Evaluation of assistive mobility product for the Japanese elderly by the Kansei sheets

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Abstract

After being a subject of psychological, social and even anthropological studies for many years, the nature of emotions and their measurement has become a popular target for research in recent times, in fields such as design and advertising. The consumer world is starting to realize that the human is by nature an emotional being, and that it is important to start addressing this in many different levels in order to for example improve sales, develop better and more personal products and in general to evaluate the effect that all these products and services may have in our life. Basically, emotion is an essential key for developing a product that brings happiness to people. This study investigated the Kansei needs of the Japanese elderly for personal assistive products relating to mobility with emotional design approaches. In Japan, the proportion of people older than 80 years is growing rapidly. To guarantee the sustainability of health and social care systems while enhancing quality of life, it is important to find ways to promote the functional capacity of older people. Mobility is a key issue in maintaining independence in old age. Mobility refers to a person's ability to move independently and safely from one place to another. In the market, there are various types of personal assistive products. This study evaluated the present design of a walking stick from the older people’s points of views. Two new emotional evaluation methods were used to carry out this study; Kansei sheets and read body language (RBL) sheet. The present study identified the problems of the walking stick design. Furthermore, it had proved the efficiency of the new evaluation methods to capture older people’s experiences and emotions.

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1. Introduction

Mobility is important for community independence. With increasing age, underlying pathologies, genetic vulnerabilities, physiological and sensory impairments, and environmental barriers increase the risk for mobility decline. Understanding how mobility declines is paramount to finding ways to promote mobility in old age [1]. Japan finds itself moving into an ageing society. The ageing of Japan is thought to outweigh all other nations, as the country is purported to have the highest proportion of elderly citizens; more than 20% are over the age of 65 today. Recently, product development for older people has shifted from a product oriented strategy to a consumer oriented strategy; the consumer’s psychological feeling and needs are recognized more invaluable in product development than ever before [2 and 3]. The affective product design is aimed at determining the relationships between consumers and products and to define the emotive properties that products intend to communicate through their physical attributes [4]. At present, many product development theories based on consumer were described. This study discussed the needs of Japanese older people for mobility. It focused on the present design of walking stick and its problems from users’ points of views. A walking stick is an important tool used by elderly people to facilitate balancing while walking. It overcomes balance problems and weak legs, and restores the person’s sense of security.

2. Methods

To carry out our research, three Japanese subjects were selected to evaluate the stick design [table 1]. The examinations were carried out at Kyushu University, in May 2012. Three emotional evaluation methods were used to examine users’ emotions and to identify the most important design problems. These methods are as follows; Kansei sheets, read body language (RBL) sheet, and interviews (Figures 1 and 2).

<table>
<thead>
<tr>
<th>Subject</th>
<th>Name</th>
<th>Gender</th>
<th>Age</th>
<th>Subject’s Movement Ability</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Maitoko</td>
<td>Male</td>
<td>72 years</td>
<td>at present, he is able to walk without using a stick</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>old</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Wada</td>
<td>Female</td>
<td>74 years</td>
<td>she wants to use a stick and search for a good one</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>old</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Okawakeiko</td>
<td>Female</td>
<td>74 years</td>
<td>at present, she is able to walk without using a stick</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>old</td>
<td></td>
</tr>
</tbody>
</table>

Last five years, in our previous studies the above new evaluation methods had proved their efficiency to capture younger people’s experiences and emotions [5 and 6]. Therefore, in this study, these two new methods had been used to capture older people experiences, and identify the stick design problems (Figure 3).

The unique strength of Kansei sheets is that it combines two qualities: it measures distinct emotions, and it can be used cross-culturally because it does not ask respondents to verbalize their emotions. The operation requires neither expensive equipment nor technical expertise (Figure 1).

Kansei sheets include two sheets. Sheet # 1 presents 14 distinct emotional responses. And sheet #2 presents 9 physical responses. The user can select from the two sheets the image/s that best express his or her emotional and physical responses to a product.

In the Kansei sheets, the user’s emotional and physical responses are measured according to a Likert-type scale. For example, in sheet # 1, I feel this to some extent (10%); I feel this (40%); I feel this very much (70%); and I strongly feel this (100%). In sheet # 2, I suffer somewhat from this (10%); I suffer from this (40%); I suffer from this very much (70%); and I strongly suffer from this (100%). Sheets #1 and #2 are used to interpret and measure internal emotional responses and conscious physical responses of users after interaction with product/ or services. Subjects were asked to use kansei sheets in each stage of stick design evaluations.

Regarding the RBL sheet, it is a preliminary guideline used by the designers to capture users’ experiences (UX) and their behaviors in the evaluation stages. In other words, this novel method aims to interpret users’ dynamic expressions by observing them while their interaction with a product. Based on several studies regarding human
emotions, 20 distinct emotional responses were interpreted and analyzed in one sheet which is called “read body language sheet” (Figure 2).

In this study, the emotional responses of each user were examined throughout three evaluation levels; visceral “superficial first impression on the device appearance”, behavioral “usage of device”, and reflective “overall impression / the device value” [7].
Fig. 1. Kansei sheets #1 and 2. Sheet 1 measures internal emotional responses. Sheet 2 measures conscious physical responses. Designed by Dr. Nermin Elokla, Faculty of Design, Kyushu University, 2009.
Each subject was asked 16 questions, including 5 questions for stick design aesthetics (visceral level), and 10 questions for stick usability (behavioral level). The last question was about stick design evaluation as a whole (reflective level). The following are the questions of stick design evaluation.

- **Stick appearance/ aesthetic evaluation - visceral level (using Kansei sheet # 1):**
  - Q.1 What do you feel about handle form?, Q.2 What do you feel about foot design form?
  - Q.3 What do you feel about the stick color?, Q.4 What do you feel about the stick body material?
  - Q.5 Overall, what do you feel about stick appearance?

- **Stick usability and overall evaluation - behavioral level (using Kansei sheets # 1 and 2):**
  - Q.6 What do you think about the usability of the stick handle from ergonomics aspect?
Q.7 What do you think about the stick functionality? Do you need other functions; such as umbrella, seat, lighting, basket, and watch. Q.8 What do you think about the handle quality?, Q.9 What do you think about the body quality? Q.10 What do you think about the foot quality?, Q.11 What do you think about the handle safety? Q.12 What do you think about the foot safety?, Q.13 What do you think about the stick height adaptability?, Q.14 What do you think about the stick size?, Q.15 What do you think about the stick weight?

Stick design evaluation as a whole – reflective level (using kansei sheet # 1):

Q.16 Overall, what do you think about the stick design?

3. Results and discussions

At present, there are many designs for walking stick in the Japanese market (Figure 4). This study evaluated ‘e’ design, as it is one of the most popular designs used in Japan (Figures 5, 6, 7, and 8). It is not a folding design.

3.1. Evaluation of stick design aesthetics (Visceral level)

Regarding the stick appearance, the results of both Kansei sheet #1 and the interviews revealed that the subjects’ emotions were pretty much positive. Their emotions were confined between satisfaction and attraction.

Their negative emotions were related to the followings: a) the design of the rubber foot form, and b) the stick body color. Subjects believed that pleasant color will add luxury and beauty to the stick. Basically, the stick body

Fig. 4. Present designs of walking stick in Japan.

Fig. 5. Mr. Maitoko evaluated stick design as a whole
design and color needs to be more attractive. Also, in terms of observable body language, 5 categories of emotional responses were realized in this stage; positive, negative, thinking status, unclear response and neutral. These categories were identified according to the results of the RBL sheet.

3.2. Evaluation of stick usability and overall design (behavioral and reflective levels)

Concerning the stick usability, the results of kansei sheets # 1 and 2, as well as the interviews revealed that positive emotions were confined between satisfaction, attraction, and hesitation. As for negative emotions (including annoyed and angry), subjects complained about the followings; quality of handle material (not safe enough due to its smooth material), difficulty in height adaptation (this caused hand pain), big size, and slightly heavy. Overall evaluations, the subjects believed that the design is somewhat acceptable, but needs some developments, including small size for storage, lightweight for easy carry, and creating more functions (such as; a seat, light and basket).

The comparison between the results of the evaluation methods revealed that there are remarkable differences between the outcomes of kansei sheet #1 and the RBL sheet. We found that the subjects’ replies (the results of kansei sheet # 1) and our observations (the results of the RBL sheet) were different. According to our survey, three possibilities might cause these differences. First possibility; sometimes observer could not recognize the special type of user facial expression which called ‘micro-expressions’. In general, this type occur when people are consciously or unconsciously trying to conceal what they are feeling [8]. This means that the outward expressions of emotions which the user presents to us are sometimes different from his/her internal emotions.

<table>
<thead>
<tr>
<th>Usability Problems</th>
<th>Stick Design</th>
<th>Aesthetics Problems</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Handle material</strong></td>
<td>A unique soft handle is required to cushion the hand and absorb the hand’s sweat.</td>
<td></td>
</tr>
<tr>
<td><strong>Height adaptation</strong></td>
<td>Subjects found difficulty to adapt the stick height. So they look for feature like ease of operation when adjusting the height of the stick.</td>
<td></td>
</tr>
<tr>
<td><strong>Small size for storage</strong></td>
<td>The stick folds into three/or four parts for easy storage in minimal space.</td>
<td></td>
</tr>
<tr>
<td><strong>Lightweight material</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Design more functions</strong></td>
<td>Stick provides a comfortable seat to rest on when open.</td>
<td><strong>Colourful and elegant design</strong></td>
</tr>
<tr>
<td></td>
<td>Basket/ Pouch easily attaches to a stick. Allow users to store personal items without interfering with mobility.</td>
<td><strong>Pleasant design</strong></td>
</tr>
<tr>
<td></td>
<td>Handle and tip glow in the dark. This light is the perfect accessory for us and any limited mobility user who appreciates having a bit more visibility for safely crossing poorly-lit streets or dark corners.</td>
<td>Users need stylish design which is aesthetically pleasing and making them feel less infirm</td>
</tr>
<tr>
<td></td>
<td><strong>New attractive form and colour</strong></td>
<td></td>
</tr>
</tbody>
</table>

Fig. 9. Older people problems and needs.
Second; facial expressions have been called the “universal language of emotion,” but people from different cultures perceive happy, sad or angry facial expressions in unique ways, according to new research published by the American Psychological Association. From cultural aspect, Japanese, when in the presence of others, try to suppress/ keep in their emotions more than Western people do [9].

In Japan, people tend to look to the eyes for emotional cues, whereas Americans tend to look to the mouth. Those cultural distinctions could lead to missed cues or misinterpreted signals about emotions during cross-cultural communications. In any case, the eyes are more difficult to control than the mouth, he said, so they probably provide better clues about a person’s emotional state even if he or she is trying to hide it.

Third; according to the somatic marker hypothesis SMH, two pathways reactivate body responses [10]. In the first pathway, emotion can be evoked by the changes in the body that are projected to the brain—called the “body loop”. In the second pathway, cognitive representations of the emotions can be activated in the brain without being directly elicited by a physiological response—called the “as-if body loop”. This means that sometimes the user’s emotions can be activated in the brain without being directly elicited by a physiological response. Therefore the observer finds difficulties to predict the user behavioral responses and evaluation.

Overall, this study identified the older people feelings towards the personal assistive product. Analyzing these affective interactions can get a better idea about the user’s impression towards the design of walking stick. Also our study revealed that new emotional evaluation methods are effective for interpretation of people’s emotions.

In the future work, we will examine more types of the walking stick design with Japanese older people. We believe that understanding users’ emotions is needed to create pleasure with products in our daily lives.

4. Conclusions

Within thirty years, Japan will experience an increase in the elderly population unprecedented in the world. Recently, the ratio occupied by the 65-years-and-over age group to Japan’s total population has been rapidly increasing. This study aimed to find out the main problems of elderly people mobility throughout evaluation of walking stick design. Two new emotional evaluation methods were used to carry out this work. This study concluded that the present stick design has different problems related to its usability and aesthetics. Also, for capturing user experiences and emotions successfully, “triangulation” of methods is important to be used. In other words, designers should pay a close attention to collect information in different ways and comparing the results. This study reveals that however “direct observation” is an appropriate method to identify the user’s problems, and also to break the ice between user and design, it is not often an effective way to understand user emotions and experiences. Overall, the new methods can be effective for developing product according to the users’ needs.

Acknowledgements

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References