How Does Customers' Fit Preference Impact Apparel Size Selection for Online Shopping?

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Abstract

E-commerce has become part of our lives with the number of online shopping transactions rising steadily, while selling clothes online is still challenging greatly due to uncertainty on size and fit selection. Return rate in the textile industry in general is reported between 20% to 40%, which has an enormous financial and environmental impact for retailers and the planet. Many efforts have been made in the past to develop new technology to create accurate 3D humans by mobile phone. However, only knowing the 3D shape of customers is not enough to have an efficient size recommendation tool. How to match the multiple types of personal information, like body shape, preference and potential usage as well as the sizes of the products is less investigated in literature. In this study, an experiment of 175 female participants with different body shapes from XS to 4XL on 6 garment top products was conducted. The collected personal information included not only their body shape, measured by a 3D body scanner and manually par two experimenters, but also their fit preference and practice usage. For each product, they were required to test different sizes to choose their preferred size as it was a purchase in a physical store, and also evaluate a bigger size and a smaller size than the preferred size to check if they would return it in an online shopping scenario. The participants were divided into three groups according to their preference. The first results of the study showed that the fit preference has a significant impact on the size choice. As expected, the data confirmed that independent from the body shape, the participants who declared preferring a loose fit have more chances to choose a bigger size than the theoretical size compared to the group of “adjusted” and “regular” fit. The difference is even more important when it comes to the product with less elasticity, like a jacket. Future research is needed to explore how to integrate the preference information into a size recommendation algorithm, together with body shapes of customers and dimensions of products.

Keywords: online shopping, fit preference, size selection

1. Introduction

During the past ten years, especially after the covid pandemic crisis, e-commerce has become part of our lives with the number of online shopping transactions rising steadily. Despite the increase of online sale figures, selling clothes online is still challenging. One of the major reasons is that size selection and clothing fit are still difficult to address within the current online platforms; Research studies [1] [2] reported that most complaints about online clothing purchases are related to size and fit, which are the major reasons for purchase return. At the same time, the product return issue has not only an important economical impact on the retailers, but also has an enormous environmental impact on the planet. A classic return process could involve a new delivering, new packaging, sometimes repairing or total loss. An internal study conducted by Decathlon showed that eliminating one product return could reduce on average a cost of 6.38 euro and 500 grams of CO2 emission in west european countries. Thus, it’s crucial to have an efficient online size recommendation tool for helping customers to buy clothing, not only to gain customers' satisfaction towards the e-stores/brands, leading to a gain of sales, but also to prevent large return costs for retailers to reduce huge financial and environmental impact.

Since there is no international standard of sizing system, it means that the size S of one brand could be different from other brands. Even within the same brand, there could be differences among products due to different materials, different design intentions and different experiences among pattern makers. Some research has been conducted on size recommendation in the past, few were applicable either due to their bad efficiency or complexity. There is a delicate balance to keep between getting as much information as possible from customers and limiting only to the information that customers can get easily because not everyone has a measuring tool at home and/or knows how to measure themselves. Currently, three main categories of solutions are adopted by different retailers. The first one is the traditional one, which gives a size chart of main measurements and customers need to measure

themselves, usually chest circumference for top products and waist circumference and/or low hip circumference for bottom products. The second category is questionnaire based by asking only some more easily obtainable information like total height, weight, and body shape categories. The second category has its advantage to give a more user-friendly interface than the first category. How it works is usually opaque due to industrial confidentiality concerns. The third category is a machine learning algorithm type based on historic purchase data. It has its advantage to implicitly take into account product specificities, however it can not be applied alone because it needs enough verified data to be robust. Few of these solutions take into account the customers' wearing preferences and specificities of products. Few data is available to evaluate or compare different methods in a scientific way with real field data.

It's not uncommon to observe that many think that the clothes size selection issue can be easily addressed by knowing the body shape information, thus a lot of efforts have been made in the past decade to develop new technology to capture 3D body shapes of individual customers as accurately and easily as possible [3]. However, it's not enough to ensure a good size recommendation based on only morphological information. It's common to observe that two customers with very similar body shapes could prefer different sizes of the same product. In many cases, the developers of new 3D body capture solutions don't have access or knowledge about how the textile products are developed and rely on only some basic guidelines of retailers, which are not necessarily adapted to the solutions. It leads to a gap between accurate body morphology information of customers and a good size of variable products. The textile industry is still working in a traditional way where the pattern of a product is determined more or less according to the experience and the preference of pattern makers. For some functional clothes like sportswears, there could exist a gap between the intention of design and final use of customers, especially nowadays we wear more and more often sportswear clothes for daily life. For example, if pants which are designed to be tight and close to the body are purchased by a customer who wants to wear it in a comfortable and loose way like a pajama at home, it's quite possible that the regular size guide would give a bad size recommendation. Including body shape information, many other factors should also be considered like customers' wearing preference and product's design intention and material.

In the meantime, main body measurements are well correlated with some basic body information like total height and weight, which are much easier for customers to get themselves instead of using more or less complicated mobile applications of new technology. Around 65% of human body shape variation could be explained by the two basic measurements and main body measurements like chest and low hip circumference can be predicted by the two measurements with reasonable accuracy, which gives little margin for the solution centered only on morphology information to achieve a good size recommendation, no matter how accurately they claim. It should be remembered that 3D capture of the whole body by mobile phone is a more difficult task by customers themselves or helped by others than just measuring their total height and weight, and its accuracy is strongly impacted by the standing body posture and how easily it can be manipulated. There are more and more virtual try-on solutions available, which gives a real help to customers to better project how the clothes will look like on their body for online shopping. However, nowadays, most virtual try-on solutions are limited to visual and aesthetic aspects, and can not be relied on for size selection, which is indispensable for an online shopper to move forward.

The main objective of this study is to get sufficient field data in a scientific and controlled way to explore how different factors would influence their perception of the clothing fit and size choice, especially customer's fit preference.

2. Method

2.1. Participant

The current study is a part of a bigger study with 330 subjects (175 females and 155 males). Only the test results of female participants are reported here, because they tested different textiles products than the male participants. They were all recruited via a recruitment agency mandated by Decathlon Sportslab by advertising on the internet. Each participant was pre-screened by answering short questionnaires about their age and habitual clothes size to have a good covering of age group and size group. A special effort was made to ensure at least 30 participants by size group for the main sizes from S to 2XL and at least 15 for the extreme sizes like XS, 3XL and 4XL. In table 1 are the main characteristics of the participants, and in figure 1 is the distribution of participants in terms of total height and weight.

Table 1. average and standard deviation of main morphological characteristics of participants.

	Age (yr)	Height (cm)	Weight (kg)	Chest (cm)	Waist (cm)	Low Hip (cm)
mean/std	40.7/6.7	165.2/6.4	70.7/17.7	96.1/13.1	83.8/15.1	100.8/14.7

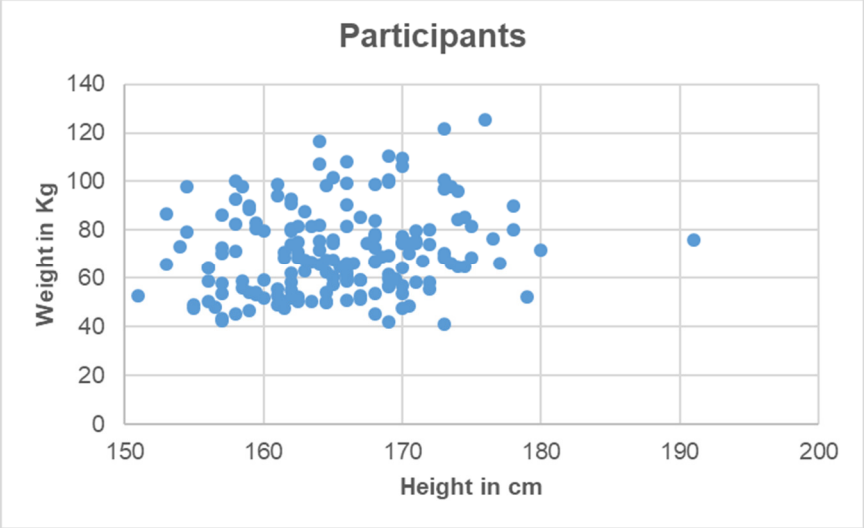

Figure 1. distribution of total height and weight of female participants

2.2. Experimental protocol

The first step of the experiment aims to gather general information about the participants. The following measurements are taken manually by the experimenters according to the definition of ISO 8559-1 : height, weight, chest circumference, waist circumference, low hip circumference, thigh circumference and arm length. The manual measurements were taken by two trained experimenters, one for female participants and one for male participants. Their age, sports practices and their perception of their body shape were asked as well.

The second step of the experiment is to evaluate the 12 garment products (6 top products and 6 bottom products). In this paper, only the results of 6 top products are reported.

Before the trial of each product, several questions were asked to participants: 1) have they worn this kind of product before? 2) what would be their usage if they were to buy this product: for sports practices or any other usage like daily life? 3) what are their fit preferences according to expected usage: adjusted, regular, or loose? Then, they will need to choose their preferred size by trying different sizes as if it was a shopping scenario in a physique store. After that, the participants are required to try and evaluate the acceptance of one smaller size and one bigger size than the preferred size if it was online shopping, and the main reason for non-acceptance if this is the case. The total experiment session lasts around 90 mins for each participant, in a dedicated room with all garment products displayed like in store and available fitting rooms. The first step was done individually, guided by one experimenter and the second step was carried out in an autonomous way by participants. There could be 2- 4 participants in each session.

2.3. Test product

The 6 tested top products are all Decathlon internally designed product, as shown in figure 2, selected to cover a large variety of products in sportswear, as shown in figure 2:

- one t-shirt designed to be close to body (P5) and the other is a regular fit (P4)
- one fitness sweater with hood (P3) and one golf sweater (P2)
- one down jacket (P1) designed to be fit, and one waterproof jacket designed to be regular fit and (P6)

All ranges of sizes were available from XS to 4XL.

Figure 2 the 6 tested top products and the associated sports practice intention

2.4. Data analysis

For each product, all participants will be classed into three groups according to their fit preference: adjusted, regular, and loose. The preference for the same participant could be different according to the product.

A theoretic size was distributed to each participant based on their chest circumference and size chart available on Decathlon's website, which is supposed to be the same for all the top products.

The evaluation of one participant on one product is considered as a trial. Based on the evaluation result, if the theoretic size is the same as the preferred size chosen by particant, this trial will be noted as 0. In the same way, if the theoretic size is bigger than the preferred size, the trial will be noted as 1, otherwise -1. If a participant has never worn one type of product before, the data was not taken into account for analysis because it's reasonable to assume they may not have the experience to evaluate the product correctly.

An one-way anova test was conducted to evaluate if there is a difference of perception among the three groups based on the wearing preference "adjusted", "regular", and "loose" group.

3. Results and discussion

The percentages of the three scenarios according to the matching between the theoretic size and the preferred size of three groups ("fitted", "regular", "loose") for each product are listed in table 2. It can be seen that there is a significant difference among the three groups. It's true that theoretic size is only determined by the size chart of one main body measurement (chest circumference for top) and there could be errors in manual measurement. However, all the participants were measured in the same way and the same size chart was applied to every participant. The fact that fit preference, which is independent with body shape, had a significant impact on the preferred size implies that the efficiency of the size recommendation algorithm without taking into account this factor will be capped.

The difference in perception of preferred size by group is even more remarkable for the two jackets (P1 and P6). For example for product 1, 70% of the group who declared a preference of wearing loose chose a bigger size than the theoretical size and nobody chose a smaller size, while only 26% of group who declared a preference of wearing adjusted chose a bigger size. The same situation was observed for product 6, 58% in the group "loose" against 4.8% in the group of "adjusted" preferred a bigger size than the theoretic size. One of the hypotheses that the preference of wearing has a higher impact on the size choice is that the two jackets have very little elasticity, thus less tolerance.

Table 2 the percentage of three scenarios ("big", "equal" and "small") of three groups ("fitted", "regular", "loose") for each product. big: preferred size > theoretical size; equal: preferred size = theoretical size; small: the preferred size<theoretical.

	"adjusted" group			"regular" group			"loose" group		
	big	equal	small	big	equal	small	big	equal	small
P1*	26,3%	57,9%	15,8%	31,1%	47,3%	21,6%	70,0%	30,0%	0,0%
P2*	11,5%	69,2%	19,2%	42,6%	34,4%	23,0%	42,1%	52,6%	5,3%
P3*	20,0%	48,0%	32,0%	26,2%	48,8%	25,0%	48,8%	39,5%	11,6%
P4*	16,7%	50,0%	33,3%	22,7%	45,5%	31,8%	31,4%	40,0%	28,6%
P5*	9,7%	61,3%	29,0%	26,5%	44,1%	29,4%	33,3%	44,4%	22,2%
P6*	4,8%	61,9%	33,3%	22,1%	54,5%	23,4%	58,3%	41,7%	0,0%

* when p-value<0.05 between the "adjusted" group and "loose" group

Despite the effort of brands to harmonize all the products using the same sizing system, there is always a slight difference among products. It can be observed in table 2 that the percentages of having the same size between the theoretical one and real one are not the same. As discussed in the introduction section, this could be due to the difference in design intention, material elasticity and experience of pattern maker etc. Ignoring this would make a part of the return issue incompressible. It implies that one potential way to improve the effectiveness of size recommendation is to take into account the product information, like product dimensions of each size, design intention and material characteristics. These are generally existing, known information for brands. One future analysis of this study is to evaluate the effect of these mentioned product parameters and to explore the possibility of integrating these information into the size recommendation algorithm.

One of the main contributions of this study is to design a relatively large scale experimental study with 330 subjects to evaluate the effects of different types of information on the garments size selection: body morphology, personal preference and products information. The second contribution is to confirm the important effect of fit preference on size selection for online shopping in an experimental way. One of the main messages of this paper is to highlight the necessity to integrate preference information into recommendation algorithms to achieve better recommendation success and reduce return rate.

4. Conclusion

In this study, the effect of fit preference impact apparel size selection was explored in a controlled experimental way with a relatively big number of participants. It was shown that fit preference has a significant impact on the size choice. Independent from the body shape, the participants who declared preferring a loose fit have more chances to choose a bigger size than the theoretical size compared to the groups of "adjusted" and "regular" fit. The difference is even more important when it comes to the product with less elasticity, like a jacket. Future research is needed to explore how to integrate the preference information, and product related information into a garment size recommendation algorithm.

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