

Shoe styles for children tend to follow the fashion trends for adults, more so in regards to shape rather than the materials used. However, the needs of children's feet are specific and change with the different stages of learning to walk. Ignoring these specific requirements can hinder the healthy development of the foot and lead to problems in adulthood.

CTC, the Centre Technique Cuir Chaussures Maroquinerie, in France conducted a study of children's footwear by testing products available on the French market in order to provide design guidelines for manufacturers. The aim was to set parameters for children's footwear with particular emphasis on shoes within the 18–23 and 24–27 Continental size ranges.

Guidelines for children's shoes



The role of a child's shoe can be considered as being threefold:

- To be aesthetically pleasing
- To support the foot in regards to fit and size
- To fit in terms of morphological requirements and the individual child's foot

A child's way of walking depends on a number of parameters and functions which vary from individual to individual dependant on personality, development, surroundings and heritage. Children generally start to walk between the ages of 11 and 18 months. From that moment on, the way they walk is used as a means of monitoring that they are developing well.

For the child, the passage from a horizontal position to one of vertical movement is the end result of a long process of physical and mental development. Walking helps every baby to increase confidence in its environment. It also gives the child confidence in itself, rouses its curiosity, encourages it to enjoy

moving around and to begin to understand its surrounding environment.

At this stage, the fit is fundamental. Children learn to walk by falling and it is therefore important to find a compromise between providing enough space not to hinder growth whilst at the same time offering enough support so as to avoid possible injury. By the age of two, walking has been mastered and the idea of comfort in the shoe becomes just as important as suppleness and support.

Size scale for children's shoes

These can be classified as follows:

Toddler	16 to 23
Infant	24 to 27
Small boy/girl	28 to 34

Beyond this, shoes already follow the adult sizing system in terms of the volume within the shoe. Using the above classifications shoe size can be related to age. ➤

Age (Years)	Boy's	Girl's
1	21-22-23	20-21-22
2	23-24-25	22-23-24
3	24-25-26-27	23-24-25-26
4	26-27-28	25-26-27-28
5	27-28-29-30	26-27-28-29
6	28-29-30-31	28-29-30-31
7	30-31-32-33	30-31-32-33
8	32-33-34-35	31-32-33-34
9	33-34-35-36	32-33-34-35
10	34-35-36-37	33-34-35-36

For the different segments, it is necessary that the shoe is precisely suited to the different morphological requirements of the particular age group in terms of size. The size of shoes for boys and girls does not differ until the age of five to seven, until which time both sexes remain identical.

Specifics of children's shoes

In terms of the foot's development, it is at its most sensitive between 9 and 12 months when the child begins to walk. This sensitivity allows the child to collect all of the information it requires in terms of walking (balance, stability, ambulation) and it is therefore vital that the shoe does not hinder development in any way.

Furthermore, the foot is growing and, because the bones are only partially calcified, this places certain restraints on the shoe. While it cannot be too tight, it must nevertheless still offer protection in terms of support to the condyles or the protruding bone each side of the ankle where it joins the leg (usually referred to by shoemakers as the anklebone) for children aged from one to three.

During this period, children must wear structured shoes that assist them in finding their balance and allow them to develop a certain amount of confidence. It is worth noting that very few children are born with malformed lower limbs but, however, only some 40% of adults have healthy feet and this is mainly due to wearing inappropriate shoes during childhood. It is therefore important to bear in mind the age of the child and the fit of the shoe when choosing footwear. The shape of the shoe is the base element and must be optimal to ensure a good fit.

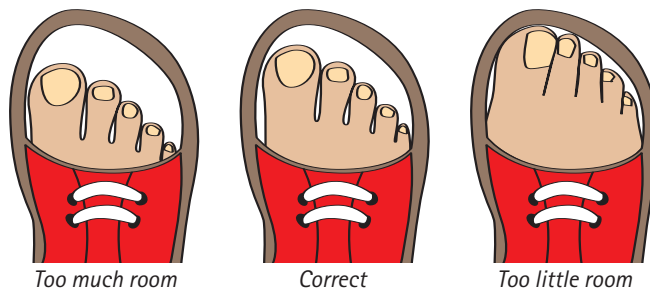
Criteria for ages 1 to 3 (sizes 18–23)

Uppers in this group are generally high cut and stop just at the condyles to ensure the foot is well supported.

Length – so as not to hinder the growth of the foot, the length of the shoe must be longer or equal to the length of the average foot in that size, bearing in mind that the increase in space between two sizes is 7mm—or possibly up to 10mm. It is important to respect this margin, although too much room can also have a negative effect on the growth of a child's foot. In effect, if the space is too large, the flex zone of the shoe is not positioned correctly in relation to the metatarsal joint of the foot.

Front of the shoe – for this aspect, two areas should be defined:

- Volume around the perimeter of the joint at the front of the foot (P.AMP)
- Area around the toes



Babies have relatively large big toes as these help them to balance and it is necessary to ensure that there is sufficient room so the toes do not cross over on top of one another, as this can lead to deformities such as 'claw' toes or ingrown toenails. At the joint, the volume must be sufficient for the individual foot and in no circumstances smaller than the average foot in that size.

Back of the shoe – neither the perimeter nor the height of the back of the shoe must be less than the average measurement for the shoe size.

Heel shape – in order to distribute the weight correctly and stabilise the foot, it is recommended that the curve of the heel corresponds to the fit (approximately 45 mm in relation to the back of the shoe).

Instep – this should follow the natural line of the instep of the foot at a front and rear height of between 5–8 mm. This part of the shoe should fit closely to the foot in order to offer some support to the arch in order to locate the forefoot inside the shoe. *Caution: It must at no time actually raise and support the arch of the foot.*

Relief – the relief or allowance in the shape of the shoe must not be over accentuated. A tolerance of 3mm is advised so as not to hinder the child's step by creating longitudinal instability caused through too much rocking whilst the child is learning to find its balance.

Criteria for ages 3 to 5 (sizes 24–27)

In comparison with the first group, children at this age are much more dynamic in their comportment. However, as the foot is still weak it is important to allow for this, although the upper can now be cut lower than for the younger children.

Length – the length of the shoe must be longer or equal to the average length of the specific size. Sizes go up in increments of 6mm.

Characteristics of French children's feet (mm)

Size	20	21	22	23	24	25	26	27
Length	123	130	138	145	152	158	165	171
Circumference metatarsal joint	140	144	148	152	156	160	164	168
CDP circumference	144	147	151	155	158	161	165	168
Joint width	58	60	61.5	63	65	66	68	70
Heel width	38.5	40	41	42	43	44	45	47
Height at toe joint	21.3	22	22	23	24	25	25	26
Height at rear of foot	35	36	37	38	39	40	41	42

Source: CTC 'Enquete de mensuration des pieds enfant' study on measuring children's feet.

CTC recommendations for footwear sizes 18-23 & 23-27

Size	18-23	24-27
Length	length of foot + 7-10 mm	length of foot + 7-10mm
Circumference at toes	AMP* + 1-2mm	same as AMP
CDP circumference	CDP + 3mm	CDP + 3mm
Width at toes**	flexed width + 1-2mm	flexed width + 1-2mm
Width at back**	heel width + 1-2mm	same as heel width
Height at toe joint	between 25-30mm	between 24-26mm
Height at back	CDP height + 2-5mm	CDP height + 2-5mm
Relief	2-3mm	4-5mm
Differential heel/forepart	5-8mm	8-10mm

* AMP refers to the metatarsal flex point

** the relationship between the width of the toes, the first joint and the sides is 0.1 for children. It can also be said that the relationship between the width of the instep and the sides is 0.95.

Front of the shoe – as with the younger child, the area around the joint must be sufficient and not less than the average foot for this size in order to avoid ingrown toenails.

Back of the shoe – circumference and height must again not be less than the average-sized foot.

Instep – this must follow the natural arch of the foot with a front and rear tolerance of 5mm.

Relief – so as not to hinder the development of the foot, the shoe should be raised at both ends by several millimetres. 5-8mm is suggested for the heel and between 4-6mm at the toe.

Criteria for ages 5 to 7 (sizes 27-33)

The foot is now becoming more structured and defined. It is also gaining in flexibility and the arch is beginning to form, lengthening the foot by some 5mm. Footwear can now start to become more like that worn by adults. It is at this point that the difference between girls' and boys' feet begins to become apparent and it is therefore necessary to have specific shoes

Length	length of foot + 6-9mm
Circumference at toes	same as AMP*
CDP circumference	toe circumference + 5mm
Width of toes	ratio of 0.41 between PAMP and size of toes
Width at back	ratio size of heel to size of footwear of 0.8 from 28 to 32 mm
Height at toe joint	28-32mm
Height at back	44 to 52 mm respectively (minimum
Relief	5mm
Differential heel/forepart	Boys' 10mm Girls' 15-18mm (max 20mm)

* AMP refers to the metatarsal flex point

for each sex.

The differences that can be noted are around the instep (difference in heel/forefoot) and in terms of the size of the main metatarsal joint. Girls' feet become defined sooner than boys' and as a result of this it is preferable to produce finer shoes for girls. It is also important to make a difference with regards to the height of the heel that is now slowly becoming more important for girls in order to accentuate the arch of the foot.

These values give a foundation upon which new functions for materials and new ideas for models can be based and then refined through actual footwear tests. For sizes 18-23, sub-sections 18-20 and 20-23 can also be considered, the first being dedicated to a child's first steps.

CTC recommendations for footwear sizes 27-33

Dual-sizing must be considered for this age group as the differences between the male and female foot are becoming more apparent. These are mainly found in the width of the foot and the height of the heel. From this age group onwards the concept of the shoe becomes very similar to that for an adult. Furthermore, the levels of compression in terms of balance between the front and back of the foot begin to come into play. 



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