



Comfort in women's fashion footwear

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A dults' fashion footwear is often characterised by design and styling that can compromise fit and alter gait, thus limiting the level of comfort that can be achieved. *Table 1* lists criteria which effectively define 'true comfort' and essentially excludes all high-heeled footwear, pointed toes, slip-on shoes and many other commonly worn styles. While consumers would ideally want all footwear to be truly comfortable, compromises are often accepted in the name of fashion.

Indeed, the antithesis of comfort in footwear is most probably the woman's high heel stiletto court shoe (or pump) and sandal. Other styles, such as mules and wedges, as well as

different types of footwear (including wellingtons and flip-flops) also have their own comfort limitations to varying degrees, falling somewhere between true comfort shoes and the high heel stiletto.

Innovation in footwear materials and design means that discomfort may be lessened or its onset delayed in wear. However, it is rarely eliminated in the more extreme styles. End use, duration of wear and wearer expectation, will also determine whether customers are likely to complain about the comfort of their footwear and return it to the retailer. For instance, a flip-flop will be accepted for what it is with little complaint unless it causes abnormal soreness between the toes.

WEAKEST LINK

Whatever the style or type of footwear, the critical comfort factor will be the one that first leads to discomfort. Where or how that discomfort materialises will depend on the footwear and the comfort factor that is compromised. The wearer may suffer soreness and, eventually, a blister in the Achilles tendon area due to heel slippage, or perhaps on the big and little toes due to excessive pressure and friction. Abrasion may occur under one of the malleoli (ankle bones), most likely on the lateral side, due to the quarter topline being too high. The underside of the heel or ball of the foot might suffer bruising from walking on hard or uneven surfaces. The plantar fascia that connects the

TABLE 1 – CRITERIA AND HOW HIGH HEELS PERFORM**Criteria for true comfort**

Uncompromising fitting standard sympathetic to the bare foot.

Supple or compliant upper.

Adjustable and secure fastening system.

Low heel with a broad base.

Supportive.

Cushioning and flexible bottom construction, bending in the correct place.

At least moderate heel shock absorption.

Good underfoot pressure distribution.

Moderate ground insulation.

Breathability to promote healthy in-shoe environment.

Properties that do not change with wear and ageing.

How high heels compare

Shoemaking last bears little resemblance to the bare foot.

Possible to a degree, but stretchy materials may reduce support and give unacceptable aesthetic appearance.

Absent.

Absent – high degree of instability.

Present, but in a very restrictive way.

Flexibility is achievable but only limited cushioning is practicable.

Absent.

Pressure thrown forward over the forepart and increased on the ends of metatarsal heads.

Virtually absent in a well-worn shoe unless platform style.

Possible, but lack of volume for ventilation and foot expansion creates high pressure as feet swell.

Unlikely to avoid changes due to high forces applied in wear.

calcaneus (heel bone) to the metatarsophalangeal joints (ball joint/toes) and which helps to maintain the longitudinal arch structure of the foot, can be severely strained and overstretched, thus becoming sore and very painful. Pressure from an arch support can have a similar effect.

The list of specific potential discomforts is endless and can be added to the general sense of tiredness and aching in the feet often experienced at the end of a long day. Foot ache is possibly due as much to the individual simply not being used to standing on their feet for long periods or walking so great a distance. It is as though fatigued muscles and overworked tendons and ligaments shout “stop.”

GOOD FIT IS THE KEY FACTOR

Comfort complaints leading to returns are challenging to deal with. Customers are unlikely to be satisfied by a retailer's response unless it has a liberal and generous refund policy. This is because unless there is an actual shoemaking fault such as an exposed trim attachment inside the shoe or an incorrectly finished seam, the cause of the discomfort is most likely to be an issue of fit.

Deciding if a shoe fits is ultimately

the responsibility of the shopper. Does the shoe fit and accommodate the individual foot comfortably? The average retail store assistant may offer guidance and advice, but cannot offer a 100% guarantee. A retailer who offers a fitting service with properly trained and experienced fitters will be able to

give a much higher level of assurance to customers. However, a shoe that may feel comfortable when tried on in a store or at home if shopping online, may still not prove so comfortable in the long term.

Figures 1 & 2 show examples of two complaints, blisters on the heel and on

Figure 1 – Blister on a wearer's heel.*Figure 2 – Blisters on big toe joints (feet also exhibit marked hallux valgus).*

IMAGES: SATRA



Figure 3 – Pilling and rolled top of internal counter indicates excessive friction in wear.



the first metatarsophalangeal joint (big toe joint). In neither case could the complaint be upheld as justified, because there was no evidence of a shoemaking fault. The materials and design of the shoes were not exceptional in any way and they had not broken down or appreciably deteriorated in wear. Thus, the inference was that the heel blister was caused by tight fit or a loose fit allowing heel slip. Of course, the wearer's hose may have been a contributory factor, with the problem exacerbated by the feet being hot and sweating.

It is worth noting that the wearer in *Figure 2* exhibits marked hallux valgus (more fully described as 'hallux abducto valgus with metatarsus primus adducto valgus'), particularly in the left foot. With this condition, the bones of the first and second metatarsophalangeal joints move apart and a bunion forms on the protruding medial side of the first joint. The tip of the hallux (big toe) moves in the opposite direction toward the second toe.

Studies have indicated a link between hallux valgus and congenital attributes such as a relatively long first metatarsal bone. Hallux valgus is seen in some children, but is more generally associated with older women with a history of wearing of close fitting, high heel, pointed toe footwear, which no doubt exacerbates the condition. In extreme cases where there is persistent pain, surgery may be advised involving realignment of the joint and possible trimming away of

excessive bone growth. Shoes with a deep, round toe profile and good fitting properties are always recommended to minimise discomfort.

In the case of the boot complaint shown in *Figure 3*, there is clear indication that excessive friction has occurred. This was sufficient to cause the pilling and rolled top of the internal counter, yet the shoe had had little wear as evidenced by the almost pristine condition of the footbed. However, without knowing how the footwear fitted the customer's feet at the time of the injury (skin abrasion and blistering), it was not possible to determine whether this was as a result of the materials used or poor fit.

MUSCULOSKELETAL INJURIES

The debate about foot health complaints becomes more complicated when considering products that incorporate particular comfort or performance features that are specially marketed as promoting comfort, health and wellbeing. Exercise sandals, rocker and toning shoes, unstructured anatomical footwear, anti-pronation devices, etc., can bring comfort and satisfaction to many customers, but potential misery to a small number of others. The simple arch support falls into this category.

Many of these products are designed to alter or correct posture or gait in some way. This means that they are likely to have musculoskeletal knock-on effects in the ankle, lower leg, and possibly up into the knees and hips. In

some cases, biomechanical studies and wear trials have been conducted that found positive outcomes to support the concept but, whether a specific product works or not, at the end of the day it likely depends on the individual wearer. The advice to any customer is that if their footwear starts to hurt or leads to unwanted symptoms elsewhere in the body, it should no longer be worn—temporarily or permanently—and a doctor consulted if necessary. Of course, this advice also applies if problems are experienced with any type of casual, work, sports or dress shoes.

DISSATISFACTION WITH HIGH HEEL FOOTWEAR

As mentioned, women's high heel fashion footwear usually represents a number of comfort compromises. As a consequence, wearers can suffer a range of discomfort, ailments and injuries. These include strained ankle ligaments, shortening of the gastrocnemius (calf muscle) and Achilles tendon, squashed and blistered toes, soreness under the ball of the foot, underfoot feel through on uneven surfaces and heel blisters due to slippage. In practice, of course, many fashion products are only worn for relatively short periods of time and major problems possibly avoided. This type of shoe is inherently uncomfortable for three main reasons:

Fit – court shoes must be a close fit simply to keep the shoe on the foot. Only a minimum toe allowance (usable toe space) is possible, otherwise heel slip occurs in which the heel of the foot will walk out the backpart. Likewise, the joint girth probably needs to be at least 8mm smaller than that of the foot in order to maintain security on the foot and help prevent it sliding forward. This close-fitting standard means there will be some restriction of foot function, particularly on how the foot elongates when all the bodyweight is borne on one foot, as well as how the forefoot spreads transversely when weight is transferred onto the ball of the foot.

This need for a close fit also means there is little fitting tolerance with this style of shoe. As a result of this characteristic, only a relatively small range of foot dimensions (such as length, joint girth and toe depth) can be

reasonably accommodated. The swelling of hot feet alone can soon make the fit intolerably tight.

Posture – the elevation of the heel significantly changes foot shape and posture when standing. The weight of the body is shifted forward onto the balls of the feet, which puts additional stress on the metatarsal bones. In turn, this forces musculoskeletal alignment changes throughout the body, tending to push the pelvis forward and causing back problems. The instep is pushed upwards and the cross section of the foot in the region of the joint tends to become more rounded. There is permanent dorsiflexion of the five metatarsophalangeal joints (the toes are lifted upwards) in the shoe, because the heel never rotates back into flat contact with the ground. In very high heels, the forefoot will not even need to flex during gait, so the muscles are not being exercised normally.

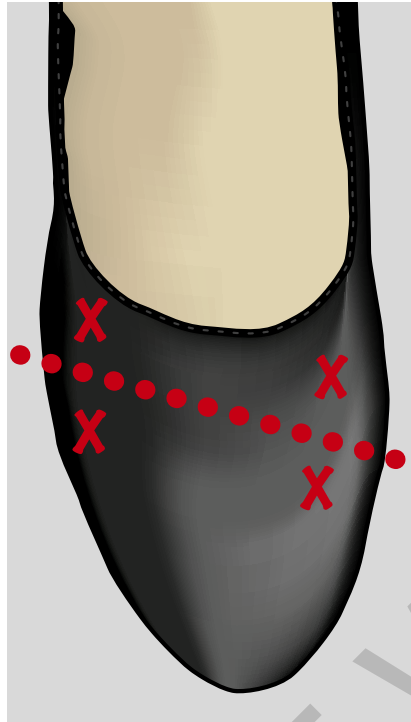
Gravity – this is perhaps the crux of the problem. The foot tends to slide forwards and downwards, squashing the toes into the toe box. Also, when combined with a small top-piece on the heel, gravity jeopardises stability as the wearer tries to balance on an extremely small area. Therefore, accepting that high heels are inherently uncomfortable but are in demand as a fashion accessory, how can the associated discomfort be minimised?

LESSENING DISCOMFORT IN HIGH HEEL STYLES

Fit – correct fit to the individual foot is critical, so from the customer's perspective to be offered shoes in UK or US half sizes and in a range of width fittings would be highly desirable. European or Mondopoint sizes are also better than UK or US whole sizes, because the smaller increment in length between sizes effectively gives the consumer more choice.

Based on a new SATRA survey, it is estimated that around 45% of UK women purchase a larger or smaller shoe size than would be predicted, based purely on foot length. One of the reasons for this is that they may find that a larger or smaller shoe size better accommodates their wide/narrow feet. The survey data also indicates that a range of three width fittings, approximately 19mm in terms of

Figure 4 – Areas to avoid when considering vamp panels, seams and decorative trims.



joint girth, should comfortably accommodate about 63% to 70% of women if an allowance is made for those who would accept a slightly close or loose fit.

Careful material selection and upper design strongly influences wearer comfort. Low modulus (stretchy) materials such as a nubuck leather are more accommodating of foot size and shape than a high modulus patent leather for example and help to increase the fitting tolerance. It should also be noted that customers can 'shop around' and find a brand or manufacturer that best fits them as width fittings will vary between brands due to a lack of standardisation. While brand X and Y may both only offer an 'average' or 'medium' width fitting, Y's product may be a comparatively wider fit than X's. Clear and accurate size and width fitting labelling would greatly assist customers to select their best option.

On high heels, we know that the distribution of pressure underfoot is also significantly affected by the heel seat angle. There is a minimum seat angle that can be recommended to minimise wearer discomfort from pressure at the heel breast and in the waist and, at the same time, reduce strain on the shoe itself. Increasing the seat angle above the minimum values does not appear to have an appreciable

effect on heel/waist comfort but will clearly work with gravity to allow the foot to slide forward more easily, squashing the toes.

Underfoot cushioning is widely used in many types of footwear to minimise high pressure points. Unfortunately, in high heel shoes there is limited scope to incorporate cushioning in the forefoot because of how cushioning affects fit. When bodyweight is applied to a cushioning material it compresses and the shoe volume effectively increases, making the fit slightly looser and less secure.

Upper design – as already mentioned, while low modulus materials promote comfort, there can be a downside. Visible profiling of the toes looks unsightly and unacceptable. Thus, a balance needs to be reached between comfort and aesthetics, using reinforcing linings where necessary. Maintaining a high vamp or throat topline and covering as much of the forefoot as possible enables the foot to be secured across the joint and reduces the necessity to apply pressure in the toe box region.

When positioning the crossover lines of vamp panels, seams, decorative trims and similar components, it is important to avoid the areas shown in *Figure 4*. It is also important to avoid the flex line of the upper where it will crease and press into the foot when flexing, as well as the bony prominences of the metatarsals and phalanges where extra layers of material, reinforcements, stitching and trim attachments will result in high pressures.

SUMMARY

Fit is the key attribute and offering a good range of sizes and fittings centred on the population average enables customers to find the best fit for their feet. The mass market generally dislikes extremes of design as this increases the probability of incompatibility for some individual customers. It is important to focus on basic shoe engineering and design aspects, such as size and width grading, heel seat angle and waist shape, upper material selection and design. Customers will accept some compromise in comfort for fashion but, by focusing on these basics, those compromises can be minimised. 🍷