Transdisciplinary Engineering: A Paradigm Shift
C. Chen et al. (Eds.)

doi:10.3233/978-1-61499-779-5-303

The Subjective Impression of Bicycle Saddles in Different Contexts

Jo-Yu KUO [a,b,1] , Chun-Hsien CHEN [a] and Jonathan ROBERTS [b]
[a] *Nanyang Technological University, 50 Nanyang Avenue, Singapore 639798*
[b] *Loughborough University, Loughborough, United Kingdom LE11 3TU*

Abstract. Customers nowadays want not only a functional product but also one can reflect their values and personalities. However, their emotional needs are not easy to be identified because people react differently according to personal experiences. Despite the high efficiency of a structured questionnaire, its validity of pre-defined items has been questioning. In order to address this problem, this study focuses on understanding how customers' subjective impressions are constructed in different contexts. When people show their interests in a certain product, their level of involvement increased along with other contexts of usage. An enthusiastic cyclist, for instance, can use bicycles as a means of sport, transportation and leisure. A case study of bicycle saddles has been chosen and thirty-three women road cyclists volunteered for interview sessions respectively. Accordingly, a semantic database and a conceptual model illustrating an enjoyable saddle experience were proposed. The findings can also help rectify current collecting approaches in terms of the emotional needs for sports equipment.

Keywords. User experience, emotional design, new product development, bicycle saddles

Introduction

The companies nowadays are aware of the benefits of emotional design and appreciate customers' feedback on product satisfaction. In the interest of creating an enjoyable product for a positive user experience, they would conduct several surveys, usually questionnaires, to identify the needs of the target market prior to the production. In the field of product design, researchers have developed an approach applying the semantic database to understand customer's impressions towards the product [1, 2]. Despite it helps designers transfer subjective feelings into technical specifications efficiently, it still has the limitations.

One of the problems is that the semantic items are often prepared to a certain extent by the person who designs the questionnaire. According to the personal construct theory, everyone has a unique way of interpreting the surroundings based on his own knowledge, and it keeps evolving by the events in their individual lives [3]. Therefore, an experienced customer will not perceive the product the same as a first-time customer. Different personal constructs can also lead to the misunderstanding to a structured questionnaire, especially to a semantic differential scale [2]. In a semantic differential test, the customer's subjective impression is often reduced to one simple

[1] Corresponding Author, Mail: m120159@e.ntu.edu.sg

word (e.g., comfortable, happy or good) although there is actually no guideline to select suitable semantic items in the literature.

Recently, the product experience has been treated as a combination of user interactions in different circumstances. For instance, a recreational cyclist prefers to seat on a saddle which makes him/her feel relaxed on the weekends, but a professional cyclist would choose a saddle that can help him/her race competitively. In this study, it is hypothesised that with the help of contextual information, it can give meanings to the semantic items so as to improve the validity of semantic database. The research method will be elaborated in the following paragraphs.

1. Case study

The bicycle saddle has been chosen as a case study. The purpose of this study is to illustrate a conceptual model of saddle enjoyment and its related factors. Therefore, an investigation into the product semantics (saddle) and the context (cycling) was organised.

Basically, the enjoyment of a saddle includes the physical comfort and the psychological comfort. Comfort as an emotional state, there has been a debate on whether its level is measurable [4, 5] whereas feeling uncomfortable suggested a physical discomfort (e.g., pain and soreness). In addition, previous research has shown that cycling comfort can be broken down into several parts, such as the bicycle (frame, saddle, handlebar), environment (road condition and weather), cyclists (position, body parts, adjustment) [6], as well as the cyclists' behaviours and opinions [7].

2. Method

The participants were recruited from local road cycling clubs based in the Midlands regions of England. The experiment was conducted at Loughborough University with ethical approval granted in June 2016. Advertisements for volunteers were posted on Facebook groups and distributed on campus and no specific profession was required as long as they rode on a regular basis. Only female cyclists were included because of gender differences in anthropometry with regard to saddle design [8]. At the beginning of the study, the experiment information sheet was shown to the participants before they signed the consent forms. The first author was the main investigator and also who designed the experiment.

2.1. Warm up: Draw a picture of your saddle

First, participants were asked to think about their saddle and draw a picture of it. They were allowed to draw more than one if they own several saddles. This was not a memory task; rather, it was a way to help them bring out a vivid picture in their minds in terms of the characteristics of bicycle saddles. Participants, therefore, were allowed to check a photo or the bike which she brought on the spot during the sketching process. However, individual sketch skill would not serve as a factor in this experiment. Some examples of the participant's saddle drawings are shown in Figure 1.

In this phase, the participants were also asked to describe their own saddles in three words (along with indicators or captions) regarding how they feel about it. Theoretically, the spontaneous statements can represent the most initial/important product impression. Also, the result can be used as a baseline for the semantic database in saddle design.

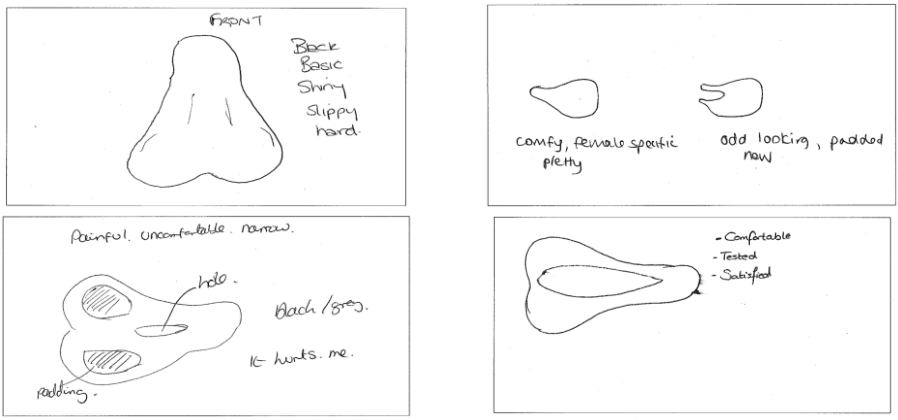

Figure 1. Saddle drawings.

2.2. Interview: Bicycle saddle in contexts

Next, the participants were asked to answer six open-ended questions which were written on a sheet of paper and given to them after the drawing session. In an attempt to minimise interviewer bias, the main investigator only assisted in clarifying the questions participants were confused with. The participants were able to freely express themselves with no time limit; the whole process was audio or video recorded depending on how comfortable they were in front of the camera.

All participants answered the interview questions (Table 1) in the same order starting from the context-based topic. Questions 1 and 2 were designed to learn about each participant's cycling background, including their riding purposes and motivations, which have a major impact on people's concerns and priorities [7]. Question 3 was designed to probe positive product interaction regarding an enjoyable cycling experience since it was the interest of this study. Subsequently, the participant's attitudes (Question 4) and expectations (Question 5) on a bicycle saddle were collected. Lastly, an activity-related topic (Question 6) helped recall how it (the saddle) feels on the bike.

Table 1. The list of open-ended interview questions.

No	Questions
1	What inspired you to use a road bike? How long have you been riding? Share your story.
2	Is this your first road bike? How many bikes do you have?
3	Best moment so far on the bike?
4	How would you describe your saddle? How do you feel about it?
5	What factors do you consider whether these saddles meet your needs?
6	How did you come to your current bike setup? How does it work?

3. Results and discussion

The initial number of participants is 33. All are English, with one German and one Slovenian, with an average age of 38 years old (*SD=11.8*). One of participant turned out not to be a road bike owner, and another two being failed to save full recordings; in total, three participants were removed prior the further analysis.

3.1. Semantic database

The result of words counts is shown in Table 2. It was grouped into three categories, viz., overall impression (34%), product properties (55%) and others (11%). Each category has a number of sub-categories respectively. Over half of the words that the participants used to describe their own saddles fall under the category of product properties, including firmness, texture, the facts-of-shape, the feel-of-shape, colour, weight and status.

Table 2. The counts of words that participants used to describe their own saddles.

Overall impression (34%)		**Product properties (55%)**			**Others (11%)**	
(general)	(positive)	(firmness)	(facts-shape)	(colour)	(gender)	(purpose)
12 comfortable	1 flexible	7 hard	5 hole	7 black	1 girly	2 race
7 uncomfortable	1 supportive	4 firm	5 narrow	3 white	1 man	1 functional
4 comfy	1 reliable	2 solid	3 wide	2 pink	1 woman	1 tested
	1 effective	1 stiff	1 slim	2 grey	1 female	1 necessary
	1 suitable	1 flat	1 long	1 red		1 chair
	1 satisfied	5 padded		1 strip of pink		1 fit for purpose
	1 efficient	4 soft		1 blue		
	1 happy	1 cushion				
	1 good					
	1 easy					
(negative)	(neutral)	(texture)	(feels-shape)	(weight)		(posture)
4 painful	2 basic	2 smooth	1 odd looking	2 light		2 middle
1 numbness	1 okay	1 slick	1 unique	1 heavy		1 position
1 scratch	1 moderately	1 slippy	1 stylish			1 area
1 hurts		1 slidey	1 strange shaped	--		1 sweet point/sit
1 annoying		1 leather covered	1 unobtrusive	(status)		
1 restricting			1 shiny	2 new		
1 bad			1 pretty looking	1 unavailable		
1 awkward				1 cheap		
1 not enjoyable						

3.2. Conceptual model

The analysis of interview was performed by the main investigator on a transcription website (http://otranscribe.com). The conceptual model (Figure 2) was built on the coded interview responses and three essential aspects were revealed, viz., cyclist, saddle, and context. This finding is not only consistent with previous comfort model [4] but also integrated the activity/behaviours domain from another [9].

It all started from a desire to go faster and further. Once they expected to sit on the saddle over a period of time or distance, the saddle comfort issue became more inevitable.

> *... I want something that is comfortable for long distances, so when I am doing 70-90 miles, I want to be able to sit comfortably in the saddle, and I don't want it to rub and chaff or give me blisters or any of the uncomfortable bit because I want to be able to get on the bike and ride again in next few days. (RRC9)*

> *... but I don't particularly enjoy riding day after day, because I know it's going to hurt. (RRC23)*

Of all participants, 66% said that they are constantly seeking a more comfortable seat. In fact, the more time each cyclist spent in this **trial-and-error** process, the closer her relationship with the saddle became [10]. Some might eventually get attached to a particular one while some admitted it was a decision to compromise.

> *... sometimes I sit on it and feel, I can do better but obviously trying to find a better saddle is not an easy task. (RRC19)*

> *... my saddle is the result of trying many saddles, with a lot of pain. (RRC32)*

> *... I have a bit of love-hate relationship with bike saddles, and I don't think you'll ever get a particularly, or a totally comfortable saddle. (RRC39)*

> *... I've had a specialized saddle which was on my very first bike. I've moved it on every road bike I've had. I am very happy with this, it and I understand each other. (RRC16)*

> *...I've had several. Got one I really like but it don't sell anymore. (RRC30)*

Regardless, the participants tended to figure out her preferences depending on the context. 40% (12/30) of participants were able to express explicitly what type or shape of the saddle they felt more comfortable with Also, 20% (6/30) of participants pointed out the correlation between saddle comfort and riding positions, and acknowledged the benefit of the right bike fit.

> *... For me, I kind of look at the weight and the width, because that's like a big factor, because I am racing. I found that the comfortable part needs to have a cut-out, so anything that is flat and padded, especially when you down the drops and trying to get into aggressive position. (RRC17)*

> *... usually got on with those really well. They are quite hard, and they are quite slim line, and they got kind of dome top. I don't like the one is deep in,*
>
> *I found that they get crap pressure points, and that's really uncomfortable. (RRC12)*

... I think I am always more comfortable on the saddle with a hole in the middle, and I, generally speaking, like a fairly narrow, neat saddle. (RRC16)

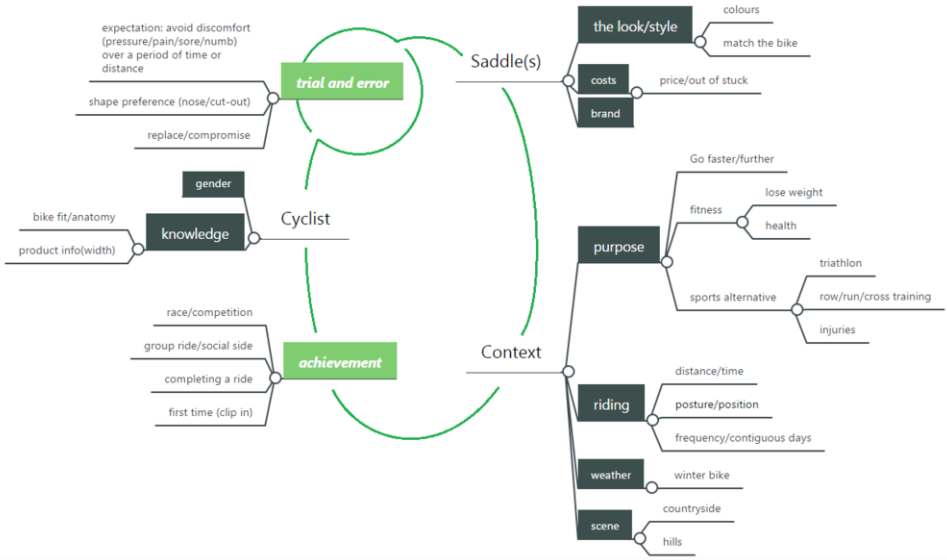

Figure 2. A relationship model of saddle enjoyment and its factors.

In addition to the physical comfort, 30% (9/30) of participants mentioned that it is important that the look of saddle matches the bike style. It is mainly related to personal taste and fashion choices but still contributes largely to an enjoyable saddle experience considering the words frequency in the semantic database.

... because a big part of cycling is you don't want a nice looking bike and then a saddle that just looks too big, doesn't look racing-like, or the colours don't suit it. (RRC21)

... I also want it to look quite nice because the rest of my bike does. (RRC28)

... which I got because it is soft and comfy. I have a black one and white one. White is a terrible colour. (RRC36)

Additionally, how the participants described their best moment on a bike (Question3) threw some light on the unknown cause of cycling comfort in the literature [4-6]. It is noticed that 63 % of participants are also involved in other sports (e.g., triathlon and cross training). Positive cycling experience, therefore, seems mostly to happen in a significant event, such as winning a medal or achieving a personal best. Occasionally, it has nothing to do with riding competitively, such as clipping in and not falling off for the first time. It has been labelled as **achievement** between Cyclist and Context in the model. In other words, it showed their favourite way of riding, weather, road condition, scene or other contextual factors. The riding buddy has some influences as well.

... maybe the one time that I beat mom in the race. It's so good. Only by a little bit but I still beat her in the race. (Cyclist 30)

... only three women, and being able to keep up with other guys (Cyclists 18).

… it was reduced to 80 miles from 100 because of the weather. It rained the whole time, and it was just flooded, but because I was with friends, and it was just hilarious. (RRC21)

4. Conclusion

4.1. Summary

Firstly, the semantic database was built in the participant's own words. The frequency and the percentage of words categories on bicycle saddles were presented. In a way, it shows the cyclist's subjective impression in a semantic level and is expected to be taken as a reference for designing a semantic differential scale.

Next, a conceptual model was proposed. It pointed out the characteristic of dynamic saddle experience in different contexts. Between the cyclist and the saddle, it is an iterative process of balancing the physical discomfort (e.g., pressure, pain, sore) and psychological comfort (e.g., style, preference, cost). The retrieved semantic items were in fact quite similar to those collected during the drawing phase. Judging from the interview responses, the participants knew clearly what negative feelings they wanted to avoid (e.g., chafing), however, they would use words related to preferable product properties (e.g., shape) to support their comfort level because it is more of an abstract concept. Apart from the product itself, 'achievement' can also strengthen cycling enjoyment in terms of positive product experience.

Overall, this study collected and analysed directly from the end-users perspectives. It is concluded that the saddle enjoyment is included, but not limited to the body comfort, and relies heavily on other contextual factors. Without providing the context of its use, user's subjective impression in the form of semantic items, might easily fail to reflect its meanings. The findings can help designers understand the construct of semantic items in an enjoyable cycling experience.

4.2. Limitations and future works

Unfortunately, there is an obvious inconsistency among participants regarding the amount of responded content. The interview length was relatively short in comparison with a general in-depth interview because the main investigator did not interfere during the sessions. It seems to vary with the participant's personality; some of them are very expressive while some provided simple narratives. Nevertheless, most of the participants tended to complain their saddles. It is assumed that due to the nature of this experiment, we are most likely to recruit people who feel discomfort in riding and want to improve the saddle experience at that time.

The fact that only road bike users were investigated may somehow limit the variety of contexts. They seem to have similar riding purposes, going faster. Therefore, it is suggested to look for a greater diversity of participants in a further study. For instance, an enthusiast cyclist can own more than one bike, and not limited to the same type of

bike. We can also invite an additional group of men cyclists in response to the disagreement of gender-specific saddle (e.g., shape preference) in the bicycle industry. It would be interesting to do a cross-analysis at their emotional needs and cycling backgrounds.

References

[1] P.M. Desmet and H. Schifferstein, Emotion research as input for product design, in: *Product innovation toolbox: A field guide to consumer understanding and research*. 2012. pp. 149-175.
[2] M. Nagamachi, Kansei engineering as a powerful consumer-oriented technology for product development, *Applied Ergonomics*, 2002, 33(3), pp. 289-294.
[3] P.W. Jordan and S. Persson, Exploring users' product constructs: how people think about different types of product, *CoDesign*, 2007. 3(S1), pp. 97-106.
[4] M.P. de Looze, L.F.M. Kuijt-Evers and J. van Dieen, Sitting comfort and discomfort and the relationships with objective measures, *Ergonomics*, 2003. 46(10), pp. 985-997.
[5] R.P. Ellegast, et al., Comparison of four specific dynamic office chairs with a conventional office chair: Impact upon muscle activation, physical activity and posture, *Applied Ergonomics*, 2012, 43(2), pp. 296-307.
[6] F. Ayachi, J. Dorey, and C. Guastavino, Identifying factors of bicycle comfort: an online survey with enthusiast cyclists, *Applied Ergonomics*, 2015, 46, pp. 124-136.
[7] J. Dorey and C. Guastavino, Moving forward: conceptualizing comfort in information sources for enthusiast cyclists, *Proceedings of the American Society for Information Science and Technology*, 2011, 48(1), pp. 1-9.
[8] J.J. Potter et al., Gender differences in bicycle saddle pressure distribution during seated cycling, *Medicine and Science in Sports and Exercise*, 2008, 40(6), pp. 1126-1134.
[9] A. Schmidt, M. Beigl and H.-W. Gellersen, There is more to context than location, *Computers & Graphics*, 1999, 23(6), pp. 893-901.
[10] R. Mugge, J.P.L. Schoormans and H.N.J. Schifferstein, Emotional bonding with personalised products, Journal of Engineering Design, 2009, 20(5), pp. 467-476.