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Customers' Perspectives on Fit and Customization of Cycling Sportswear: Cross-National Comparison

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ABSTRACT

Feedback on fit and customization from activewear users provide a valuable source for improvements in apparel products. This research aims to contribute to effective design and patternmaking for activewear apparel, with a focus on cycling clothing. Cycling is becoming more widespread, not only as a professional sport, but also for commuting and recreational activities. Within the context of this research, customer preferences for cycling clothing, fit and customization were compared across two countries. Two data collection methods; semi-structured interviews and questionnaires were employed, collecting both qualitative and quantitative data. Data from the interviews and questionnaires, conducted in the US and in Turkey, revealed similarities between the two environments in cycling habits, clothing preferences and fit satisfaction. This study is of value, providing an analysis of cycling clothing and fit issues through a cross-national comparison, and increasing understanding of cyclists' needs and desires for companies interested in international markets.

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KEYWORDS

Cycling sportswear, activewear, fit, customization, cross-national comparison

1. INTRODUCTION

Participation in sport activities and consumption of sport clothing has risen dramatically since the early 1980s [1]. Following this trend, activewear design has been a major topic for research and innovation. Improving mechanical properties of fabrics enhances comfort, performance and protection [2], which has been one main direction in this field. In order to support athletes' performances in the face of increasing competition, high-tech-textiles have also emerged, such as compression garments, smart textiles and wearable technologies, as recent innovations [3,4]. Another fundamental prerequisite for comfort and performance in activewear is the garment construction and a good fit. Fit and comfort aspects seem to dominate contemporary athletes' evaluation of sport clothing [5]. Closer fitting clothing often performs better, and thus fit gains even more importance for activewear [6]. For activewear, both the active and static body should be accommodated for a good fit [7]. However, providing and assessing the fit of activewear introduces extra challenges, as body dimensions vary during motion [8]. Therefore, it is important to understand the changes to the body and the interaction of garments throughout this motion for the facilitation of unconstrained movement [9-11]. Such an understanding would lead to an improvement in design and patternmaking of activewear. Within this framework, a general feedback on fit and customization from activewear users provide a valuable source for further progress in apparel product development. With a focus on cycling sportswear, this study investigates fit and customization preferences of cycling clothing customers, and generates an overview of their characteristics and perceptions, which may ultimately contribute to the development of better fitting clothing.

For this investigation, survey analyses were conducted in Turkey and in the US. As international marketing of goods and services increases, cross-national comparison studies such as that conducted in this research, can provide valuable information to marketers and product developers. Similar projects employing cross-national comparisons in

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relation to clothing include topics such as customer behavior and tendencies, or physical attributes as body shapes [12-17]. The approach in this research is distinguished from such directions with the comparisons, evaluations and expectations of fit from customers based on a specific garment category.

Despite national differences in the level of integration of cycling as a professional and/or recreational activity, there is a clear rise in the popularity of cycling in both Turkey and the USA. Parallel to this tendency, use of more sophisticated bicycle clothing has also become a fashion trend [1]. Downer and Cassidy classify bicycle clothing as either professional (Track cycling, Road/tour cycling, mountain biking, cyclo-cross, bicycle motocross, triathlon) or recreational (Commuting, leisure and fitness) [18]. Based on the objectives of this research, all pursuits (both categories) were considered for evaluation in order to project a broader perspective on bicycle clothing customers.

In academic literature, cycling clothing has been investigated from various viewpoints. Those relevant to the current topic included below:

Evaluation and improvement procedures to address the fit and comfort of cycling wear have mainly been conducted on the static body. However, some recent research explores the dynamic body and the interaction of clothing throughout the cycling motion. Liu, et al. evaluated dynamic wearing comfort of cycling clothing from the aspect of clothing pressures with 3D animation technology [19]. Vuruskan and Ashdown developed customized digital models and half scale dress forms in active cycling poses for apparel design and testing [8]. In a recent research effort, Peeters et al. compared the accuracy of three methods; using 2D images, 3D markers and a 3D scan technique, and concluded that 2D images can be used as quick, low-cost, convenient and accurate method for calculating most important body measurements and developing a system to predict size of custom made cycling jerseys [20].

Another approach in cycling clothing research is to acquire an understanding of customers' demand. Casselman-Dickson and Damhorst investigated female cyclists' use and interest in sport clothing at two levels of involvement [1]. Downer and Cassidy explored the requirements of cycling clothing for various cycling pursuits in relation to fitness for purpose, fashion context, innovative technologies and lifestyle [18]. Jung and Lee conducted a survey investigating cycling clothing designs for active senior consumers in order to develop design suggestions [21]. Ho investigated needs related to indoor cycling wear design in order to establish design criteria that meets different needs of committed and casual indoor cyclists [22]. Luo et al. developed a theoretical model for cycling sportswear design to model the design process by identifying the relationships between different types of knowledge and integrating these. Aesthetics, biomechanics and thermal physiology were studied to meet cyclists' aesthetic and functional demands [23].

For design of functional clothing, similar research methods and procedures have been applied to develop an understanding of customers' needs in various other activewear categories, some of which include design development for sailing clothing [24], female collegiate basketball players [25], female collegiate golf teams [26], in-line skaters [5], dance practicewear [27] and rock climbers [28].

In addition to aligning with this body of research related to cycling sportswear (or activewear) by exploring a specific subject in relation to customer demands or understanding the interaction of clothing throughout cycling motion, this research covers a cross-national feedback from activewear users aiming to contribute for product development and marketing in global apparel business.

2. STUDY OBJECTIVES

This research aims to contribute information important to effective design and patternmaking for cycling clothing. Cycling is an attractive area of study for clothing development, as it is an elite sport, and is also popular for both recreation and commuting. In order to enable further research on the product development and fit evaluation of bicycle clothing, this initial study provides feedback about customers and the key fit issues. The specific objectives of the research include the following regarding cycling sportswear:

- to understand the range of and variation in customers,
- to understand main fit issues (for example, which specific garment categories or the body parts for which most fitting problems occur, …),
- to analyze the importance of customization,
- to compare these results within two countries with different geographical locations and cultures.

3. METHODS AND PROCEDURES

For the survey analysis, two data collection methods, semi-structured interviews and questionnaires, were employed in two different countries.

3.1 Interviews

Participants and data collection procedures. The first phase included interviews with management personnel from eight bicycle stores; four in the USA and four in Turkey. Kvale defines qualitative research interviews as "attempts to understand the world from the subjects' point of view, to unfold the meaning of peoples' experiences, to uncover their lived world prior to scientific explanations" [29]. It was important to consider the results from different points of view and different experiences to achieve a detailed, cross-national comparison.

Data were collected through in person interviews. Participants from bicycle stores were recruited via email and phone connection. For the interviews, initially, participants in 'Manager' positions were sought out and contacted, and if not willing to participate, were asked to recommend a member of their team to be interviewed. No personal identifiers were sought. Consent forms were signed by both parties. Interviews were audio recorded with participant consent and lasted for a maximum of 60 minutes.

Data analysis. After the interviews, transcripts were prepared from the audio records and a qualitative analysis of the interview data was conducted. Data were coded based on the objectives of the interviews [30]. Open-ended responses to questions provided the evaluator with personal comments (quotations), which were also used as the source of raw data. These qualitative interviews were used as an exploratory step before designing structured questionnaires as a further step [31].

3.2 Questionnaires

Participants and data collection procedures. Following the interviews, a 20-item questionnaire was prepared, including 5 open-ended questions (Per request, the questionnaire form can be provided from the author). In order to focus the target group, male cyclists only were chosen as the subjects. The questionnaire was initially applied to 25 participants in the US (in Ithaca, NY), who cycle for exercise or to commute at least once a week. The same questionnaire was translated into Turkish, and was applied to 25 cyclists in the city of Izmir in Turkey. The questionnaire was circulated through personal networks, using the same participant criteria as in the US. Age group was defined as 17 to 60 for both groups.

Data analysis. After finalizing the questionnaires, results of these two sample groups were compared. Descriptive statistics were used to reveal general characteristics of the data, and the open-end questions were analyzed individually. Data were coded for statistical computation and analyzed using IBM SPSS Statistic 25.0. In order to distinguish the difference of participant ages in TR and US groups, two independent samples t-test was applied. Responses to the questions from both groups were compared by chi-square test. Additionally, Fisher's exact test was applied in fourfold (2 by 2) tables when necessary. P values<0.05 were considered to be statistically significant.

In addition to the frequencies, a total score was obtained for some of the questions, where 5 selection levels were provided for each item in the question. Total scores were calculated by multiplying the frequencies by the selected levels. For the questions about cycling sportswear categories with the best/worst fit, and about the body parts with the most fit problems, total scores were calculated for comparisons (evaluations are given in Section 4.2.2 and Section 4.2.3). The scale included 5 levels for the category of each garment/body part, where level 1 indicated the least problems (best fit) and level 5 indicated the most problems (worst fit). Considering that 25 participants exist in each group, the total score would range from 25 (least problematic/best fit) to 125 (most problematic/worst fit) for individual groups, and from 50 to 250 for the entire group including both TR and US participants.

4. RESULTS AND DISCUSSION

Both the interview and questionnaire results consist of items under two main categories. The first category concerns analyzing customers and their cycling habits. The second category provides a perspective about fit satisfaction and customization in cycling sportswear. For questionnaire evaluations, a third exploration category is added, where the topic was narrowed down to cycling shorts and tights since the change of motion mostly occurs with the lower body in the cycling activity. The last category of the questionnaire includes open-ended questions, allowing participants to provide extensive feedback on fit issues.

4.1 Interview results

4.1.1 Analyzing customers

All four of the US-based bicycle stores, according to the interview results, serve a wide range of customers from children to older people. However, two of the stores focused on the 18-35 age group as the "majority of riders in the main market". One interviewee suggested that *"... The people who mostly spend money on bike clothing are from the college age (around 20) to the most active years through age 40. They are actively involved and seeking sport-specific clothing. For kids and older people, cycling is not necessarily the absolute focus, and they are riding with whatever they have."* A similar outcome was observed in Turkey (TR)-based stores. They all reported a wide customer age range. In addition, three of the Turkish interviewees identified the 20-35 age group as their main customers.

None of the interviewees declared a specific gender difference among their customers, however, three TR-based store managers and one US-based store manager cited a 60/40 percentage difference in favor of male customers. The other TR-based store, located in an outer part of the city, reported that 90% of their customers were male. Garrard, Handy and Dill state that whilst in bicycle-friendly cities and countries cycling is seen as a highly inclusive activity open to most demographic groups, in car-oriented cities it is often largely perceived as the preserve of young and middle-aged men [32]. Both cities in our research are car-oriented due to distances, geography, and extreme climate conditions (hot summers in one city, cold snowy winters in the other). However, it is understood from these interviews that despite a slightly higher ratio of male cyclists, there is a balance of clothing purchases between the genders.

A common view was that most customers are commuters or casual/recreational riders, with a small portion of professional or competitive riders. However, one US-based interviewee added that *"For the clothing line, I would modify these percentages. The serious bikers will be a higher percentage in general."* This was echoed by one TR-based store manager, adding that the professional and competitive customers made the majority of clothing purchases.

A broad variety of brands of cycling apparel existed among the different stores, and there were specific differences in the brands according to country. Despite the differences in brands' size charts among all these brands, the range of sizes the interviewees mostly provide for their customers were generally similar, as given below:

- TR-based stores (Store1: Female M-XL / Male M-XXL; Store2: Female S-M / Male M-L; Store3: Female S-M / Male L-XL; Store4: Female S-M / Male L-XL)
- US-based stores (Store1: Female S-M / L-XL; Store2: Female S-M / Male M-L, Store3: Female S-M / Male L)

Another focus of the interviews was to identify the body shapes of customers these stores mostly encounter, and whether there is a categorization for different body shapes.

Almost all participants in both groups stated that they had no categorization or specifications for body shapes for bike fit or clothing fit. None of the interviewees were able to identify a specific body shape for cyclists, except one US-based store manager, who mentioned that a typical competitive cyclist had bigger thighs and legs and a smaller upper body than the general population. However, this would not apply to the majority of casual, commuter or recreational bikers, whose bodies are not trained for that specific sport.

4.1.2 *Fit satisfaction and customization of cycling sportswear*

For fit issues, none of Turkish interviewees consider clothing fit as a major problem and did not indicate any customer demand for clothing customization, except for customization in the form of padding. All four stores prioritized price and design for cycling clothing in line with customer demand. US-based stores had a larger clothing inventory and product range in response to customer demand and awareness. Nonetheless, one store manager mentioned that since most garments have a lot of stretch, and a variety of sizes exist, customers can easily find suitably fitting clothes. He claimed that 99% of customers focus on design rather than fit, and most customers do not want to pay high amounts for cycling clothing. Fit plays a very important role only for professionals, who are a very small percentage of their customers, as explained by a US-based store manager: *"If you look to the technical developments in bike clothing, they are mostly for high end racers, who are skinny people. Casual or less series bikers are just looking for fashion or just simple comfortable clothing. ...One of the things about bicycle shops is the profit margin. In the bicycle business, it is around 30%. In clothing, it could be around 50% markup. That is why if you have a good fit, you could have at least half of the equation solved. From the bike shop perspective, you can gamble with colors, patterns, but fit doesn't change."*

It was seen that all the managers interviewed for this project have a clear understanding and awareness of the importance of clothing fit, however, since clothing is a much smaller portion of their business, and there is not much customer interest in fit issues, they tend to avoid risks and innovations in this field. As discussed by Dickson and Pollack, fit and comfort aspects generally dominate contemporary athletes' evaluation of sport clothing [5]. We believe that this might also reflect the views of casual and recreational customers. If this is the case, it is important to take a pioneering approach, investigating fit issues for all type of cycling clothing users, and applying the enhanced comfort and performance provided by a better fit to the casual cyclists at affordable prices, rather than exclusively for high-end professionals.

Customization of bicycle clothing was another area of discussion in the interviews. Since cycling clothing is more seen as a side business in the interviewed stores, none regarded customization of clothing as an option. As suggested by one store manager: *"If you are doing something custom, you are moving out to the ends in the bell shaped curve, and you need to have money."* Online shopping was mentioned by one of US-based participants as an option, since custom clothing is more likely to be ordered online. As a result of these interviews, we expect that many stores, including those in this study, would only direct their business towards customization if the problem of cost efficiency can be overcome. Therefore, it is seen that further research in this field is necessary to facilitate customization of activewear.

In addition to these topics, included in the semi-structured interviews, various additional topics were raised by the interviewees, such as; specification and importance of brands and branding in cycling wear; other comfort and performance characteristics, in example, issues with fabrics; price, cost and business issues, etc. These topics are all related for cycling sportswear design, which is also suggested by Luo, et al. as a multidisciplinary model including thermal physiology, aesthetics and bio-mechanics [23]. All these contributions provided a vital aspect for this research area and the long term development of this overall project, but are not directly related to the specific objectives in this research paper, and are therefore excluded here.

4.2 Questionnaire results

4.2.1 Customers and cycling habits

The first set of questions establish the demographics of the bicyclists. Results confirmed that the participants' ages were similar for both national groups (Table 1). By using t-test analysis, it was confirmed that two groups did not significantly differ in terms of their age (p=0.344).

In order to understand their cycling habits, participants were asked about their commitment to cycling and the number of years as regular cyclists. Most described themselves as dedicated cyclists. Comparison of groups revealed no significant difference in terms of commitment to cycling, according to Fisher's exact test (p=0.235). A similar result was obtained for the number of years each group was engaged in cycling; the majority indicated more than 10 years. According to Fisher's exact test, no significant difference between groups was found in the number of years of regular cycling (p=0.558).

Table 1. Age of participants in the questionnaire

	N	Min	Max	Mean	Std Deviation
USA	25	20	59	35,04	9,4
TR	25	17	53	38,24	13,8

Participants were also asked about the number of days cycled per week and the distances traveled. Results are given in Figure 1. Cycling frequencies per week showed a difference between groups. Most US-based participants cycled 3-4 days per week, whereas TR-based participants were more evenly distributed, from 1-2 days a week to 7 days a week. Based on the results of Pearson's chi-square test, the difference of cycling frequencies per week are significant (p=0.027). However, cycling distances showed a similar tendency for both groups, with most participants cycling more than 15 miles per day (p=0.887). According to these results, cycling habits across the groups showed many similarities, highlighting the justification for further research to compare clothing and fit related issues.

4.2.2 Cycling sportswear and fit issues

A second investigation topic concerned use of cycling sportswear and fit issues with existing products in the market. Participants were asked about the amount of money they allocated for cycling clothing. Almost half of all participants reported spending less than $100 per year on cycling sportswear. Based on the results of Pearson's chi-square test, there is no significant difference between the two groups in terms of spending on cycling clothing (p=0.493).

A follow-up item targeted fit problems with cycling sportswear. Results indicated that around three quarter of participants had no problems with the fit of the cycling sportswear. According to Pearson's chi-square test, the difference between two groups is not significant (p=0.529). Participants in both groups stated a moderate to high level of satisfaction with the fit of existing cycling sportswear in the market (p=0.259) as seen in Figure 2.

Following this general question about cycling sportswear fit issues, participants were asked which specific garments created the most serious fit problems. In this question, a list of 8 garment categories were provided, for ease of selection for participants, and for ease of evaluation for researcher. A total score was calculated by considering the 5 levels of fit problems given in the scale and the number of participants who selected this level (calculation of the total scores are explained in detail in Section 3.2). For each group, the minimum score, 25, would indicate the best fit; whereas the maximum score, 125, would refer to the most common fit problems. Figure 3 illustrates these garment categories and the total scores including both groups. It was seen that fit problems most frequently occurred with bicycle tights and shorts. There was a slight difference between groups. For US-based participants, fit problems with outerwear were as frequently cited as fit problems with tights. This is expected due to the harsher weather conditions in this specific region, including rain, snow, wind and cold. The latter exploration location has milder weather conditions with a warmer climate, and therefore outerwear is much less frequently sought in this geographical location. However, despite this difference, statistically there was no significant difference between groups for their choices of garments with fit problems, when items are individually expressed in Table 2.

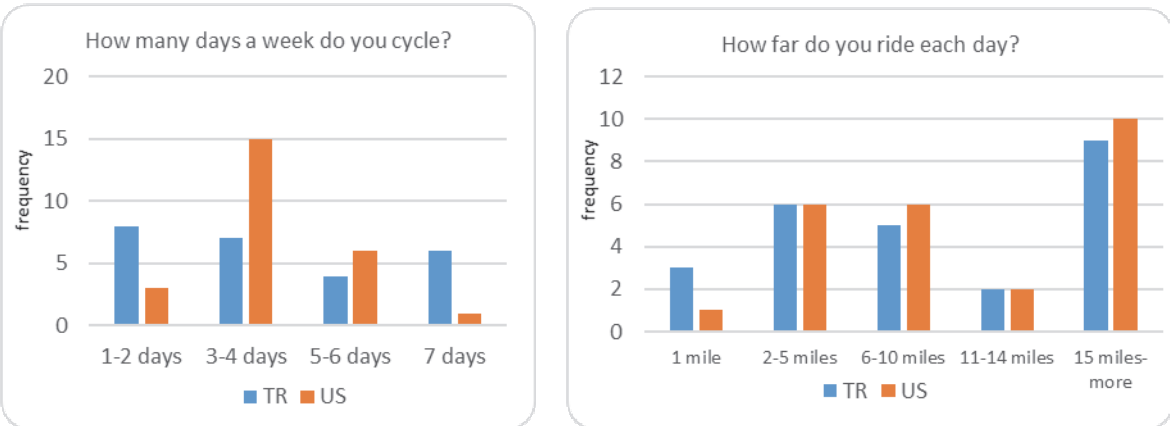

Figure 1. Cycling frequencies per week and traveling distances per day

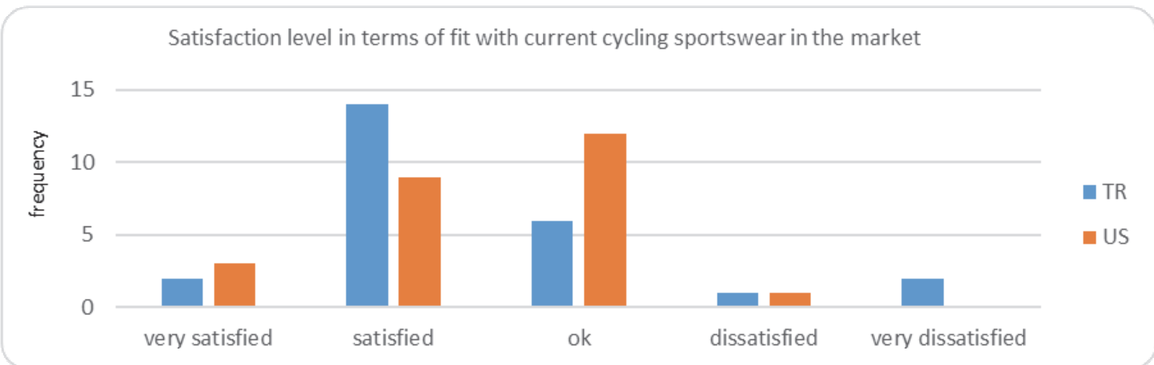

Figure 2. Satisfaction with cycling sportswear

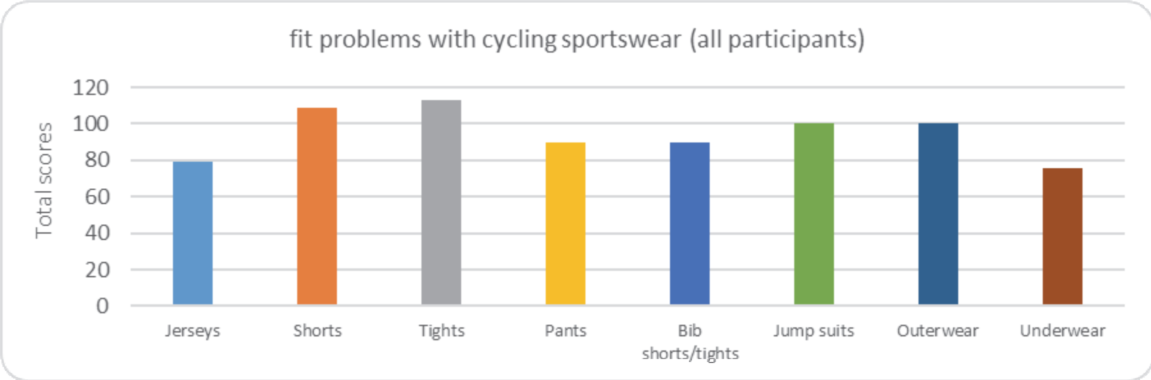

Figure 3. Fit problems for cycling sportswear considering garment categories

Table 2. Total scores and p-values for specific garment categories with fit problems

		Total score (TR)	Total score (US)		
1	Jerseys	32	47	p=0.224	no significant difference
2	Shorts	49	60	p=0.417	no significant difference
3	Tights	56	57	p=0.730	no significant difference
4	Pants	45	45	p=0.811	no significant difference
5	Bib shorts/tights	41	49	p=0.429	no significant difference
6	Jump suits	45	55	p=0.710	no significant difference
7	Outerwear	43	57	p=0.438	no significant difference
8	Underwear	38	38	p=0.160	no significant difference

Participants were asked about the importance level of four main parameters: price, fit/comfort, performance/function and design, when purchasing cycling sportswear. When a total score was calculated for these four parameters based on the choices of all participants, fit/comfort was seen as the most important parameter, followed by performance, price, and design respectively. The preferences showed a similar pattern for TR-based participants. Although, fit/comfort was also the most important item for US-based participants, values for price and performance/function were almost as high. Significant differences between groups were noted for fit/comfort ($p=0.018$) and performance/function ($p=0.049$). These results indicated fit and comfort as the key criteria for the purchase of cycling sportswear; however, for US-based customers, there was more of a balance between price, fit/comfort and performance/function.

4.2.3 Cycling shorts/tights and fit issues

Similar questions were directed to participants specifically regarding bicycle shorts and tights, the focus of this research. It was anticipated that most fit problems would occur with lower body garments. Results from the previous section supported this assumption, highlighting participants' views that cycling shorts and tights were the most problematic garment categories.

More than half of the participants reported spending less than $100 per year for cycling shorts, in line with the amount given for all cycling sportswear categories. Responses of both groups were very close to each other and there was no statistically significant difference ($p=0.561$).

In order to specify the type of lower body garments being used while cycling, participants were given 7 different garment visuals labelled as follows: padded cycling shorts, loose fit shorts, loose fit padded shorts, bibshorts, tights, bib tights and regular pants. Figure 4 and Table 3 show the frequencies for the most preferred cycling wear for lower bodies and the comparison of two groups (Participants could select more than one garment category).

In order to understand customer demand, participants were asked to state the number of cycling-specific shorts/tights they owned. A majority indicated either of 1-2, or 3-4, and the results from both groups showed a parallel tendency. A follow-up question investigated specific body parts with which were most problematic for cycling shorts/tights' fit. Total scores were calculated by considering the levels of fit problems and the number of participants who selected this level (calculation of the total scores are explained in detail in Section 3.2). It was found that the most problems were with the crotch and thigh areas (Figure 5). We believe that crotch fit problems might be due to the riding position and the change of body posture in standing and cycling poses. A solution would be pattern development for active body poses, in this case, in the cycling pose. This would allow development of a garment for which the padding placement is optimized for the active position, instead of in the standing position.

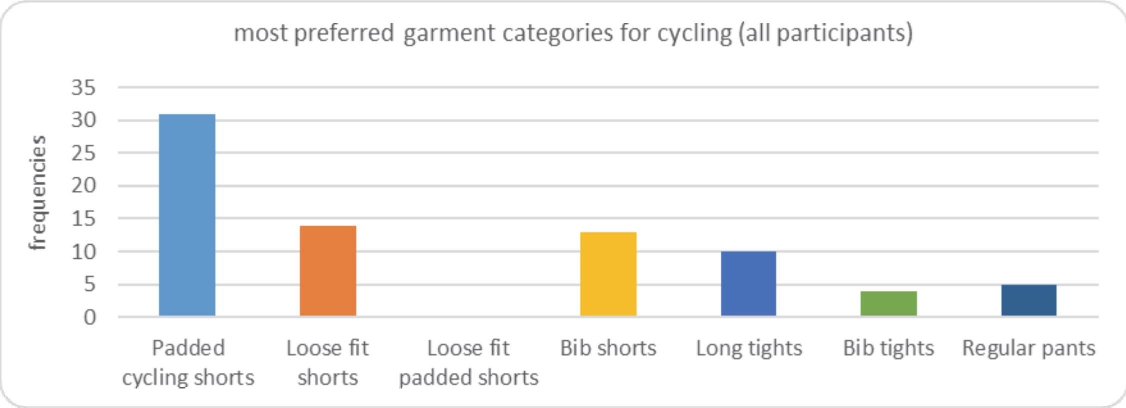

Figure 4. Most preferred cycling wear for lower bodies

Table 3. Frequencies and p-values for the most preferred cycling wear for lower bodies

	TR	US		
Padded cycling shorts	18	13	p=0.145	no significant difference
Loose fit shorts	7	7		
Loose fit padded shorts	0	0		
Bib shorts	4	9	p=0.196	no significant difference
Long tights	4	6	p=0.480	no significant difference
Bib tights	2	2		
Regular pants	3	2	p=0.500	no significant difference

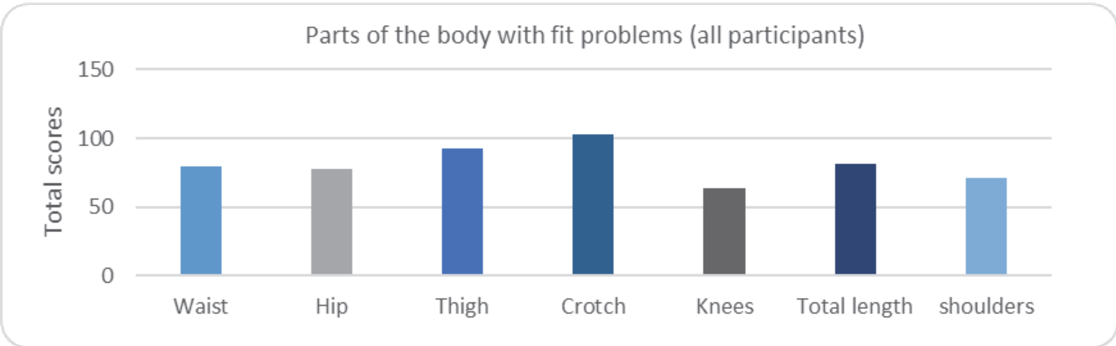

Figure 5. Specific body parts with which were most problematic for cycling shorts/ tights' fit

A comparison of the two groups reveals some differences. For the US group, following crotch and thigh, high values were also found for waist, total length, shoulders and hip, while for TR-based participants, fit problems were comparatively much less for these body parts. Total scores for each groups and p-values are given in Table 4. Since TR-based customers do not prefer bib shorts as much as the US-based customers, they encounter shoulder fit problems less frequently. The difference between the groups in fit issues with the total length of the shorts could be related to the differences in body height of participants. Since body height values were not collected for this survey, it was not possible to correlate these two variables. In addition to possible variations of anthropometric measures and body proportions of the groups, differences might also arise because of variations in fit awareness between groups. Since cycling habits were similar for both groups (see section 4.2.1), issues such as cycling distances, cycling duration or bicycle types are probably not the cause of the differences between groups.

Table 4. Total scores for TR and US-based customers for selected body parts with fitting problems

	TR	US		
Waist	34	46	p=0.013	significant difference
Hip	33	45	p=0.048	significant difference
Thigh	46	47	p=0.382	no significant difference
Crotch	51	52	p=0.605	no significant difference
Knees	35	29	p=0.171	no significant difference
Total length	35	46	p=0.134	no significant difference
Shoulders	28	43	p=0.014	significant difference

The last investigation issue for this category aimed to investigate the comfort and fit issues with padding in the tights/shorts. When asked whether they would prefer customized padding, 72% of TR-based participants and 78% of US-based participants answered positively. One of the important results of this survey was the finding that cyclists are generally unsatisfied with the padding of the shorts across a broad range of brands.

4.2.4 Open-ended questions

Responses to five open-ended questions were solicited in the final section of the questionnaire. One of these questions concerned the preferred brands. There was a significant variety in the selected brands. Turkish participants mentioned about 20 different brands, and US participants, 23. The vast majority of brands listed in the two groups' responses were different between the two countries as well as among participants. This revealed that participants are referring to a diverse range of sizing and fit problems, since there is likely to be significant variation in size charts and garment measurements across brands. Therefore, these responses are not limited to specific brands, but are representative of a wide range of products in the market.

When asked about the main features they would most like to be able to customize, 5 TR-based participants highlighted general fit issues, expressing the view that currently available brands are inappropriate for Turkish anthropometric standards, and 2 addressed customization of paddings. Other issues cited by the TR-based participants were mostly related to fabric related comfort factors, such as customization of breathability features. US-based participants discussed more specific fit and customization issues. The main categories that US-based customers would like customization in order of response frequency is as follows: jersey fit -body, length, arms, back of jersey, around belly (7); fit of shorts/ tights-compression in thighs (6); padding level/location (6); fit of bibshorts/ bibtights -length, straps, inseam (5); design - zip, pocket, graphic customization, etc. (5); hip-waist-thigh ratios (3). Customization demands mentioned by one or two participants were sleeve length, crotch fit, outerwear issues and collar size. Even though interviews with store managers in this research suggested little demand for customization, it was seen that when customers are specifically directed to this topic, they become more aware of their needs.

Another open-ended question in the questionnaire was about participants' most serious problems with their cycling sportswear. For this question, responses demonstrated that cyclists from the two countries face similar problems with their cycling clothing. Almost half of the TR-based participants expressed their problems with the fit of tights/shorts and paddings. A similar outcome was obtained with the US-based participants, where the most frequent responses were padding (9), fit of pants/short (6), fit of bib shorts/tights (6) and upper body fit (6). These results aligned with the outcomes from the multiple choice questionnaire items described in sections 4.2.2 and 4.2.3.

When asked about the aspects of cycling sportswear, which could positively influence their performance and comfort, three quarters of respondents stated a better fit of tights/shorts and an improved (superior) padding. A suitable compression was another recurrent topic for augmented performance and comfort.

5. CONCLUSIONS AND FUTURE WORK

The purpose of this exploratory study was to identify cycling sportswear customers and their fit preferences in two different contexts. Cycling was chosen as the focus of the research because of its tremendous global growth, and the consequent development of various product lines for better fit, performance and comfort. The analyses of qualitative data from the interviews of the shop managers, and quantitative and qualitative data from the questionnaires answered by the bicyclists themselves shed light on issues relating to cycling clothing customers and fit in a cross-country comparison. Being in relation to various research approaches for cycling sportswear, the perspective in this study differs by the analysis of cycling habits, clothing fit/customization preferences, and discussing tendencies with the aim of improved design and pattern making of active wear.

We had anticipated that different cultures and traditions of cycling in the two countries would be reflected in fit problems and customization interests. However, many similarities were found between two groups in their cycling habits, clothing preferences, fit satisfactions and customization demands. Parallels and consistency between the qualitative and quantitative results reinforced the validity of the findings. Interview and questionnaire results from both groups revealed demographic similarities such as age and gender. Even though cycling involvement level was not considered as a categorization in this research, participants showed much similarity in respect to dedication to cycling, distances traveled and number of years of regular cycling. When asked about general fit satisfaction, participant responses revealed no major dissatisfaction, and no special garment type or body section was highlighted. However, response to the question that was focused on fit satisfaction in relation to specific body parts, or to specific garment types, revealed that the greatest dissatisfaction involved cycling shorts/tights, mostly with padding design. When the question focused on specific body parts, the crotch and thigh were areas of dissatisfaction of fit for customers from both countries. This was expected due to an extreme change of body position and body dimensions in these areas from the standing to the cycling position. Therefore, a garment which is designed to accommodate the active body more effectively is foreseen to provide an improved fit, because it reduces the stress in the cycling position. The solution is to more effectively investigate the active body, the changes of the body when in motion, and to identify the interaction between the active body and the clothing, which will be the aim of future research projects.

Additionally, opinions from interviews with bike store managers suggested that, since clothing purchases are less expensive than bike and bike accessory purchases, clothing fit and customization issues are considered less important. Perfect fit for performance and comfort is seen as a requirement only for highly professional cyclists. However, it is believed that with casual cyclists' increased use of clothing designed for competitive or frequent biking, fit and customization issues will become priorities. A better fit will be sought for all cyclists, not only the professional, but at affordable prices. Therefore, an innovative approach in the field will be needed to develop products meeting the fit, comfort and performance needs of all cyclists, regardless of commitment level, at affordable prices. Mass customization is a possible solution, however, this requires different levels of customization, and the integration and analysis of various tools. Further research will therefore involve the investigation of patternmaking, product development and fit evaluation procedures for customized activewear to bring improved fit and comfort.

While acknowledging the limited number of participants, we highlight the high consistency of results for both groups. According to the quantitative results, differences between groups were not statistically significant for most of the evaluated criteria. The main significant differences observed between the two countries were with fit problems of cycling shorts/tights at waist, hip and with cycling bib shorts at the shoulders, which can be attributed to body shape differences and to customer preferences for particular garments. More specific data on these differences could come from advanced comparison of body measurements and body shapes between these groups, such as a comparison of two national size surveys.

Despite clear distinctions between two investigated cities in this research, (i.e. climate conditions, perspectives of being a bicycle- or car-oriented, and degree to which cycling is seen as a highly inclusive activity), customer habits and preferences showed similarity. This was an important outcome of this research clearly highlighting the transition of the apparel business into an enormous global market with relatively uniform customer characteristics/patterns. The results of the present study illustrate the close alignment of two diverse groups. This suggests that customer tendencies may be aligning within the global market of clothing, regardless of geographical location. An increased number of participants and range of countries can provide a stronger basis for arguing implications about the global apparel market. Such data sets would provide an even greater contribution to fit improvement in activewear industries.

This study provides direction for the development of improved pattern design for cycling apparel. Further work will investigate procedures for fit evaluation and compression measurement with tight fitting bicycle shorts and bibshorts.

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