# Developing a questionnaire to explore people's attitudes towards emotionally-driven prostheses: a pilot study

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The literature shows that societies' attitudes towards people with disabilities are negative, as a consequence of stigma. The design of the products (e.g. prostheses) can affect the attitudes of the people as products elicit emotions. However, research suggests that people have difficulties expressing their emotions. Therefore, the conduct of a pilot study, based on an interview-based survey questionnaire, was essential before conducting a full-study to test whether prostheses evoke emotions in non-prosthetic users (feasibility of study). The objectives were: to gain insights regarding aspects of the structure of the questionnaire; to examine whether people's attitudes towards people with limb-loss can be affected by the design of prostheses; to identify whether people's attraction towards prostheses can be affected by their level of emotionally-driven design; to investigate if prostheses can elicit emotions in non-prosthetic users, and; to explore if there is any relationship between the level of attractiveness and the emotions prostheses elicit. The findings cannot be considered as representative, since the sample was small (23 participants). However, they showed that prostheses elicited emotions in non-prosthetic users; the most frequently expressed emotions were sadness, admiration, and serenity. The level of emotional-design of prostheses appeared to affect the level of people's attractiveness and implied the existence of a relationship with the emotions that were elicited. These findings highlighted the importance of conducting a full-study and suggested the existence of an opportunity for altering the negative perceptions towards people with limb-loss into positive ones through the design of prostheses.

*Keywords: emotionally-driven; emotional design; prostheses; amputees*

## 1    Introduction

Stigma is based on the relationship that exists between the person who is considered to have a difference (e.g. homosexuality, people with limb-loss) and other people who evaluate and understand this difference negatively (Green et al., 2005; Riddell & Watson, 2003). From this interaction, there are two types of stigma; *public* and *self-stigma*. According to Werner and Shulman (2015), public stigma derives from the opinion of society towards stigmatised people, while self-stigma is a consequence of the opinion that the individual forms, based on society's attitude.

The literature around disability studies suggests that societies' attitudes towards people with disabilities are affected by the culture in which they live. For instance, the study of Westbrook et al. (1993) was conducted in a multi-cultural society (Australian) with 665 health practitioners

from six different communities (Chinese, Italian, Greek, German, Arabic speaking and Anglo-Australian) and showed that people from different communities had different attitudes towards the twenty disabilities that were investigated such as diabetes, amputated leg or arm, cancer, facial scars, and blindness. Westbrook et al. (1993) pointed out that participants from the collectivism communities, where people present strong bonds with groups and try to maintain the group harmony (e.g. Arabic, Greek, Chinese), had more negative attitudes than the participants from individualistic communities, in which people act independently and are motivated by personal goals (e.g. German, Anglo-Australian). As Westbrook et al. (1993) stated, that happened because of stigma that affected their behaviour. However, although people from the individualistic communities showed higher levels of tolerance and comprehension towards people with disabilities, they still discriminated and separated them from able-bodied people (Westbrook et al. 1993). Another study concerning the attitudes of 138 Chinese college students towards people with different disabilities showed that the Chinese (collectivism) presented more positive attitudes than the Americans (individualism) towards people with physical problems and less towards people with psychiatric problems (Grames & Leverentz, 2010). This study suggested that discrimination between people with disabilities and able-bodied people still exists, in both individualism and collectivism societies. Therefore, in order to eliminate stigmatisation, it is necessary to alter the negative attitudes into positive. One way that this could be achieved is through the design of products.

Products elicit emotions in users; nevertheless, the emotions that are elicited do not derive from the products as such, but by the meanings that people assign to them (Desmet et al., 2001; Demirbilek & Sener, 2003; van Gorp & Adams, 2012). Desmet (2012) showed that people experienced various positive emotions during their interaction with products and although these emotions were all positive, they differed regarding the influence they had on people's behaviour and thoughts. Coates (2003) widens the importance of the meanings of products from the individuals to society by pointing out that the form and appearance of products have "moral and cultural significance that reflects not only its creators but also its audience. More important, it reinforces or reshapes the values, beliefs, concerns, and preoccupations of its audience… In turn, a product's design reflects and affects its surrounding culture" (p. 4). In accordance with that, Pullin (2009) stated that traditionally, the design of medical devices aimed to be discreet to hide and undermine the disability and for that reason, hearing aids for example usually had skin tones to match the users' skin colour. Based on the design principles that medical products follow in order to conceal users' disability problem, Pullin (2009) posed the following question:

"But is there a danger that this might send out a signal that disability is after all something to be ashamed of?" (p. 15)

In this case, the use of these products displays a negative image of disability, through their design, which enhances stigmatisation and creates unpleasant emotions in users. Therefore, Pullin (2009) declared that "a more confident and accomplished design could support more positive images of disability" (p. 15). In agreement with Pullin (2009), Vainshtein (2011) and Hall and Orzada (2013) proposed that if prosthetic limbs adopt an emotionally-driven approach, social statements can be made that would reject the "societal pressure to conform to the normative embodied ideal… and highlight yet another aspect of diversity within the contemporary society" (Hall & Orzada, 2013, pp. 26-27). Desmet and Dijkhuis (2003) also stated that the design of wheelchairs, a product that is usually connected with feelings of discrimination and marginalisation, is mainly focused on the principles of ergonomics,

usability, and technology, without taking into consideration the emotions that wheelchairs can elicit in users. Additionally, they suggested that further studies with non-wheelchair users, would also give valuable insights regarding the stigmatising aspects of wheelchairs. Although these arguments indicated the existence of a non-linear relationship between products, users and people around them (users' environment), to date, only one paper focused on people's interaction with prostheses, with respect to their design. More specifically, Sansoni et al. (2015) tried to understand people's attitudes towards prostheses which have a realistic or non-realistic appearance, by using the Uncanny Valley, a Japanese theory which posits that artificial devices with a high level of human-likeness create negative feelings towards people. The findings of their study were contrary to Uncanny Valley, as prosthetic limbs with a high level of human-likeness were considered more attractive by participants than those with more robotic or abstract designs (Sansoni et al., 2015). Nevertheless, although Sansoni et al. (2015) investigated the level of attractiveness of prosthetic limbs, their study did not explore the emotions that prostheses elicited in people.

Previous studies in the area of emotional design suggested that it is difficult for designers to investigate the emotions that products elicit in people, as the extent to which people can verbalise and express their emotions varies (Desmet, 2012; Yoon et al., 2016). As Desmet, (2012) stated about participants's capability of expressing their emotions, based on a study he conducted, "almost half of the reported words did not actually refer to distinct emotions, but instead to only the positive nature of the emotions (e.g., good, fine, pleasant, up, great, and nice), or to expressions or behaviour (e.g., smiling, laughing, getting goose bumps)" (p.13).

Based on the difficulties people have with expressing their emotions, a pilot study was considered essential before the conduct of the full-study, which consisted of an interview-based survey questionnaire.

## 1.1   Aim and objectives of the pilot study

The aim of the pilot study was to test if prosthetic limbs could evoke emotions in non-prosthetic limb users (feasibility of study), and whether participants were able to express these emotions (insights regarding the structure of the full study). As in this study, the participants were non-users, the word 'design' referred only to the appearance of the prostheses.

Therefore, the objectives of the study were:

1. To gain insights regarding various aspects of the structure of the questionnaire that could be improved, to make it easier for participants to complete.
2. To examine whether people's attitudes towards people with limb-loss can be affected by the design of prostheses.
3. To identify whether people's attraction towards prostheses can be affected by the level of emotionally-driven design of them.
4. To investigate if prosthetic limbs can elicit emotions in non-prosthetic limb users, with respect to their design.
5. To explore if there is any relationship between the level of attractiveness of prostheses and the emotions these prostheses elicit.

## 2 Research Methods

### 2.1 Interview-base survey questionnaire

In order to understand people's attitudes towards people with limb-loss, with respect to the prostheses they wore, an interview-based survey questionnaire was developed in the Bristol Online Survey (BOS) software, which consisted of five sections, with Section 5 being a repeat of Section 2 (see Figure 1). The Section 1 of the questionnaire had six demographic questions (sex, age, area of residence, educational level, occupation, and nationality) and two disability related questions (e.g. 'Do you have any disability problems?' and 'Do you know any person close to you who has a disability problem?'). The aim of the two disability related questions was to explore whether people's familiarity with disabilities influenced their attitudes towards people with limb-loss or their attractiveness towards prostheses, in comparison to those who were not familiar with any disability.
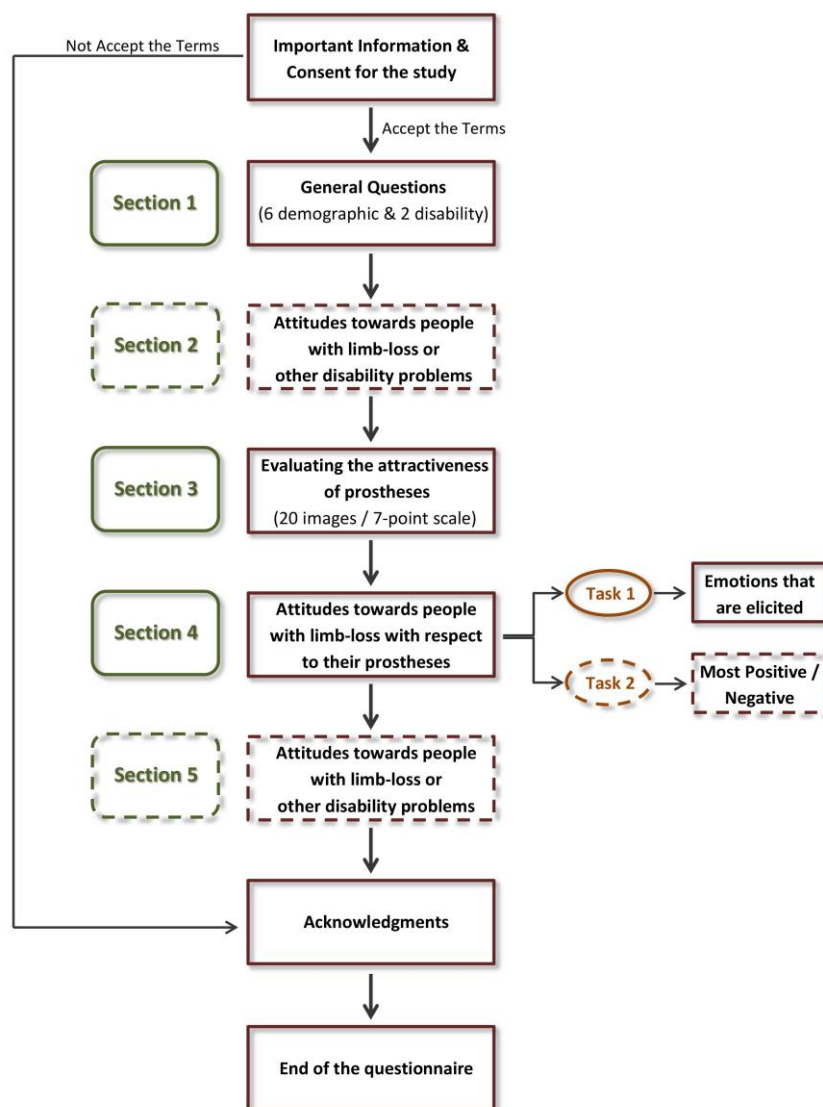


*Figure 1 The structure of the interview-based survey questionnaire. The boxes with the dashes depict the sections of the questionnaire that were removed after the conduct of the pilot study, since they were considered unnecessary*

In Section 2 of the questionnaire, participants were asked to explain what they thought when they saw a person with limb-loss (see Figure 1). This question was asked before participants saw any image of prostheses to avoid being affected by the design of prostheses. The same question was asked again at the end of the questionnaire (Section 5, Figure 1) and was intended to identify whether people's attitudes towards people with limb-loss were affected by viewing prosthetic limbs.

In Section 3 of the questionnaire, participants had to evaluate the design of twenty prosthetic limbs (see Figure 1) by using a seven-point scale (1='Not attractive at all' to 7='Extremely attractive'). The prosthetic limbs were separated into three categories based on the level of the emotionally-driven design they had. Since there was no previous research to separate prostheses into different types based on the level of their emotionally-driven design, their division into each type was conducted by the authors, based on the theories in the area of emotional design. The first type was the *Realistic Prostheses* (RP), which are considered to have a low level of emotionally-driven design, since their appearance imitated the appearance of natural human limbs and they offered limited functionality. The second type were the *Functional Prostheses* (FP), which presented a moderate level of emotionally-driven design, as their appearance differed from the one of human limbs in shape and colour, and they offered great functionality. Finally, the third type was the *Expressive Prostheses* (EP), which had a high level of emotionally-driven design, since their appearance showed various patterns, decorative elements, colours, and it was inspired by user's unique personality. Not only did EP present a high level of emotionally-driven design because they communicated meanings about their users to people around them by expressing their personality, but also because users actively participated in design process. The images of the prosthetic limbs that were used were chosen from websites and they were cut and edited on Adobe Photoshop CC 2017 in order to present a neutral (white) background, have high resolution, and depict only the prosthetic limb on that area of the wearer's body to avoid participants' distraction from other elements that could affect their evaluation (e.g. the style of their clothes).

Finally, Section 4 was separated into two tasks (see Figure 1). In Task 1, nine images were given to participants who were asked to write the emotions that were elicited in them, when they were looking at the person in each image, with respect to the limb he/ she wore. These images depicted the same prosthetic limbs as those that were used in the Section 3; however, in that case, the wearer's body was shown entirely, apart from his/ her face, which was hidden, as it was considered that facial expressions and characteristics may affect participants' emotions. In Task 2, the same images that were used on Task 1 were given to participants, and they were asked to choose the one that created the most positive emotions, and the one that created the most negative, and specify the reasons these emotions were triggered. The reason for using the same images of prosthetic limbs in Sections 3 and 4 of the questionnaire was to be able to compare the data and investigate whether there was any relationship between the level of attractiveness of the prostheses and participants' emotions towards the users, with respect to their prostheses.

### 2.1.1 Validity of the questionnaire
According to Bryman (2012), validity is relevant to "whether a measure of a concept really measures that concept" (p. 170) and as it is related to the integrity of the results, it is the most important criterion. Various ways can be used to test the validity of a study, such as those of face, concurrent, or predictive validity. In this study, face validity was used and

therefore, the questionnaire was tested by six experts; three experts in the area of prostheses, two experts in the area of statistics and one prosthetic user.

## 2.2 Ethics

The study was approved by the Ethics Sub-Committee for Human Participants of Loughborough University. In the introduction page of the questionnaire, the Participant Information Sheet and the Informed Consent Form was presented to participants.

## 2.3 Participants

Participants were recruited electronically through e-mails and social media (e.g. Facebook, Twitter). Participation in the study was completely anonymous and the only inclusion criterion of the study was for participants to be over eighteen years old.

The questionnaire was completed by twenty-three participants; eighteen participants were men and the mean age of participants was 34. Two of the people who participated in the study answered they had a disability problem, with one of them being an above knee amputee; eleven participants replied they knew a person close to them with a disability problem, with four of them referring to people with limb-loss. All participants had a high educational level (degree or higher), whilst the number of participants who were living in a city was the same with those living in a town (11 participants respectively). Participants' nationality varied including UK, Italy, Portugal, Greece, Cyprus, Spain, China, Pakistan, the Netherlands, and USA.

## 2.4 Data Analysis

As the sample of the study was very small, statistical analysis could not be conducted; therefore, the analysis of the quantitative data was conducted by using Microsoft Excel 2010 software, whilst NVivo Pro 11 was used for the analysis of the qualitative data (open questions and emotions).

### 2.4.1 Internal Reliability

Internal reliability was conducted to test the internal consistency of the images that belonged to each type of prostheses (Table 1) by using Cronbach's Alpha. The results of Cronbach's Alpha for the images that belonged to Realistic Prostheses (prostheses with low emotionally-driven design) was 0.944, whilst the one for the images of Functional Prostheses (prostheses with moderate emotionally-driven design) was 0.919; finally the results of the images on Expressive Prostheses (prostheses with high emotionally-driven design) was 0.932. These results indicated that the internal consistency of the images belonged to each type of prostheses was very high. The internal reliability of the study was conducted by using the Statistical Package for the Social Science software (IBM SPSS Statistics 23).

## 3 Results

The analysis of participants' answers regarding their attitudes towards people with limb-loss and other disability problems showed that almost all of the participants (n=22) felt sadness, pity, compassion and sympathy towards them regarding their situation, the difficulties they need to confront in their daily lives, and the fact that in many societies, people with limb-loss are restricted and marginalised. More specifically, one of the participants said that "I feel pity, I emphasise towards their sense of pain or discomfort. I do not know how to fairly approach them", whilst another one mentioned that "I feel sad for the unfortunate person". Participants' attitudes remained the same after the completion of the questionnaire.

Table 1 depicts the images of the twenty prosthetic limbs that were given to participants in Section 3 of the questionnaire to rank the level of attractiveness based on the design they had. The results showed that Expressive Prostheses (EP) presented the highest mean value of attractiveness ($MA_{EP}=4.45$), whilst Functional Prostheses (FP) the lowest ($MA_{FP}=3.06$). The level of attractiveness towards prostheses of the people who answered they knew a person close to them with limb-loss, showed that FP had been ranked as the least attractive. On the other hand, the ranking order of attractiveness of the participant who said they did not know any person with limb-loss was different; EP had been ranked as the most attractive ($MA=6.44$) and the one of Realistic Prostheses (RP) as the least attractive ($MA=3.33$).

The emotions that were elicited in participants towards the prosthetic limb users, with respect to their prosthetic limb, were separated into pleasant, neutral, unpleasant and unspecified (see Table 2). In the category 'Unspecified' were emotions that could be considered as both pleasant or unpleasant (e.g. surprise), or descriptions that could not be considered as emotions (e.g. the limb looks robotic, the limb is not apparent). As Table 2 shows, the prosthetic limbs with MA close to two ($FP_3$) appeared to evoke mainly unpleasant emotions, whilst the one with MA more than 4 ($RP_3$, $EP_{2,6,7,8}$) evoked pleasant emotions. Prosthetic limbs with a MA around 3.5 ($FP_{2,7}$, $EP_3$) presented almost the same number of pleasant and unpleasant emotions.

The prosthetic limb that is depicted in image $RP_3$ was chosen as the one that creates the most pleasant emotions, by seven participants; second was the limb in image $EP_8$ (5 participants) and third the one in the image $EP_3$ (3 participants). None of the participants chose an image from the prostheses that belonged to FP. The analysis of the reasons these emotions were elicited showed that the seven participants chose $RP_3$ because, as they said, it looks 'normal' and the user does not seem 'disabled'. On the other hand, the prosthetic limbs from EP created the most pleasant emotions in the participants, because they were considered stylish, fashionable and attractive. This evoked admiration from participants and created the impression that the user felt confident with his/ her appearance and situation. As one of the participants answered about the prosthetic limb in image $EP_2$, "The prosthesis is stylish without trying to conceal it and the posture shows confidence and therefore she deserves respect". Regarding the prosthetic limbs that created the most negative emotions, nine participants chose the prosthesis in image $FP_3$; second were chosen the limbs in images $FP_2$ and $FP_7$ (four participants equally). None of the participants chose the limbs in images $EP_6$, $EP_7$, and $EP_8$ as the ones that created the most negative emotions. The analysis of the reasons that the negative emotions were elicited in participants was more relevant to the shape of the limb, which looked artificial and external to wearer's body. Additionally, some participants mentioned that the design of the limbs that belonged to FP were more robotic and medical and therefore, more connected to 'disability'.

*Table 1 The Mean Attractiveness (MA) of prostheses and the type they belonged*

| Realistic Prostheses (RP) $MA_{RP} = 4.13$ | Functional Prostheses (FP) $MA_{FP} = 3.06$ | Expressive Prostheses (EP) $MA_{EP} = 4.45$ |
|---|---|---|
|  RP$_1$ $MA_{RP1}=4.30$ |  FP$_1$ $MA_{FP1}=4.17$ |  EP$_1$ $MA_{EP1}=4.17$ |
|  RP$_2$ $MA_{RP2}=3.48$ |  FP$_2$ $MA_{FP2}=2.87$ |  EP$_2$ $MA_{EP2}=4.52$ |
|  RP$_3$ $MA_{RP3}=4.30$ |  FP$_3$ $MA_{FP3}=2.39$ |  EP$_3$ $MA_{EP3}=3.57$ |
|  RP$_4$ $MA_{RP4}=3.70$ |  FP$_4$ $MA_{FP4}=2.04$ |  EP$_4$ $MA_{EP4}=5.04$ |
| |  FP$_5$ $MA_{FP5}=3.00$ |  EP$_5$ $MA_{EP5}=4.61$ |
| |  FP$_6$ $MA_{FP6}=2.35$ |  EP$_6$ $MA_{EP6}=4.26$ |
| |  FP$_7$ $MA_{FP7}=3.61$ |  EP$_7$ $MA_{EP7}=4.57$ |
| |  FP$_8$ $MA_{FP8}=2.35$ |  EP$_8$ $MA_{EP8}=4.91$ |

*Table 2 Emotions that were elicited with respect to the design of prostheses. The numbers represent the frequency with which the emotions were referred to by participants.*

| Images of prostheses | Mean Attractiveness (MA) | Pleasant emotions | Neutral emotions | Unpleasant emotions | Unspecified emotions |
|---|---|---|---|---|---|
| $RP_3$ | 4.30 | 9 | 13 | 1 | 0 |
| $FP_2$ | 2.87 | 8 | 4 | 9 | 2 |
| $FP_3$ | 2.39 | 3 | 4 | 12 | 4 |
| $FP_7$ | 3.61 | 8 | 6 | 8 | 1 |
| $EP_2$ | 4.52 | 9 | 3 | 5 | 6 |
| $EP_3$ | 3.57 | 10 | 2 | 9 | 2 |
| $EP_6$ | 4.26 | 18 | 2 | 1 | 2 |
| $EP_7$ | 4.57 | 16 | 2 | 2 | 3 |
| $EP_8$ | 4.91 | 13 | 2 | 4 | 4 |

In order to identify the most frequent emotions that were elicited in participants, with respect to the level of emotional-driven design of prostheses, a word frequency analysis was conducted by using NVivo Pro 11 software. Participants' answers, regarding the emotions that were elicited to them, were exported in a word document. Emotions which were considered the same, such as 'sad' and 'sadness', 'happy' and 'happiness', were grouped together. Additionally, emotions that could not be classified, neither as pleasant nor as unpleasant (e.g. 'surprise'), were excluded from the analysis. From the analysis were also excluded words that did not describe emotions, but pleasant or unpleasant nature of emotions, such as 'cool', 'good', 'weird', and 'awkward'. The findings of the analysis are presented in Figure 2. As it can be noticed by Figure 2, 'sadness' (N=19) and 'admiration' (N=15) were the most frequently used emotions, followed by 'serenity' (N=7), 'amazement' (N=6) and 'joy' (N=6).
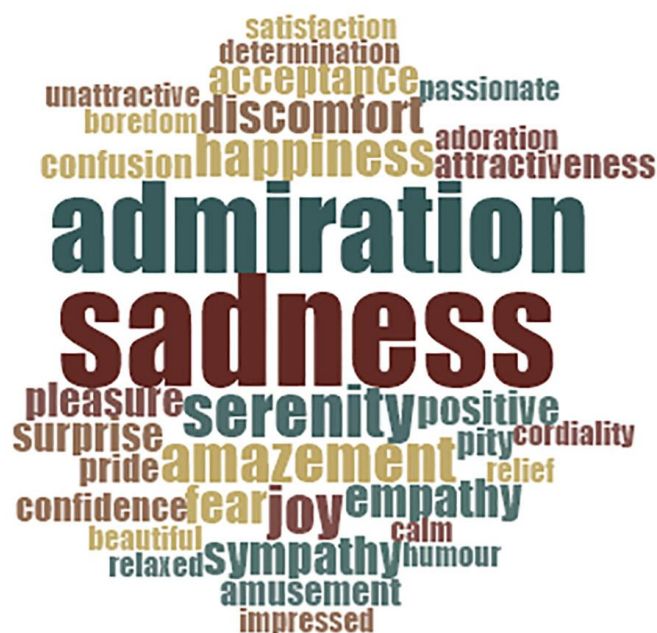


*Figure 2 Results of the emotions that were elicited based on the word frequency analysis*

## 4   Discussion

This study was a pilot which aimed to test the feasibility of investigating the effects of prostheses on non-prosthetic limb users. Although, the sample size was small and the findings could not be considered as representative, they gave valuable insights regarding the objectives of the study.

The results of the pilot study regarding people's attitudes towards people with limb-loss, or other disability problems, were in accordance with literature and showed that participants' attitudes were negative; participants answered that they mainly felt compassion, sadness and pity towards people with disabilities and the problems they confronted in their daily lives, and in some cases, people also felt respect regarding the efforts of people with disabilities. The fact that participants' attitudes remained the same after the completion of the study suggested that participants' attitudes were not affected by the images they saw and the design of the prosthetic limbs (Objective 2). Consequently, it was considered that this part of the questionnaire (Sections 2 & 5) would not be included in the full-questionnaire (Objective 1).

Although statistical analysis could not be conducted, because of the small sample size, the findings suggested that the level of emotionally-driven design of prostheses affected people's attraction towards prostheses. EP which is considered to have the highest level of emotionally-driven design presented the most pleasant emotions (Objective 3). The researcher assumed that the fact that RP (low level of emotionally-driven prostheses) presented high mean attractiveness (MA) was not related to the level of aesthetic appeal they had, but to the fact that these prostheses looked realistic and its design imitated natural human limbs. Therefore, since their design was familiar to people, they could analyse and comprehend it more easily. These findings were also in accordance with the findings of the study that Sansoni et al. (2015) conducted and showed that non-prosthetic limb users were more attracted by prostheses with a high level of human-likeness.

Previous studies in the area of emotional design suggested that people cannot easily express their emotions. The results of the pilot study partly agreed with them; although participants expressed emotions, they mentioned they had difficulties with comprehending and writing the emotions that were elicited in them, with respect to the design of prostheses (Objective 4). Additionally, in many cases, participants did not write emotions but words that described the nature of emotions, which was also in accordance with Desmet (2012) and Yoon et al. (2016). Due to these difficulties, it was decided that in the full-questionnaire, a list of various emotions will be given to people, based on the one that the participants of the pilot study wrote, together with an open-ended question, where participants could write further emotions that may not be included to the given options (Objective 1). However, it is important to mention that the difficulties participants had with expressing and writing their emotions could also be a result of the fact that they were asked to write the emotions in English, although most of them were not native English speakers. Additionally, although the emotions of empathy and sympathy were considered pleasant in the literature (Desmet, 2012), in this study, they were considered as unpleasant, since participants who reported them, also reported sadness. Furthermore, since participants could not clearly explain the reasons why the pleasant or unpleasant emotions were evoked, it was considered that Part 2 of Section 4 of the questionnaire did not give valuable and useful insights and as a result, it was decided to be excluded from the main questionnaire (Objective 1). These changes could

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also reduce the time of completion of the questionnaire and increase the number of participants as they made the questionnaire shorter and its completion easier.

Finally, the analysis of the study showed that a relationship between the level of attractiveness towards prosthetic limbs and the emotions that were caused could exist; the more attractive the design of the prostheses, the more positive the emotions were evoked (Objective 5). However, as the number of participants was very small, a statistical analysis could not be achieved to test the significance of this relationship, and further research is necessary with a larger sample size.

## 4.1 Limitations of the study

One of the main limitations of the study was the fact that participants had to evaluate the design of prosthetic limbs through images and not through physical products. This may have affected the level of attractiveness as emotions that are elicited by important senses (e.g. touch, smell) could not be evoked through the images. Another important limitation was the fact that the background of the images, which depicted people wearing prosthetic limbs, as well as the clothes of the people and other elements that were illustrated (e.g. users' body postures), could also affect the emotions that were created in people. However, as in real life people's emotions and attitudes towards prosthetic limb users can be formed and be affected by similar factors, this limitation was considered acceptable for the purpose of the study. Finally, although the participation in the study and the completion of the questionnaire was anonymous, it could have affected participants' answers regarding their attitudes towards people with limb-loss and the emotions that were elicited in them.

## 5 Conclusions

As it was pointed out in the introduction, products, through their design, create meanings which can change the values, beliefs and concerns not only of their users, but also of the people who are around them. Although the sample of the study was small and the results cannot be considered as representative, they showed that prosthetic limbs could create various emotions in non-prosthetic limb users. Additionally, the level of emotional-driven design that prostheses had appeared to affect the level of people's attractiveness. Furthermore, the findings indicated that a relationship may exist between the level of attractiveness and the emotions that were elicited in people; the higher the level of attractiveness, the more pleasant the emotions were. These findings were considered valuable since they implied that an opportunity may exist to alter the negative perceptions of people towards people with disabilities into positive, through the emotionally-driven design of prostheses.

As all the objectives have been met, the aim of the pilot study was achieved. Not only did the pilot study test the feasibility of investigating the effects of prostheses on non-prosthetic limb users, but it also highlighted the importance of conducting a full study and gathering data from a large sample size which will give useful insights on the area of prostheses.

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