

Effective Measurement of Child's Shoes Customized Design Based on Feasibility Study

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Abstract: Owing to the existence of domestic shoes product design and other technical issues for comfort, this paper raises the feasibility study on children foot measured consumer individuals on the basis of customized products produced. Children customized design shoes will enrich the level of product consumption structure, make up for gaps in the development of the domestic custom shoes, increase the competitiveness of domestic child's shoes and has a positive meaning to explore the formation of independent product of high and mid grad child's shoes.

Keywords: Child's shoes design, comfort, customized design, foot measurement.

1. INTRODUCTION

Today China is ushering in "only child" special population age, and parents' requirement about child's physical quality of life rises to an unprecedented height. Consumer demand has not been met both in product design personalized shoes or production technology for the existing height. In the tens of billions of annual sales, the most popular brand shoes and more high-end products are from abroad, while domestic casual brand products accounted for more than 70% of total sales. Based on the effective measurement of child's shoes custom design feasibility studies [1, 2], it is a new direction to deal with the problem to the existence of domestic shoes product design and other technical issues for comfort. Referring to adult shoes customized production model [3, 4], people can seek a new direction in the development of high and mid-grade shoes brand.

2. THE CURRENT SITUATION OF DOMESTIC CHILD'S SHOES PRODUCTS

Domestic shoes market is developing rapidly in recent years, but the product design in the foot data and appearance shape shows little attention to child's individual differences and the design has many hidden dangers on child's foot health. The result from footwear R & D institutions that sample part of child's shoes products show more than 43% of child's shoes have problem in pattern, material, design, etc. and consumer satisfaction sampling rate is lower than 59%.

The existing domestic brand child's shoes are also in a batch production, although the need for large-scale production mode is more suitable for the national conditions of developing countries, the quantitative production cannot pay careful attention to specific differences in consumer individual foot type data, and data processing concept will bring

child's individual deviations in comfort. The fuzzy data, simplify processing of child's shoes, to a certain extent, also hinder the optimal comfort for the individual and can not guarantee the healthy growth of child's feet physiology. This phenomenon is a great blind spot to the consumer groups who have economic foundation for the pursuit of high standards of aesthetics and comfort in shoes. Therefore, it becomes a new opportunity for the development of child's shoes to find a way to focus on child's consumption of the individual's own foot physiological data and find the closest model to the data and create the most comfortable shoes.

3. CHILDREN FOOT VALID MEASUREMENT

With the continuous development of the domestic living standards, the child's foot data need to be replaced once at least every five years. But the foot data acquisition need enough measured object. At the process of measuring, professional technical operation measuring staff are needed and the measurement data itself must span a long time and some is up to 5-10 years. Moreover, child's foot data structures are complex and manual measurements are very prone to error, and a certain number of matching procedure is needed and it is a big cost but small gain, which leads to a majority of child's shoes enterprises at present use basically old version series data. The existing data itself cannot meet the actual needs of child's feet structure.

3.1. Foot Plane Measurement

Customized design can not only make the foot measuring for child's consumption, but it can also build foot data files, and track the long-term healthy development of the foot structure in order to ensure the best comfort of shoes. Footwear R & D institutions selected a part of school-age boys (ten years old) for foot measurement, great differences in length dimension and width dimension, circumference and other data size are founded, among which foot length dimension is the most obvious one. The Maximum foot length of some boys reached 255.4mm, while the minimum foot length of the same aged boys reached only 212.1mm.

Table 1. The boy group (34 yards) foot length measurement data table.

	Length Size	The maximum Value	The minimum Value	Scale Difference
1	Foot length	224.7 mm	216.2 mm	8.5 mm
2	Toe protruding point position	204.2 mm	195.5 mm	8.7 mm
3	The little toe protruding point position	176.5 mm	169.8 mm	6.7 mm
4	The first metatarsophalangeal position	165.4 mm	157.2 mm	8.2 mm
5	Front landing position	160.2 mm	152.7 mm	7.5 mm
6	The fifth metatarsophalangeal position	144.6 mm	138.6 mm	6 mm
7	Lumbar fossa position	94.2 mm	94.2 mm	4.6 mm
8	Heel center position	41.2mm	39.7mm	1.5 mm

Table 2. The boy group (34 yards) statistical table foot width measurement data.

	Width Size	The maximum Value	The minimum Value	Scale Difference
1	Toe width	34.1 mm	32.9 mm	1.2 mm
2	The little toe width	45.7 mm	45.3 mm	0.4 mm
3	The first metatarsophalangeal miles wide	37.7 mm	32.3 mm	5.4 mm
4	The fifth metatarsophalangeal width	48.4 mm	47.1 mm	1.3 mm
5	The metatarsophalangeal straight wide (base width)	87.6 mm	84.5 mm	3.1 mm
6	Metatarsophalangeal ramp width (bottom width)	90.1 mm	89.3 mm	0.8 mm
7	Flank outside width	34.6 mm	33.4 mm	1.2 mm
8	Heel heart full width	58.3 mm	56.2 mm	2.1 mm

Meanwhile, footwear R & D institutions use rota-table red camera and other advanced measuring instruments to get foot length of plane data from the same group of 20 boys (all wearing shoes 34 yards). The measurement results show that children who all wear shoes 34 yards, and their length of legs is still a considerable gap. Data shows that the difference in foot length of the same group of children wearing the same shoes in size 34 is at least about 8.5 mm, difference in the outer scale to toe bump part is the biggest, reaching 8.7mm, which is almost 5 percent of numerical itself. The second is the little toe evagination position and the fifth metatarsophalangeal location and the difference between the maximum and minimum scale is more than 8mm. Even the data of the heel part of the heart, waist and other position is relatively stable, and its standard deviation reached 1.5-4.6mm. Data is listed in the Table 1.

The children who live in different environment and at the same age are different in some significant ways of the foot shape and structure. Even though the children whose length of foot are totally the same, with the data of the foot width and circumference as well as the height and weight, the shape and structure of the foot would be influenced. Having measured the foot width of the children in the same group who wear the 34 size shoes, the footwear research institutions found obvious dimension data difference in the aspect

of width, including the data of base width and sound stage width, reached 1-3mm, over 5 percentage points; among the base of the smallest outer width of waist, data difference also reached 1.2mm, which is over nearly 5 percentage points compared with the data in the previous year. From that we can see the create procedure of child's footwear called "one fits all" will result in some deviation in data handling, so that it cannot achieve optimal comfort. See Table 2.

2.2. Foot Stereo Measurement

The anticipation of white light foot measurement instrument and the rota-table red heat camera in China, fundamentally reduce the difficulty of the foot-dimensional data measurements. As long as professional and technical operation, the child's feet can be measured rapidly and accurately such as plantar girth, circumference tarsus, pocket girth and so on which are relative error prone manual measurement. In the procedure of measuring the stereo data of same group (34yard) child's foot, we got the clear stereo data. It can accurately control real data of the various parts of the size. Combined with the foot plane measurement data and the professional processing of data in the machine, we can get the data which is consistent with the first hand mold foot morphology of consumers. See Table 3.

Table 3. The boy group (34 yards) Foot-dimensional measurement data table.

Girth Dimension		The Maximum Value	The Minimum Value	Scale Difference
1	Plantar girth	217.2 mm	209.6 mm	7.6 mm
2	Tarsal girth	218.5 mm	214.4 mm	4.1 mm
3	Pocket Girth	282.5 mm	274.6 mm	7.9 mm

3. CUSTOMIZED DESIGN

3.1. Customized Shoe Last Modeling

Compared with adults' shoe mold, child's one is more complex, as children's foot is growing continuously and the data of children's toes, heels and flesh, etc. are unstable. It is also the reason why the design and manufacture of children's shoe mold attracts less attention than the products of adults' shoes. It is a design's technical difficulty for data acquisition of shoe last modeling. The critical points for the concept of children's shoes custom are as follows. Firstly, using advanced instrument measure the foot of customers accurately so as to form three-dimensional's shoe last modeling. Secondly, combining the individual data of customers' foot structure and using technique can produce shoe last modeling data. Customized design for children's shoe mold has the merits of possessing abundant adjustment space and considering the growing features of children's foot fully. Such design can create shoe last modeling greatly which is highly in keeping with foot's height according to children's individual's foot data in design principal, thereby reaching the role of tailor-made.

3.2. Individuation Style Development

Aim at many problems about homemade shoes of plagiarism, imitation and adult-style, etc. based on effect foot measurement, customized design for child's shoe is now creating with independent and novel ideas and providing the design service of individuation style which meets the need of individual through the communication between designers and customers.

3.2.1. Type Customized

We need to take full consideration in some factors about the customization of types of child's shoes, such as convenience, shortcut, etc. We need to cut from the existing system of adults' shoes. According to the architectural feature of consumers' foot measured data and foot type, we will provide the basic types suitable to child's consumption. On the basis of consumers' suggestions during the process of customization design, designers adjust the length, width and radian of the upper of shoes and complicate or simplify the cutting technique. Or according to consumers' requirement, designers add the fabrication processing of child's shoes plus material, such as heat pressing, repair, embroidery, etc. and strengthen the sense of hierarchy making it conform to individual aesthetic taste [5-7].

3.2.2. Style Customized

The age range of child's shoes' consumer group is big. A portion of children have owned independent aesthetic stan-

dard, especially the older children who begin to pay attention to the design styles of products [8-11]. During the customization design, designers can provide popular design styles of products or properly adjust and mix different design styles, or can also create products' styles according to child consumers' temperament. The process of child's shoes' customization design shows the one-to-one design service, and designers have free create space in designing products: customization design not only reach the desired effect by appropriate color match and accessory use on the basis of existing types, but also add individual designated elements to products' style design according to the expectation of consumers and parents so that it can present the symbolic value of customization design through various channels and skills.

3.2.3. Fabric Customized

Customized design enjoys advantages of price and technology. According to customers' requirements, designers could have daring ideas with some rare and luxurious leather like crocodile, ostrich, boa patterns; or deeply process the fabric colors in order to form the pink or other light colors of the psychological characteristics of children, making them look cute; or remix different materials like silk, veil, plastic, lace, cotton, linen, canvas and so on, making them diversified; or absorb some other elements like England, polka dots, stripes and polka dots, love etc, improving the colors and styles of the fabric to create designs in accordance with child's consumption age; popular patterns in adults' shoes such as cow or zebra prints, after professionally process in the art of childish, producing new forms of child's shoes [8-11].

3.2.4. Accessories Customized

Child's shoes products have a wide range of numerous accessories such as a variety of decorative sheet, changeable decorative buckle, shoe flower, shoe drill, Tassels and other forms. In addition to circulation accessories, shoes custom design products can create personalized accessories based on consumer's independent demand. Due to custom design, the independent accessories of child's shoes products are not constrained to output and process and have a certain cost space so that they can guarantee that the design objects may fully be inlaid paste suture, providing the imagination space for artistic creation. The designer can make full use of all kinds of design methods with the transformation of child's shoes style design accessories, including the design of parts of the shape, replacement parts form material, accessories which can change color, accessories filling sponge in order to create a stereoscopic effect, greatly enriching the design object presented.

3.2.5. Pattern Customized

Pattern is a process of rendering figurative perception. Every consumer has a perception of patterns with a clear subjectivity especially for young children who are keen to cartoon and other patterns, which will affect the product design form significantly. Custom design offers a great creative space for the pattern of child's shoes products. In addition to the inherent fabric pattern can be chosen to use, a product design can be printed from print fabric painting, Complex patterns can be presented by printing and computer embroidery, making the pattern re-created. Unique custom with handmade creation and mechanical applications may protect a variety of creative ways of operational integration. According to the child's preferences, designers can design a powerful and unconstrained creation, customize a unique product pattern.

3.2.6. Function Customized

People's consumption concept is increasingly rational. Child's shoes function's innovative design has become a new hot spot to attract consumer groups. Categories of products like some expensive parts of configuration are limited by cost. While the child's shoes' custom designed individual production can avoid the price limitation and develop objects by adopting suitable priced products [14, 15]. Designer develops its practical features from a different perspective. For example, they can make hybrid materials embody the concept of environmental protection. Or a complex mosaic of soothing, decompression and other local design features can enhance the comfort of the product. Or add part of the fun functional design which can be spliced, removable, variable loading, can be hung, easy to store, easy to carry for the new chance of design creative child's shoes [12, 13].

CONCLUSION

The idea of customizing child's shoes indicates the increase of the buyers' demands, and also encourages the sellers to take further consideration for the current consumption of child's shoes in our country. The customization does not only draw attention to the importance of buyers' personal information of their foot, but carries on discussion in terms of developing the style and function of child's shoes. With technical research on the comfort level and exterior of child's shoes, the products could truly reach the high level where buyers customize their own product, which is still a blank wall in the country. And it enables child's shoes to overcome the defects in the discomfort and lack of attractiveness caused by traditional business mode.

CONFLICT OF INTEREST

The author confirms that this article content has no conflict of interest.

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