to estimate differences between populations in other body parts, by calculating the ratio of the body part to stature. This assumes that body proportions are similar in both populations and has been demonstrated to be an acceptable method of estimation for body lengths, but less so for those measurements subject to bodyfat deposits such as body breadths and circumferential measurements [24].

3 Use of stature to estimate secular trend in other anthropometric data

There is very little guidance on how a secular increase in stature affects other anthropometric measurements. It has been suggested that in some countries a secular increase in stature has been produced almost wholly by an increase in leg length only [6,11]. However, more precise information than this is needed, using comparable data over long periods of time on a complete range of body dimensions and from a larger sample of countries. This is as yet unavailable and so any practical interpretation of secular trend has had to be based on the stature and weight data only.

4 Method of comparison of stature and weight data

Current UK childhood stature and weight data were taken from the new Growth Reference Curves produced by Freeman et al (1994). The data are grouped in monthly age groups from birth to 18 years. Data from the sources in the Handbook however are grouped into yearly age groups. Source data for each yearly age group were therefore compared to the mid-year month data from GRC (ie 4 year old data from the Databank were compared to data for children aged 4 years and 5 - 5.9 months from GRC). Curve fitting was attempted, but it was decided that the level of accuracy offered by direct comparison of the datapoints was sufficient. This method assumes that sample sizes in the sources are large enough to ensure that yearly data adequately represent children of all ages spread equally across the twelve months of the year.

5 Comparison of mean data only

For most sources comparison was made of mean data only. However a comparison of mean, fifth and ninetyfifth percentile values was made for Pheasant's data in order to investigate any differences throughout the population. The increase in mean stature was around 1.3%; the increase in fifth percentile stature was slightly higher (around 2%) while the increase in ninetyfifth percentile stature was slightly lower, around 0.7%. While these results suggest that further investigation may be necessary, the magnitude of the differences between the percentiles suggests that the data are valid for use with the current UK population.



Appendix 2

6 Comparison of infant data

Infant data could not be compared in this way because of differences in data groupings. First of all, age groups were different; GRC data were grouped in monthly age groups while all the infant data in the Handbook were grouped in either three or six monthly age groups. The amount of variation in anthropometric measurements in infants from birth to around two years is too great to compare across these age groups. Secondly, the GRC data were presented separately for males and females while the sources present data combined for males and females. Comparison of data from each source was therefore started from the first age group where age and sex groups were comparable.