

The importance of good fit for children's shoes

LEE WILSON considers how to meet the challenge of combining good fit with fashion in children's footwear, to minimise the risk of damaging their feet with styles that compromise foot health.

Children's feet are delicate and particularly vulnerable to damage from wearing ill-fitting or inappropriate shoe styles. For example, feet squeezed into tight ballerina-style pumps can leave red weal marks on the skin where excessive pressure has been applied. Such marks can also indicate a restriction of blood circulation – lateral pressure on the big toe can lead rapidly to hallux valgus and the formation of a bunion (figure 1). Even good shoe styles with generous fitting properties can cause foot injury if not correctly selected and matched to the individual child's foot size and shape.

Children's feet grow in length by nearly 1mm per month on average up to their mid- to late-teenage years. In practice, of course, they do not grow at a uniform rate, but often rapidly and in short bursts. Parents or guardians therefore need to monitor fit over time, as the child's foot grows and the shoe wears. Depending on the rate of foot growth, it may be necessary to replace footwear before it is worn out if pressure on the foot becomes excessive. By contrast, shoes may need to be replaced due to heavy wear and breakdown before the child has outgrown the shoe. Uneven sole wear – particularly at the heel – can lead to an unstable base and an unstructured upper can quickly distort. In both cases, the result is a loss of support for the foot and high stresses are put on both the foot structure and the ankle joint, with potentially damaging consequences for the child.

Retail trends

For previous generations of children, footwear retailers placed great emphasis on the provision and selection of good-fitting footwear, with fashion being less of



'Sensible' shoes can be fashionable without risking the health of a child's vulnerable feet

a consideration. Shoes were therefore made available that gave children's feet appropriate support and protection for everyday wear, and which had the correct fitting properties to accommodate foot dimensions and shape, with allowance for foot growth.

Shoes were bought from high street shoe stores where advice and guidance were available from sales staff, with foot measurement and fitting services being widely provided. For those who could afford them, children's fashion shoes were available for occasional or party wear, but parents were generally encouraged to buy 'sensible' shoes as the main pair for long periods of everyday wear.

Today, however, we are living in a fast-moving commercial world. Footwear prices are relatively low and, with ever-changing fashions, a considerable amount of footwear (including that in the children's market) is seen as a disposable, short-term purchase. Peer pressure on children and prolific media advertising increases awareness and demand for all sorts of products, not all of which are going to be good for foot health.

The fitting process experienced in a store is not available when shopping on the internet, by mail order, or in cut-price retailers and supermarkets. Even when retail shop assistants are not available to guide parents and children, customers visiting a store have the opportunity to try on and compare several styles and sizes before selecting a purchase. Most internet and mail order suppliers have excellent returns policies, so there is usually no problem with sending shoes back. However, it is important that good fitting advice is also provided.

Risk assessment

With today's consumer compensation culture and acute awareness of health and safety issues, it is increasingly likely that claims may be made against ill-fitting or inappropriately designed shoes – especially those that cause injury or damage to children's feet. Of course, the onus must lie with the parents who buy the footwear and allow their children to wear it. However, although this might reasonably seem a sufficient defence, there is still a requirement for retailers to place only safe, fit for purpose products on the market (see box 1). Any fitting



Figure 1: Hallux valgus is the outward distortion of the big toe joint with inward deflection of the big toe tip. A bunion or bursal sac may subsequently form on the protruding joint

Box 1: Risk assessment and legislation relating to children's footwear

The fitting properties and general design of children's footwear can pose potential risk to the wearer. It is therefore important to undertake a wide-ranging risk assessment of children's footwear products.

There is no specific legislation that applies expressly to children's footwear as, for example, there is for occupational footwear where compliance against national or international standards may be mandatory. However, as with all consumer products, the possibility of rejection of products, recalls and damage to brand name is highly undesirable, and can significantly affect a business.

In some parts of the world, more general consumer product laws exist to cover goods not already included in any other specific legislation. These may not particularly mention children's footwear, but they do require products to be safe for children to wear and with regard to any other foreseeable health risks. It therefore encompasses potential hazards such as slipping due to poor slip resistance, tripping as a result of the footwear being oversized, protruding design features, excessive lace length, lace entanglement, sole or heel detachment, fastening breakage, and sharp edges on buckles and trims.

SATRA has a number of test methods to cover these issues.

It may also be useful to consider other child-related standards in order to assess risks to children associated with playing with footwear or sucking and chewing on the materials. This will identify potential hazards – such as the possibility of choking on components that may become detached. In addition, restricted substances legislation covers all chemical risks in relation to allergic reaction and toxic elements.

Finally, general product 'fitness for purpose' may be covered by legislation relating to the sale of consumer goods and associated guarantees. This type of legislation covers all situations for which customers may wish to return footwear and seek some form of redress or compensation for an issue that is not deemed to be safety-related. This might therefore cover colour fastness problems, rapid or premature wear or poor fit.

Risk assessment is key to all the above and to distinguishing between safety and general fitness for purpose issues. This is not a simple area – please contact SATRA for further information on any of these aspects of risk assessment and footwear-related legislation. However, please note that SATRA cannot provide legal advice.

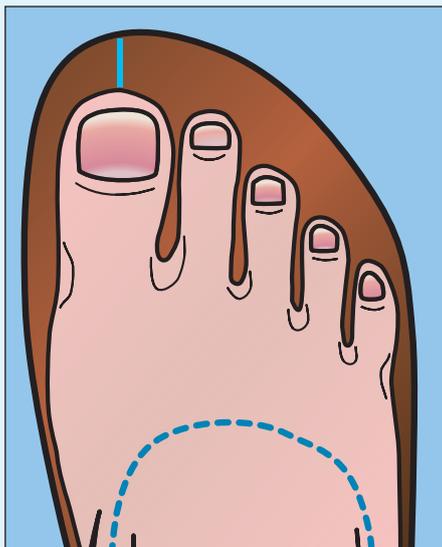


Figure 2: The correct length with 10-12mm of toe room for children's shoes

service provided by the retailer can be extremely beneficial in selecting a good-fitting shoe, although the retailer then shares some responsibility.

Pressure on manufacturers

To keep up with retail market demands, considerable pressure is placed on manufacturers to regularly and quickly make new products while maintaining low production costs and short development times. This can severely limit the time and attention required to ensure that new styles of children's footwear have, where possible, good fitting properties. If samples are not correct first time, the opportunity to revise and improve rapidly diminishes.

The potential consequence of time pressure on the development process is to accept a compromise on fitting properties, despite the fact that poorly-fitting shoes worn during childhood can damage feet for life.

There are a number of measures that can be taken in order to reduce product development time (and costs), such as re-working and re-using existing lasts, sole moulds, insole and backpart shapes, as well as simply changing the upper design and styling. This strategy can work well, assuming that the original product was well designed and that the consequences of the modified elements (materials, components, fastening system and so on) are not overlooked.

Two different upper styles made on the same last may well have different fitting properties on the foot if variations in such

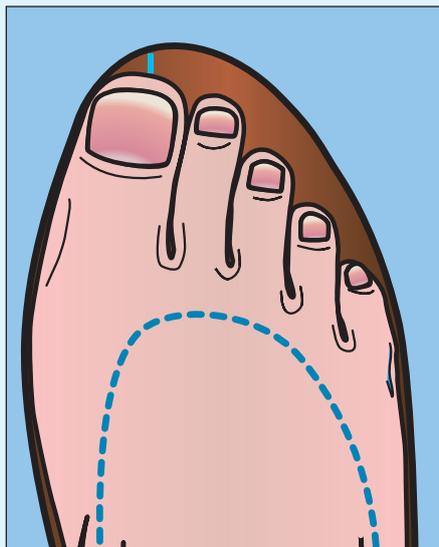


Figure 3: Fitting problems that arise with a ballerina pump style of children's shoe

characteristics as material modulus (stretch property), seam thickness and type of foam lining are not fully taken into account in the shoemaking process. For instance, it may be necessary to use a variety of lasting forces and heat setting conditions for different uppers.

Developing totally new lasts and sole moulds provides the opportunity to start afresh and implement change, learning from experience and improving products. Naturally, this takes much longer, is more expensive and requires even closer attention to detail at every stage of development – from last and upper pattern design and grading to process control. Please see page 6 for details of SATRA's new digital last assessment service

Factors to consider in fitting the market

There are a number of issues worth reviewing when considering the fitting needs of children's feet in the commercial market place:

- characteristics of children's feet
- the sizing of children's footwear
- fitting standards for different styles of children's footwear
- the development of fashion styles while still protecting foot health.

Characteristics of children's feet

With regard to fitting, the children's footwear market is very different from shoes produced for men or women because children's feet are continually changing. Babies' feet do not contain

bones, but have a soft skeleton of cartilage protected by thick fatty pads and tissue. Very slowly, the cartilage ossifies as calcium is deposited and the bones start to develop and joints form. It takes until early adulthood for the hard, strong skeleton to fully form.

During these early years, the foot is very vulnerable to injury from poorly-fitting footwear. Even tight hose (socks) can distort the alignment of the soft bones. Until infants start to walk outside, there is little reason to put their delicate feet into structured footwear. However, once they do begin to walk outside, some protection is required from rough and uneven surfaces. Nevertheless, their feet are still very vulnerable, and shoes should be both lightweight and flexible in order to minimise the stress on the foot during walking and play.

Children, of course, have lower bodyweight than adults and, therefore, the pressures underfoot are also lower and generally of little concern. Infants also have thick fatty pads under their feet which provide good natural shock absorption.

Over recent decades, we have seen indications that children's feet are getting wider (increasing girth) relative to their length and, thus, width-fitting standards have had to increase. Ideally, children's shoes should be available in a range of width fittings to accommodate the variety of foot widths in the children's population. Squeezing a foot which is two fittings above average into an average-fitting shoe is clearly going to exert undue pressure and potentially damage the foot. Likewise, an average foot in a shoe two fittings above average will not be given the required lateral support.

Good fit must take into consideration foot dimensions and foot shape.

Dimensions and shape change with age and differs between the genders. Boys will tend to have slightly wider feet than girls, but girls may have a slightly higher instep.

When undertaking fit assessment, it is necessary to consider the styling of the footwear and not just rely on the size marking or intended age group. This is because there is such a wide range of ages that might wear a given size (typically plus or minus two years), with the range increasing with shoe size. Some styles are clearly aimed at younger children, while others appeal to

older age groups. The appropriate foot shape should, therefore, be used in the fit assessment.

We have found that some footwear aimed at older children does not have suitable fitting properties for their feet, because it has been produced on lasts graded down in size from an adult range. Grading down in this way does not work when the market changes from adults to children, as they have different foot shapes – with children's feet being much slimmer. Children require lasts designed specifically for their characteristic foot shape.

Sizing children's footwear

Sample shoes are often seen that are marked with an incorrect size. If shoes are fitted and purchased correctly for the individual child, the size marking is irrelevant. The shoe will be chosen as having the correct fitting properties and growth room for that child, irrespective of markings.

However, some parents may buy according to size marking – especially if purchased via the internet or by mail order, as previously discussed. Some may have their children's feet measured in one store and be told the corresponding shoe size, only to go to another store, or to the internet, and buy a different brand that has different fitting standards. Under these circumstances, there is the potential for the child to be given inappropriate footwear, which may lead to problems with foot health.

'Incorrect size marking' simply means that the marked shoe size does not correctly indicate the length of foot that would be expected to be accommodated by that shoe – it does not necessarily mean that the footwear has poor fitting properties. For example, we would expect a child's UK size 11 shoe to satisfactorily accommodate a foot length of 176mm (and to reasonably accommodate foot lengths between 172mm and 180mm). If the shoe best fits a 184mm long foot, it should be marked as UK size 12, or if the best fit is somewhere in the middle – such as 181mm – we advise marking it as UK size 11½.

One cause of incorrect or inaccurate size marking is the problem of converting sizes between different size systems, such as those used in the UK, the US, Europe, China and Japan. The



Assessment should include the risk of young children chewing or sucking on footwear

UK and US size systems use a size-grading interval of 8.47mm, whereas the European system uses 6.67mm. Because of this difference, there are few sizes where there is an exact conversion from one to the other. The UK and US systems also differ in that there is usually an arbitrary ½ size difference between these scales, with shoes being marked a ½ size up on the US system (size 4 UK is size 4½ US).

The SATRA shoe size conversion chart is available to members and indicates our recommended size conversions between different scales. However, it is helpful to know the size system to which the shoes were produced before making the size conversions. This is because the size marking on that scale is likely to be the more accurate one, with size conversions to other scales introducing small errors.

Acceptable fitting standards

What fitting standards should be accepted for children is the big question for today's retailer when trying to balance the need for good-fitting, healthy footwear and the pressures of fashion. Figure 2 illustrates the correct length and toe room for children's shoes. There should be a minimum of 10-12mm of space in front of the big toe for a foot of average length for the given size. This allows adequate space for movement of toes during walking and running without pressing them against the shoe upper, as well as reasonable growth room for about three to five months' wear, depending on growth rate.

Adequate toe depth is also important to protect the toe nails and, depending on the toe shape or styling of the shoe, additional insole length may be required in order to ensure correct overall toe allowance.

By contrast, figure 3 illustrates the situation that arises with a ballerina pump style of children's shoe – for example, where no more than 5-6mm of toe space can be allowed without the wearer's foot literally 'walking out' of the shoe. This style clearly cramps the child's toes and risks damage to toe nails and distortion of the toe joints. While this may be considered acceptable in the name of fashion for an adult's shoe, it is clearly not conducive to children's foot health.

When assessing children's fit at SATRA, we are always looking for the ideal situation shown in figure 2. However, with the range of styles seen today, this is not always possible. In practice, we take the approach of looking for the optimum fitting standard possible, given the constraints imposed by style of shoe submitted. Thus, while SATRA advises against any child wearing a ballerina style shoe for anything other than very short periods of time, we do endeavour to advise how to make the shoe fit to its best possible level. It is a commercial decision for retailers themselves to select what types and styles of children's footwear to put on the shelf.

Improved fashion styles?

In order to move a ballerina style from the position shown in figure 3 to that in figure 2, a number of compromises to fashion would have to be accepted. The single most beneficial modification to make to this style is to add a broad,

adjustable fastening strap across the instep. This will hold the shoe securely on the foot and obviate the need for any pressure on the toes. Increasing the vamp length and raising the topline as much as possible to increase foot coverage also provides better foot security and gives better accommodation of the toes and the ball joint of the foot.

Although this article has mainly concentrated on aspects of fit from the length and toe accommodation, the backpart is also important. Children's shoes should have well-formed, firm (but not hard) backparts. This ensures that the foot is held correctly positioned and aligned in the shoe. The foot cannot then slip over the edge of the sole, misaligning the ankle joint and adversely affecting the biomechanics of heel strike or foot flexing.

Likewise, unstructured shoes and boots without a firm counter (stiffener) are potentially harmful if worn for long periods. Toe post sandals such as flip-flops and mule styles are not advisable for young children, due to the lack of security of foot location in the footwear. Indeed, these may be considered a stumbling or trip hazard, although perhaps acceptable for occasional short periods of wear.

Insocks are often used to adjust the fitting properties of children's shoes. When a sample product is assessed for fit and found to be too close or too generous in volume for the given length, the first action should be to check that the correct allowance to accommodate the intended insock thickness was used in designing the last. The insock thickness should then be checked against the product specification.

If the allowance was correct and a suitable insock was used, an adjustment to the volume of the last itself should ideally be made to modify and correct the fitting properties of the footwear. However, it is common practice to avoid the costs associated with doing this by simply changing the insock thickness – increasing thickness to reduce volume, and vice versa. This can work reasonably well to a degree, but must be accepted as a compromise solution, because i) changing the thickness of an insock alters the volume but not the tread width of the base of the shoe, which may also be too narrow or too wide, and ii) reducing insock thickness reduces cushioning and comfort, while increasing thickness might give excessive

cushioning and instability. In addition, the effect of compression set of the insock material over time will be accentuated in terms of increasing the volume.

SATRA's fitting service

SATRA offers members a footwear fitting service for all types of footwear, including children's shoes. Essentially, this involves fitting a number of children into a pair of sample shoes and recording details of how well they fit with respect to all essential fitting properties, such as length, girth, toe allowance, foot security and fastening. The results are then analysed and interpreted in relation to the intended market target foot dimensions. A report is produced, which includes recommendations on how the fitting properties can be improved if required.

We always measure the children's feet using a measuring stick and tape, as this is far more accurate than the majority of fitting boards and similar devices. Where helpful, we cut windows into the toe and/or heel region to see precisely how the foot is located within the shoe.

Many children have left and right feet that are slightly different in length and/or width. While this can make selecting and buying shoes for these children more difficult (and the motto is 'fit to the biggest foot'), for fitting trials the difference can be helpful in assessing the overall fitting properties for the wider population market.

How can we help?

There are many difficult issues associated with fitting children's shoes, some of which are discussed in this article.



It is not always possible to provide definitive answers that suit all circumstances and, indeed, fitting is not an exact science. However, SATRA will be pleased to provide fit assessments for members and provide guidance where possible. Please contact SATRA's footwear team for assistance.

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