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South African school shoes: Urgent changes required for our children's unique feet

Significance:

Ill-fitting shoes can negatively impact the developing foot. Despite the notable differences in foot shape between South African and European populations, shoe design largely adheres to a universal standard. This discrepancy may arise due to several factors, including limited data on the South African foot morphology, economic constraints, fashion trends, and consumer complacency. As such, the development and manufacturing of school shoes in South Africa face the challenge of accommodating the unique foot shape of the local population. Moreover, consumers should be knowledgeable about the potential long-term adverse consequences associated with wearing ill-fitting shoes.

A recent investigation brought attention to the lack of availability of school shoes in South Africa specifically designed to accommodate the distinctive foot shape of habitually barefoot children.¹ The study revealed that a significant majority of children, approximately 98%, wore shoes that were too narrow for their feet, while 59% wore shoes that were not the appropriate length. These findings corroborate earlier research that found that 67% of children wore ill-fitting school shoes, that is, shoes that were not the correct width and length.² It is important to note that both studies assessed foot measurements in a static standing position.^{1,2} However, it should be acknowledged that dynamic movements lead to further spreading of the foot, resulting in the lowering of the lateral and medial arches.³ Consequently, these findings regarding the prevalence of ill-fitting school shoes among school-going children raise even greater concerns.

In compliance with the *South African Schools Act*, the inclusion of a school uniform is deemed vital for attaining social and educational objectives, including the reinforcement of discipline, the creation of an enriched learning environment, and the assurance of overall school safety. Within the realm of South African public schools, the school shoe constitutes an integral component of the mandatory uniform. The legislation emphasises that the uniform should facilitate the child's engagement in all activities with comfort and safety.⁴ In South Africa, it is customary for children to spend approximately seven hours per day at school, wearing school shoes. Based on the mentioned research,^{1,2} it is possible that many of these children spend many hours in ill-fitting shoes that do not conform to their foot morphology.

The association between wearing improperly fitted footwear and foot health and function is intricate. Foot pain, pes planus, and hallux rigidus in the forefoot can be attributed to or aggravated by inadequate fit, restricted toe box flexibility, and shoes that do not conform to the shape of the foot.^{3,5,6} Hallux angle deformities are frequently observed in cases where individuals wear shoes that are either too narrow or too short for their feet.⁷⁻⁹ A study conducted in South Africa reported that 80% of participants experienced foot pathologies as a result of wearing ill-fitting footwear.¹⁰ However, it is important to note that the study had a limited sample size, consisting of only 60 women.

Foot deformities have been identified as a potential cause of increased medio-lateral postural sway during walking and impaired balance, ultimately impacting an individual's psychological well-being and overall quality of life.^{9,11} A noteworthy investigation involving 1238 preschool children from Austria revealed a significant correlation between the risk of developing hallux valgus and the usage of ill-fitting footwear.¹² Furthermore, a compelling study involving monozygotic and dizygotic twins indicated that external factors, such as constricted toe boxes and non-genetic influences, played a crucial role in the development of hallux valgus.¹³

Within numerous African countries, there exists a prevalent inclination among adults and children to engage in daily activities barefoot. A comparative study involving regularly shod Maasai women, partially shod Maasai women, and Korean women demonstrated that Korean women exhibited narrower feet in comparison to both Maasai groups. Notably, the hallux valgus angle was significantly higher among Koreans and the regularly shod Maasai group when contrasted with the partially shod Maasai group.¹⁴ Although hallux valgus tends to be irreversible in adults, interventions targeting children's footwear by adjusting the width to provide ample space and comfort in the toe box hold promise in mitigating the adverse effects associated with this condition.^{3,9}

This inquiry prompts the question: what is the prevailing scenario within the South African context? In a study conducted by Hollander et al.¹⁵, it was revealed that children and adolescents in South Africa who habitually go barefoot exhibited a noticeably higher degree of foot flexibility but also a larger hallux valgus angle compared to their German counterparts. The increased hallux angle observed in the barefoot population was unexpected. It is plausible that the prescribed school uniform, which includes more restrictive footwear, may have contributed to the relatively constrained conditions experienced by the habitually barefoot group as compared to their shod counterparts.^{15,16}

The intrinsic association between footwear and pathology necessitates the adherence of footwear to specific requirements tailored to the population in question. Various factors should be taken into consideration when designing shoes, including the fit, weight, structure, motion control properties, material composition, and cushioning. Previous studies have acknowledged these general components in the context of South African school shoe manufacturers.^{6,17,18} However, it has been observed that these manufacturers have not adequately addressed the fundamental foot measurements necessary to accommodate the unique shape of the South African child's foot. It is important to note that this oversight may not be attributable to ignorance but rather a lack of available data on the foot morphology of South African children and adolescents. Fortunately, recent research endeavours have yielded valuable insights into the shape of habitually barefoot South African children and adolescents, which can

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be instrumental in guiding the design of shoes that promote healthy foot development in this population.¹

The question arises as to why South African companies should implement changes based on foot measurements and adapt the current South African school shoe. Several international studies have reported variations in foot shape, particularly in terms of forefoot width, among populations from different continents.¹⁹⁻²¹ These studies provide valuable insights into the potential differences in foot morphology across diverse ethnicities and regions.

One study compared four different ethnic groups from Japan, Indonesia, France, and Australia, revealing notable variations in foot dimensions.²¹ While the French and Australian samples exhibited longer feet, their feet were relatively narrower compared to those of the Japanese and Indonesian populations. Additionally, the French male individuals had wider feet in comparison to their Australian counterparts. Most foot dimension measurements were similar between the French and Australian samples, except for foot width, where differences were observed. These findings underscore the importance of considering foot width variations when designing and manufacturing footwear.

In more recent research, Mauch et al.²⁰ conducted a comparative study involving children from Germany and Australia. They found that German preschool children had longer feet, larger ball-of-foot circumferences, and higher dorsal arches than their Australian counterparts. German primary school children also exhibited longer feet, greater ball-of-foot circumference, lower dorsal arch height, and a significantly larger ball-of-foot angle compared to the Australian sample. These findings highlight additional differences in foot morphology between different populations and emphasise the need for tailored footwear solutions.

The underlying mechanisms responsible for the observed inter-continental variations in foot morphology remain unclear.²⁰ However, the findings suggest that population-specific factors, such as genetics and environmental influences, may contribute to these differences.

The design of a shoe relies on primary data derived from the foot's shape and dimensions, with the primary objective of providing foot protection. To achieve this, a comprehensive understanding of foot biomechanics and structure is essential for the design of the shoe last (the form around which the shoe is constructed).^{3,22} It has been observed that South African shoe manufacturers typically employ a shoe design based on the British Mondo Point System, which primarily utilises foot length as a key measurement and increases the shoe's girth in standardised increments.^{3,10} As a result, most children can find shoes that accommodate their foot length by selecting the appropriate size; however, options for accommodating foot width are limited.

To ensure a proper fit for the shoe, it is crucial to incorporate a flexible toe box and an articulation line that aligns with the base of the joints. Nevertheless, many shoe manufacturers offer a standard width that may be suitable for most populations accustomed to wearing shoes, while individuals from habitually barefoot populations may encounter difficulties in finding suitable shoe widths. In the past, certain shoe companies have produced half-size shoes specifically for wider feet. However, these sizes are currently scarce in South Africa, possibly due to economic constraints. Considering the prevailing situation concerning the appropriate width of school shoes, it is plausible that the South African adult population also faces challenges in finding shoe designs that align with their foot morphology. If the foundational structure of the shoe last does not align with the shape of the foot, achieving a proper fit for the shoe would prove challenging.^{23,24}

The *South African Schools Act 84 of 1996* places significant emphasis on adopting a 'Proudly South African' approach when formulating school uniforms within South Africa.⁴ Pertinent questions and challenges can be directed towards the school shoe industry, parents, and educators. One key question is whether the focus on South African manufacturers extends to South African school shoes. Despite clear evidence highlighting differences in foot morphology, there remains a concern regarding the perpetuation of British and American foot morphology data dominating the South African shoe manufacturing industry. Another crucial concern is whether fashion

and aesthetic considerations will continue to overshadow the fundamental aspects of shoe measurements specific to the South African population. Furthermore, it is necessary to explore whether parents and educators are prepared to acknowledge and embrace the necessity for research-based shoe designs for their growing children.

Existing research consistently supports the notion that shoes, as an external factor, can have a negative impact, particularly when they are too narrow in the toe box. This evidence challenges the South African shoe industry to adapt the prevailing British lasts used in the production of school shoes for children who are habitually barefoot. It is imperative that prospective longitudinal studies in the future examine the repercussions of ill-fitting shoes during childhood on the development of foot malformations in adulthood.²⁴

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Competing interests

We have no competing interests to declare.

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