

# Embodied Typology of Positive Emotions

## The Development of a Tool to Facilitate Emotional Granularity in Design

JungKyoon Yoon\*, Pieter M. A. Desmet, and Anna E. Pohlmeier

*Department of Industrial Design, Delft University of Technology, Delft, The Netherlands, j.yoon@tudelft.nl*

**Abstract:** This paper introduces a tool that has been developed to facilitate emotional granularity in design: ‘Embodied Typology of Positive Emotions’. Emotional granularity reflects individual differences in the ability to precisely represent and interpret one’s own and others’ emotional states, referring to distinct emotion words rather than merely to a general feeling of pleasantness. It can be advantageous for designers to have high emotional granularity. In design, the awareness of and ability to label nuances in emotions may facilitate to recognise users’ complex emotional responses with accuracy, and to specify design intentions in terms of emotional impact more clearly. The tool supports an understanding of 25 positive emotions by providing definitions of emotion labels, eliciting conditions, and visuals of expressive behavioural manifestations. This paper describes the tool, its development process, as well as ideas for applications in design. Implications of the tool and future research steps are discussed.

**Key words:** *Emotional Granularity, Positive Emotions, Design Tool*

### 1. Introduction

Using a product can elicit all kinds of emotions such as joy, pride, frustration, hope, disappointment and sympathy [7]. Some people are more aware of the differences between these emotions than others. This is called emotional granularity [23]. Emotional granularity reflects individual differences in the ability to precisely represent and interpret one’s own and others’ emotional states, referring to distinct emotion words rather than merely to a general feeling of pleasantness [23, 35]. A person with high emotional granularity can articulate an emotional experience with discrete emotion words (such as confidence, satisfaction, amusement, pride, relief, etc.) to explicitly represent the distinctiveness. On the other hand, an individual with low emotional granularity tends to report a distinct emotional experience in a blurred way using a global term such as good, pleasant or happy [35]. Positive psychology literature suggests that there are various benefits of having a developed emotional granularity: high emotional granularity enables people to be more flexible, effective, and resilient than those with low emotional granularity [35]. In various studies (e.g. [2, 35]) it was found that individual differences in the tendency to precisely label emotional experiences are associated with emotion regulations and coping abilities. In stressful situations, those with high emotional granularity are likely to engage in thorough consideration of information and think of an array of behavioural options. Furthermore, emotional granularity is known to be associated with empathy: the ability to recognise emotions from others with precision is better among those higher in empathy [25]. In design, empathy has been a defining characteristic of designer-user relationship that facilitates the understanding of a user from his / her perspective and knowing what it feels like to be that person [37]. Regarding the beneficial effects of emotional granularity, it can be advantageous for designers to have developed emotional granularity. We see at least two advantages for designers to have high emotional granularity: (1) it helps

them in the initial design stages to empathize with the complex emotional responses of users, and (2) it helps them formulate nuanced design goals in terms of intended emotional impact of their designs. Despite the value of emotional granularity, to date little attention has been paid in design research to this topic and its practical implications. Since little is known about how emotional granularity can be facilitated, this research focused on developing a design tool that can facilitate emotional granularity.

Contrary to negative emotions, positive emotions are somewhat undifferentiated. For example, joy, amusement and serenity are not easily distinguished from one another in terms of facial expressions as they all result in a smile [13]. Similarly, action-tendency, another component of emotional experiences [14, 32], is less differentiated for positive than for negative emotions. In contrast, we can readily identify the differences between negative emotions such as anger, sadness, or fear by observing behavioural manifestations. This implies that it comes less natural for people to have positive than to have negative emotional granularity. For designers however, it is especially relevant to have high positive emotional granularity because their intentions are usually to evoke positive emotional experiences. Hence, we decided to develop a tool that can help designers in developing their positive emotional granularity.

This paper firstly reports the process of developing the design tool ‘Embodied Typology of Positive Emotions’. Next, a workshop is reported that was carried out to explore how the tool can be applied in a design process. Based on these ideas, applications of the tool in the design processes are proposed. The implications and limitations of the tool are discussed and future research steps are proposed in the general discussion section.

## 2. Development of Embodied Typology of Positive Emotions

Several basic emotion-sets have been suggested (e.g. [9, 14, 20]) that include one to five of the following positive emotions: joy, love, interest, anticipation, and pleasant surprise. The disadvantage of these sets is that they are oversimplified to represent the variety of human emotions, thus they are not useful to facilitate emotional granularity. Desmet [7] found that there are at least 25 positive emotions that can be experienced in response to products, and formulated a typology of positive emotions (see Figure 1). We decided to use this typology as a basis since it is concise, but fine-grained enough to illustrate distinctiveness of various emotional experiences.

Empathy	Affection	Aspiration	Enjoyment	
Sympathy, Kindness, Respect	Love, Admiration, Worship	Dreamy, Lust, Desire	Euphoria, Joy, Amusement	
Optimism	Animation	Assurance	Interest	Gratification
Courage, Hope, Anticipation	Surprise, Energetic	Pride, Confidence	Inspiration, Enchantment, Fascination	Relief, Relaxation, Satisfaction

Figure 1. Typology of 25 positive emotions categorised in nine emotional types (adapted from Desmet [7])

Although the typology provides an overview of various positive emotions, solely providing a list of emotion words and definitions seems not to be enough to help designers to capture fine nuances between emotions. It is therefore worthwhile to explore different components of emotions such as eliciting conditions, expressions, and behavioural manifestations. As all emotions are different in terms of these components [32], we assume that understanding the distinctiveness of the 25 positive emotions regarding these different components would potentially contribute to facilitating emotional granularity. As Wallbott’s study [36] showed, behavioural

manifestations are indicative of a specific emotional state. In line with this idea, we believe that providing visuals of behavioural manifestations with the typology can make it more comprehensive. It can be also useful to know when and how a distinct emotion arises to better identify nuances between positive emotions. Therefore, we aimed to integrate the typology with a set of rich representations for each of the 25 emotions, providing multiple sources of information in terms of conditions that elicit the emotions and images of people having these emotions in real contexts. We collected images that clearly characterise the behavioural manifestations the 25 positive emotions, formulated the eliciting conditions, and arranged them according to the typology.

## 2.1. Defining Eliciting Conditions of 25 Discrete Positive Emotions

All emotions have unique ‘core relational themes’ that represent the conditions that elicit them [22]. Core relational themes of the 25 positive emotions were formulated to describe the eliciting conditions on the basis of 25 sources within the appraisal theory based literature (see Appendix 1). However, only few references address the emotions kindness, worship, dreaminess, euphoria, courage, energetic, and enchantment. For those emotions, core relational themes were formulated based on the examples of eliciting conditions in human-product interactions, collected in Desmet’s study [7]. Table 1 shows the core relational themes of the positive emotions.

Table 1. Core relational themes of the positive emotions

Emotion type	Emotion	Core relational themes
Empathy	Sympathy	One recognises that someone is suffering a distress and is motivated to be helpful.
	Kindness	One finds relatedness with someone and is motivated to be conducive to his/her goal achievement.
	Respect	A praiseworthy character of someone conforms to internal or external standard.
Affection	Love	An appealing character of someone provides a likelihood of mutual affection or something facilitates associations with a loved one.
	Admiration	Someone’s praiseworthy behaviour surpass internal or external standard.
	Dreaminess	Something facilitates a stepping outside of the current experience and leads to associations with an experience (either in the past or future).
Aspiration	Lust	Someone’s sexual appeal corresponds to one’s appetite or facilitates associations with an erotic interaction.
	Desire	Something potentially beneficial for personal concerns is expected to be reachable.
	Worship	An appealing character of someone surpasses one’s internal or external standard or when something facilitates associations with an idolised one.
Enjoyment	Euphoria	Something extraordinary that enables to surpass one’s boundaries happens.
	Joy	Something that facilitates goal accomplishment happens or provides sensory pleasure.
	Amusement	One is awakened to the realisation of a relational meaning of something absurd in a clever and witty way.
Optimism	Hope	One finds a prospect of accomplishing his/her wishes.
	Anticipation	One notices that there is a high chance that a desired event will actually take place.
	Courage	It is certain that my behaviour will ensure a removal of an obstacle and improve chance of goal accomplishment.
Animation	Surprise	Something unexpectedly happens beyond one’s expectation.
	Energetic	Something pleasant facilitates the enthusiasm and determination to do something.
Assurance	Pride	One’s praiseworthy behaviour surpasses internal or external standard, and/or one recognises that others appreciate it.
	Confidence	It is certain that one is capable of overcoming a challenge in the process of realising his/her goal.
Interest	Inspiration	One is awakened to the realisation of a relational meaning of something and is enabled to do something creative.
	Enchantment	An appealing and/or mysterious character of something facilitates physical or mental isolation in a pleasant way.
	Fascination	Something unexpected and mysterious happens offering a clue to understanding.
Gratification	Relief	It is certain that an undesirable situation has gone away or changed into better situation.
	Relaxation	It arises in a pleasant situation, when it is certain that an undesirable event will not occur in any way.
	Satisfaction	An expected desirable event has been realised conforming to or surpassing internal or

		external standard.
--	--	--------------------

## 2.2 Visuals of Behavioural Manifestations of the 25 Positive Emotions

This section describes the process of collecting and validating the visuals of behavioural manifestations of emotions in three steps: (1) collecting and selecting visuals of the positive emotions, (2) validating the image-sets, and (3) improving and re-validating the invalid image-sets.

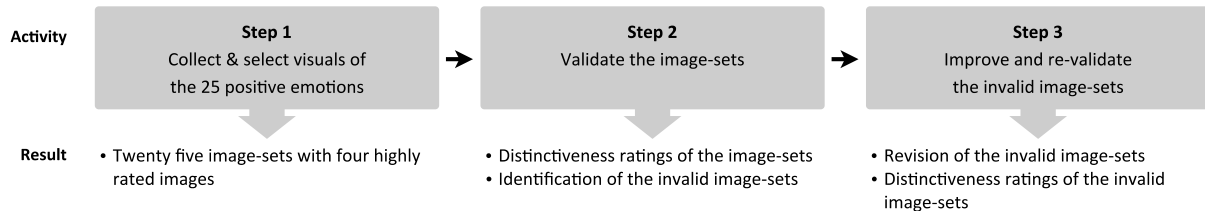


Figure 2. The procedure of collecting and validating the visuals of behavioural manifestations of emotions

### 2.2.1 Collecting and Selecting Visuals of Behavioural Manifestation of the 25 Positive Emotions

For each emotion, descriptive pictures were collected based on the discriminating features such as emotion words and thought-action tendencies by using online imagery databases (e.g. Gettyimages.com). Thought-action tendencies are states of readiness to carry out a certain action or thought, involving both bodily arousal and cognitive preparation following emotion appraisals. Different emotions correspond to different sets of action and thought tendencies [14]. To search the images that characterise fascination, for example, the following search queries were used: (1) emotion word: fascination; (2) synonyms: engaged, concentration, engrossed, involved, attention, curious; (3) thought-action tendency: focus, immerse, captivation, absorbed, investigative, probing. For each emotion, 20 images were collected (in total 500 images) and evaluated to sort out the clearest representations. The collected pictures usually illustrated both behavioural manifestations of people and the contexts that affect the causes of emotions (e.g. being proud of winning a game). Although the pictures embodied visual information of contexts and behavioural manifestations, there was ambiguity of interpretations. In order to minimize ambiguity, we decided to use four pictures to explicitly represent each emotion. We assumed that by presenting various pictures together, people could catch what specific emotion the pictures characterise because the pictures could share common qualities of the behavioural manifestations of the intended emotion. The number of pictures was based on practicality: each emotion should be represented with various images, but it should be manageable to interpret at once.

Before evaluating the collected pictures, the amount of pictures was reduced from 20 to 10 pictures by five design researchers because 20 pictures for each emotion was considered to be an overload for proper evaluation. The design researchers were Ph.D. candidates who have experience in product design and emotional design research at the faculty of Industrial Design Engineering of Delft University of Technology. The task was to select ten pictures that best represent each of the 25 positive emotions by using an online-survey. For each emotion, the emotion word, its definition, and 20 images were presented. The procedure was conducted individually and the order of emotions and presented pictures were randomised. Ten images that received high ratings within each emotion were chosen for further evaluation. In order to make sure that the mix of images was diverse and accurate, two criteria for selecting the pictures were applied: (1) pictures in the set should be clear representations of the specific emotion and (2) pictures in the set should be diverse. According to these criteria, similar pictures and ambiguous pictures were filtered out. Also, an attempt was made to remove pictures that describe culture-

dependent behaviours. The selected 10 pictures per positive emotion were further evaluated with 19 respondents (female  $n=9$ ) by using an online-survey. The age ranged between 22 and 33 (mean=24.37, SD=2.95). The recruited participants were master students of the 'Design & Emotion' course at Delft University of Technology. They received course credit for their participation. The procedure was the same with the one used in the pre-selection stage. The respondents were guided to select 5 (out of 10) pictures that best visualise the given emotion. After data collection, four highly rated pictures were determined for each emotion. Besides the ratings, the diversity criterion also influenced the selection. If there were two similar pictures for a specific emotion, the picture that received the lower score was not included in the set, and instead the picture that was the next in the rank of the survey result was selected.

### 2.2.2 Validating the Collected Pictures

A validation study with 19 participants (11 female) was carried out to evaluate if the chosen pictures could effectively characterise the target emotions, and whether they were distinct from other similar positive emotions. The age of the participants ranged between 18 and 36 years (mean=24.2, SD=4.37). All participants were master students or Ph.D. candidates at the faculty of Industrial Design Engineering of Delft University of Technology and were paid five euros for their participation. The session took 30 minutes. Image-sets that represent the 25 different positive emotions were printed. Each image-set consisted of the chosen four pictures. Twenty-five positive emotion words were presented on a table clustered to nine groups that were drawn from the typology of positive emotions [7], see Figure 1. The procedure was conducted individually. The task was to place the 25 image-sets under the emotion group where they might best fit in. Definitions of the positive emotion words were provided to ensure a consistent understanding of the given emotions. Participants were allowed to write other emotion words if they thought that an image-set did not match any of the nine groups. The order of the image-sets was randomised for each session. After finishing the categorisation, a questionnaire was filled in. With a five-point scale, each image-set was evaluated to what extent it represented a certain emotion within the group to which it was placed. This was done to evaluate if an image-set can be recognised as a clear representation of a specific emotion, not other neighbouring emotions in the same group. The session ended with an interview in which the participants openly explained the way they categorised the image-sets.

#### Results

The collected data were analysed in two steps: (1) the proportion of how well the image-sets were categorised was checked. (2) Next, the rating scale of each image-set with the intended emotion was compared with the ratings of other emotions in the same group. The graph in Figure 3 indicates the proportion of the selected groups for each image-set. Proportion of correct categorisation was above 50% in most cases except for the image-sets representing admiration (31.6%), energetic (36.8%), worship (42.1%), and inspiration (42.1%). These image-sets were considered invalid.

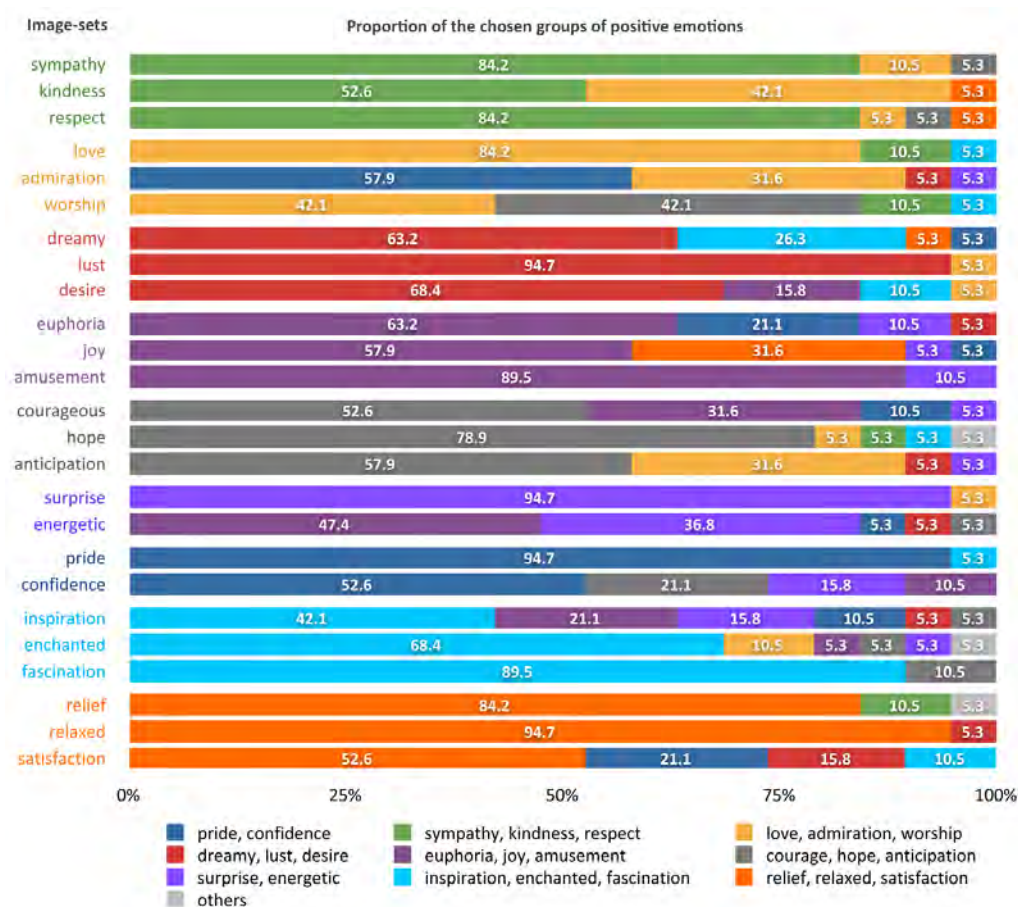


Figure 3. Proportion of categorisations of the image-sets to positive emotion groups

For the image-sets that were correctly categorised, the mean values of scale ratings were analysed to determine if they were also specific to the target emotions. In almost all cases, the image-sets well matched with the intended emotions indicating the highest ratings compared to other similar emotions in the same group, and were in all cases above the mid-point of the scale (3) (see Table 2). For example, courage was in the highest level for the image-set 'courage', which means that the image-set was recognised as a clear representation of courage over the other two emotions in the same group of optimism: hope and anticipation. For the image-set of amusement, the score of joy was slightly higher than that of amusement. Nonetheless, we decided to regard it as valid for two reasons: first, it was well recognised as a part of the group enjoyment (see Table 1) with high percentage (89.5%) in categorisation. Secondly, the score of amusement (4.18) was higher than midpoint.

Table 2. Mean values of scale ratings of the image-sets for the intended emotions

Image-set	N	Scale (Disagree: 1, Agree: 5)	Image-set	N	Scale (Disagree: 1, Agree: 5)
Sympathy	16	Sympathy: 4.88, Kindness: 3.81, Respect: 2.56	Courage	10	Courage: 5, Anticipation: 2.3, Hope: 2.2
Kindness	10	Kindness: 4.9, Sympathy: 3.3, Respect: 2.5	Hope	15	Hope: 4.6, Anticipation: 3.4, Courage: 1.93
Respect	16	Respect: 4.94, Kindness: 2.19, Sympathy: 2.13	Anticipation	11	Anticipation: 4.91, Hope: 4.09, Courage: 1.82
Love	16	Love: 4.94, Admiration: 2.5, Worship: 2.19	Surprise	18	Surprise: 5.00, Energetic: 2.33
Admiration	6	Admiration: 4.67, Worship: 3.83, Love: 1.67	Energetic	7	Energetic: 4.43, Surprise: 1.57
Worship	8	Worship: 4.63, Admiration: 4.13, Love: 1.67	Pride	18	Pride: 4.72, Confidence: 3.89



		Love: 2.13			
Dreaminess	12	Dreaminess: 5, Desire: 2.17, Lust: 1.25	Confidence	10	Confidence: 4.1, Pride: 3.6
Lust	18	Lust: 4.94, Desire: 4.17, Dreaminess: 1.83	Inspiration	8	Inspiration: 4.5, Enchantment: 3.38, Fascination: 2.13
Desire	13	Desire: 4.85, Lust: 3.08, Dreaminess: 2.31	Enchantment	13	Enchantment: 4.15, Fascination: 3.54, Inspiration: 1.92
Euphoria	12	Euphoria: 4.67, Joy: 3.75, Amusement: 2.83	Fascination	17	Fascination: 4.47, Inspiration: 2.94, Enchantment: 2.88
Joy	11	Joy: 4.36, Amusement: 3.64, Euphoria: 3.36	Relief	16	Relief: 4.56, Relaxed: 3.31, Satisfaction: 2.25
Amusement	17	Joy: 4.53, Amusement: 4.18, Euphoria: 3.06	Relaxation	18	Relaxed: 4.78, Satisfaction: 3.83, Relief: 2.28
			Satisfaction	10	Satisfaction: 4.7, relief: 2.9, relaxed: 3.3

### 2.2.3 Improving the Invalid Image-Sets

The image-sets of ‘admiration, worship, energetic, and inspiration’ were edited or altered to better represent the intended emotions by reflecting the participants’ comments. The modified image-sets were re-validated with regards to whether they specifically represent the intended emotions. The procedure was the same as in the previous validation study. Nineteen participants (female: 11) participated and the age was between 24 and 36 years (mean=28.53, SD=4.29). All participants were master students or Ph.D. candidates at the faculty of Industrial Design Engineering of Delft University of Technology, and were not paid. The task was to place the four image-sets under the groups where they might best fit in. Next, with a five-point scale, each image-set was evaluated to what extent it represented a certain emotion in the group in which it was placed.

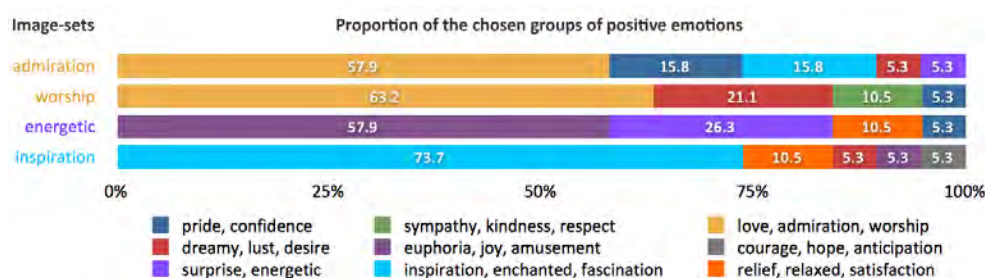


Figure 4. Proportion of categorisations of the revised image-sets to positive emotion groups

The results indicated that the proportions of correct categorisations were higher than the previous version in three image-sets: Admiration (57.9%, n=11), worship (63.2%, n=12), and Inspiration (73.7%, n=14). However, the image-set of ‘Energetic’ did not show an increase in correct categorisation to the group animation (surprise, energetic) (26.3%, n=5). This image-set therefore remains invalid. In the mean values of scale ratings, the image-sets of admiration, worship, and inspiration showed highest ratings for the intended emotions compared to similar emotions in the same group and were all above the mid-point (3) (see Table 3).

Table 3. Mean values of scale ratings of the improved image-sets for the intended emotions

Image-set	N	Scale (Disagree: 1, Agree: 5)	Image-set	N	Scale (Disagree: 1, Agree: 5)
Admiration	11	Admiration: 5.00, Worship: 4.09, Love: 2.45	Worship	12	Worship: 4.50, Admiration: 4.08, Love: 3.42
Inspiration	14	Inspiration: 4.57, Fascination: 3.79, Enchantment: 3.71	Energetic	5	Energetic: 5.00, Surprise: 2.20

### 3. Integration of the Developed Elements

The generated eliciting conditions, visuals and definitions of the emotion words were incorporated into a set of 25 cards in A6 paper size (see Figure 5). The card format was selected since it is effective to be communicated to designers as well as effective to share and arrange the contents with others. A card format has been used in many design tools such as Collective Action Toolkit from Frog and Learner Centred Toolkit from BBC. Drawn from Desmet’s typology [7], the card-set was labelled according to the nine emotion categories to make it easy to browse and sort the cards.



Figure 5. Three examples of the Embodied Typology of Positive Emotions

#### 4. Applications of the Developed Tool in a Design Process

As a pilot study, a workshop with five master-degree designers who have a minimum of three years work experience was conducted to explore (1) the relevance of emotional granularity in design and (2) how the tool can be applied in a design process. In the beginning of the session, the tool was introduced to the participants providing a brief explanation about its purpose and the concept of emotional granularity. Participants were asked to briefly introduce their general design processes, roles, and approaches to fulfilling their responsibilities. First, they discussed if it could be useful to develop emotional granularity as designers. Next, they were guided to discuss how the tool could support them by specifically describing when it could be beneficial and what advantageous effects it might have in a design process. The structure of the discussions was left open, and the interviewer (the first author) took notes during the two-hour session.

## Results

Participants reported that it could be advantageous to develop emotional granularity as designers, mentioning that it might facilitate designer-user bonding since designers could empathise with their users by better understanding their emotions. Also they found that this ability could be helpful to approach design problems with a set of different perspectives as emotional granularity may stimulate them to take into account users' varied emotional responses and the related product aspects. Overall, they agreed that in light of the benefits of emotional granularity, it would be desirable to have a tool or a technique that can support designers to have high emotional granularity. With respect to the developed tool, they appreciated the way information is presented. They found it effective to combine verbal and visual descriptions of an emotion.



The reported ideas of the tool applications were categorised according to the similarity of their applications to specific stages within a human-centred design process, i.e. ISO 9241-210 [19]. Participants suggested that the tool could be used as a source of inspiration in every stage of a design process in general. The ideas were mainly about using the tool to gain insights early on about project stakeholders' or users' concerns and to inform or evaluate the design of new products. Figure 6 illustrates the suggested applications of the tool per design phase.

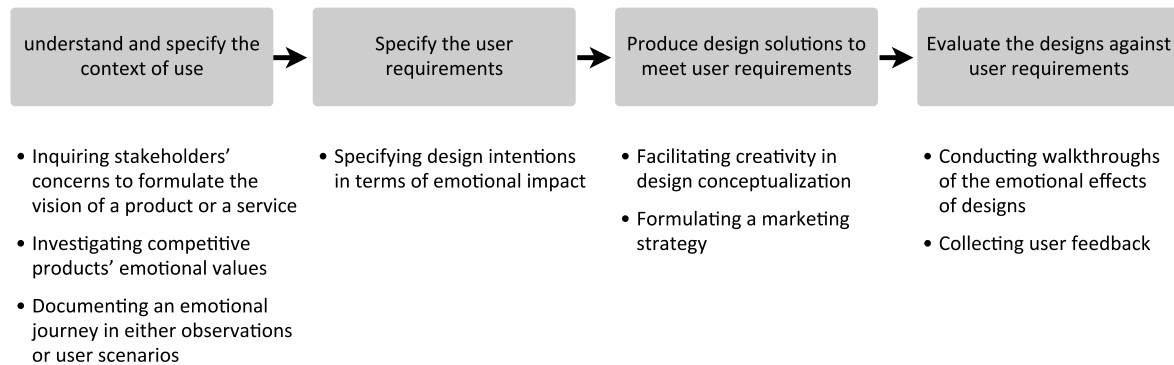


Figure 6. Suggested applications of 'Embodied Typology of Positive Emotions' in a human-centred design process

The main ideas of the applications gathered during the workshop are as follows. Almost all participants reported that the tool can be used as a reference that assists the stakeholders such as a client or product development teams to explicitly communicate the desired emotional experiences that a new product is expected to, or should, evoke (inquiring stakeholders' concerns to formulate the vision / specifying design intentions in terms of emotional impact). Some participants mentioned that the tool can be used as a means to describe a user's emotional states in various stages of product use: a flow of user emotions can be mapped with the cards as a visual representation of changes in emotions (mapping emotional journey in scenarios / observations). One participant pointed out that using the tool could facilitate designers to constantly consider users' emotions so that they could keep their users in the centre of the focus during a design process. Most participants mentioned that the tool might facilitate divergent thinking in design conceptualisation. Designers might use the tool to explore various design directions. By selecting some cards that represent differentiated positive emotions and trying to evoke them referring to the eliciting conditions described in the tool, designers could generate different concepts since each positive emotion would guide to a different design direction (creativity facilitation). Additionally, it was mentioned that the positive emotions addressed in the design process also could be employed in formulating a marketing strategy. Finally, participants said that the tool can support users to articulate their emotions in response to a product in the evaluation process: users could pick cards that represent their emotions that they experienced while using a product, and explicitly report what specific product attributes triggered each emotion. In sum, participants found that applications of the tool could assist designers in every stage of a design process offering a variety of advantages.

## 5. Conclusion and General Discussion

In this paper, we have reported the development of a tool, 'Embodied Typology of Positive Emotions', for facilitating positive emotional granularity, and pointed out first ideas for potential applications in a design process. The validation study demonstrated that each image-set could distinctively characterise the intended emotion. In a

workshop conducted to explore the application possibilities of the tool, participants confirmed that for designers it is desirable to have high emotional granularity, and reported that the tool could be used as a means to effectively probe and discuss their design activities with project stakeholders.

However, the findings also indicated that some issues need to be resolved to enhance the validity of the tool. The pictures that represent 'energetic' were often perceived as characterising the emotion group 'euphoria, joy, amusement'. For the image-set, the participants gave the highest rate for joy (joy: 4.25, amusement: 3.56, euphoria 3.33), which implies that there was an overlap with the pictures that express different positive emotions. This imprecise differentiation could be explained with the high similarity between the two groups. Desmet's study [7] showed that similarity between these two groups ('energetic, surprise' versus 'euphoria, joy, amusement') was the highest among the nine positive emotion groups (see Figure 1). This means that in a broad perspective, the image-set of 'energetic' may fit in a superordinate category that covers both groups. Note that the low validity of this image-set is not very problematic in the context of the design tool because, rather than being used in isolation, the set is used in combination with the appropriate emotion word and a definition of the emotion. There is a need to investigate if the descriptions of the eliciting conditions differ enough to indicate distinctiveness of each of the positive emotions.

During the discussion on the tool applications, participants made some suggestions to enhance the tool. One participant mentioned that it might be useful to provide examples of anecdotes or quotes that illustrate when and how a user experiences a certain emotion in relation to a product. Another suggestion was to make the card-set classifiable according to thought-action tendencies. It was often addressed that sorting the cards out based on thought-action tendencies might be supportive in certain design activities such as specifying design intentions (e.g. design for acceptance, a thought-action tendency of respect). These suggestions imply that the tool should not only be developed to effectively facilitate positive emotional granularity, but also be developed to be suitable for certain design activities. Within the collected ideas of the tool application, there were some activities in which designers use the tool together with other stakeholders such as a client and a project manager (see Figure 6). Although participating designers addressed the tool could be useful in cross-functional communications with other stakeholders, it is uncertain whether other stakeholders would see the value of having positive emotional granularity in the same manner and be open to use the tool. As stated in Goffi and Micheli [17], other stakeholders often do not have sufficient understanding of benefits of design-driven approach and feel uncomfortable to adopt it in product development process themselves. Therefore, it is required to involve other stakeholders in further identifying the opportunities to work with positive emotional granularity and in improving the tool.

At present, we are in the process of validating actual effects of using the tool based on the gathered ideas of application possibilities. We will refine the current tool and continue to develop new design tools and techniques for training emotional granularity and exploring detailed application possibilities, incorporating the collected suggestions.

## 6. Acknowledgements

This research was supported by MAGW VIDI grant number 452-10-011 of The Netherlands Organisation for Scientific Research (N.W.O.) awarded to P. M. A. Desmet.

## 7. References

- [1] Arieti, S. (1976) *Creativity: The magic synthesis*, Basic Books, New York.
- [2] Aspinwall, L. G., & Taylor, S. E. (1997) *A stitch in time: self-regulation and proactive coping*, Psychological Bulletin, 121(3), 417.
- [3] Demir, E., Desmet, P. M. A., & Hekkert, P. (2009) *Appraisal Patterns of Emotions in Human-Product Interaction*, International Journal of Design, 3.
- [4] Desmet, P. M. A. (2002) *Designing emotions*, Doctoral dissertation, Delft University of Technology, Delft, the Netherlands.
- [5] Desmet, P. M. A. (2003) *A Multilayered Model of Product Emotions*, The Design Journal, 6(2), 4-13.
- [6] Desmet, P. M. A. (2008) *Inspire & Desire*, In P. M. A. Desmet, J. v. Erp & M. Karlsson (Eds.), *Design & Emotion Moves* (pp. 108-124), Cambridge Scholars Publishing.
- [7] Desmet, P. M. A. (2012) *Faces of product pleasure: 25 positive emotions in human-product interactions*, International Journal of Design, 6(2), 1-29.
- [8] Dickert, S., Sagara, N., & Slovic, P. (2011) *Affective motivations to help others: A two-stage model of donation decisions*, Journal of Behavioral Decision Making, 24(4), 361-376.
- [9] Ekman, P. (2003) *Sixteen enjoyable emotions*, Emotion Researcher, 18(2), 6-7.
- [10] Ellsworth, P. C., & Scherer, K. R. (2003) *Appraisal Processes in Emotion*, In R. J. Davidson, H. Goldsmith & K. R. Scherer (Eds.), *Handbook of the Affective Sciences* (pp. 572-595). New York, Oxford: Oxford University Press.
- [11] Ellsworth, P. C., & Smith, C. A. (1988) *Shades of Joy: Patterns of Appraisal Differentiating Pleasant Emotions*, Cognition & Emotion, 2(4), 301-331.
- [12] Fredrickson, B. L. (1998) *What Good Are Positive Emotions?* Review of General Psychology, 2(3), 300-319.
- [13] Fredrickson, B. L. (2003) *The Value of Positive Emotions-The emerging science of positive psychology is coming to understand why it's good to feel good*, American Scientist, 91, 330-335.
- [14] Frijda, N. H. (2007) *The Laws of Emotion*, Lawrence Erlbaum Associates, Publishers, London.
- [15] Frijda, N. H., Kuipers, P., & Ter Schure, E. (1989) *Relations among emotion, appraisal, and emotional action readiness*, Journal of personality and social psychology, 57(2), 212.
- [16] Goetz, T., Frenzel, A. C., Stoeger, H., & Hall, N. C. (2010) *Antecedents of everyday positive emotions: An experience sampling analysis*, Motivation and Emotion, 34(1), 49-62.
- [17] Goffin, K., & Micheli, P. (2010) *Maximizing the value of Industrial Design in New Product Development*, Research-Technology Management, 53(5), 29-37.
- [18] Herrald, M. M., & Tomaka, J. (2002) *Patterns of emotion-specific appraisal, coping, and cardiovascular reactivity during an ongoing emotional episode*, Journal of personality and social psychology, 83(2), 434.
- [19] ISO. (2010). *9241-210- Ergonomics of human-system interaction - part 210: Human-centred design for interactive systems*, International Organization for Standardization, Geneva, Switzerland.
- [20] Izard, C. E. (1977) *Human emotions*, Plenum, New York.
- [21] Kaplan, S. (1992) *Environmental preference in a knowledge-seeking, knowledge-using organism*, In J. H. Barkow, L. Cosmides & J. Tooby (Eds.), *The adapted mind: Evolutionary psychology and the generation of culture* (pp. 581-598). Oxford University Press, New York.
- [22] Lazarus, R. S. (1991) *Emotion and Adaptation*, Oxford University Press, Oxford.

- [23] Lindquist, K. A., & Barrett, L. F. (2008) *Emotional complexity*, Handbook of emotions, 513-530.
- [24] Ludden, G. D. S., Schifferstein, H. N. J., & Hekkert, P. (2008) *Surprise As a Design Strategy*, Design Issues, 42(2), 28-38.
- [25] Mayer, J. D., & Salovey, P. (1993) *The intelligence of emotional intelligence*, Intelligence, 17(4), 433-442.
- [26] Ortony, A., Clore, G. L., & Collins, A. (1988) *The Cognitive Structure of Emotions*, Cambridge University press, Cambridge.
- [27] Roseman, I. J. (1996) *Appraisal determinants of emotions: Constructing a more accurate and comprehensive theory*, Cognition & Emotion, 10(3), 241-278.
- [28] Roseman, I. J. (2001) *A model of appraisal in the emotion system: Integrating theory, research, and applications*, In k. R. Scherer, A. Schorr & T. Johnstone (Eds.), Appraisal processes in emotion: theory, methods, research (pp. 68-91). Oxford University Press, New York.
- [29] Roseman, I. J., & Evdokas, A. (2004) *Appraisals cause experienced emotions: Experimental evidence*, Cognition and Emotion, 18(1), 1-28.
- [30] Ruch, W. (1993) *Exhilaration and humor*, Handbook of emotions, 1, 605-616.
- [30] Scherer, K. R. (2001) *Appraisals Considered as a Process of Multilevel Sequential Checking*, Oxford University Press, New York.
- [32] Scherer, K. R. (2005) *What are emotions? And how can they be measured?* Social Science Information, 44(4), 693-727.
- [33] Silvia, P. J. (2008) *Interest - The Curious Emotion. Current Directions in Psychological Science*, 17, 57-60.
- [34] Tan, E. S. H. (2000) *Emotion, Art, and the Humanities*, In Lewis & J. M. Haviland-Jones (Eds.), Handbook of Emotions (pp. 116-134). The Guilford Press, New York.
- [35] Tugade, M. M., Fredrickson, B. L., & Feldman Barrett, L. (2004) *Psychological resilience and positive emotional granularity: Examining the benefits of positive emotions on coping and health*, Journal of personality, 72(6), 1161-1190.
- [36] Wallbott, H. G. (1998) *Bodily expression of emotion*. European journal of social psychology, 28(6), 879-896.
- [37] Wright, P., & McCarthy, J. (2008) *Empathy and experience in HCI*. Paper presented at the Proceedings of the twenty-sixth annual SIGCHI conference on Human factors in computing systems.

## Appendix 1.Appraisal Literature Reviewed for Formulating Eliciting Conditions

Emotion Type	Appraisal literature reviewed
Empathy	<b>Sympathy:</b> Dickert, Sagara [8], Lazarus [22] / <b>Kindness:</b> Desmet [7] / <b>Respect:</b> Desmet [7]
Affection	<b>Love:</b> Ellsworth and Smith [11] / <b>Admiration:</b> Desmet [4], Ortony, Clore [26] / <b>Dreaminess:</b> Desmet [7]
Aspiration	<b>Lust:</b> Frijda [14] / <b>Desire:</b> Desmet [4], Desmet [6], Frijda [14] / <b>Worship:</b> Lazarus [22]
Enjoyment	<b>Euphoria:</b> Desmet [7] / <b>Joy:</b> Demir, Desmet [3], Ellsworth and Scherer [10], Frijda, Kuipers [15], Roseman [27], Roseman [28], Roseman and Evdokas [29], Scherer [30], Scherer [32] / <b>Amusement:</b> Desmet [4], Ruch [30]
Optimism	<b>Hope:</b> Lazarus [22], Roseman [28], Roseman and Evdokas [29] / <b>Anticipation:</b> Lazarus [22], Ortony, Clore [26] / <b>Courage:</b> Desmet [7]
Animation	<b>Surprise:</b> Desmet [5], Ellsworth and Smith [11], Frijda [14], Ludden, Schifferstein [24], Roseman [27] / <b>Energetic:</b> Desmet [7]
Assurance	<b>Pride:</b> Goetz, Frenzel [16], Herrald and Tomaka [18], Lazarus [22], Ortony, Clore [26], Roseman [28] / <b>Confidence:</b> Ellsworth and Smith [11]
Interest	<b>Inspiration:</b> Desmet [6], Arieti [1] / <b>Enchantment:</b> Desmet [7] / <b>Fascination:</b> Desmet [5], Ellsworth and Smith [11], Kaplan [21], Silvia [33], Tan [34]
Gratification	<b>Relief:</b> Frijda [14], Lazarus [22], Ortony, Clore [26], Roseman [28] / <b>Relaxation:</b> Ellsworth and Smith [11], Fredrickson [12] / <b>Satisfaction:</b> Demir, Desmet [3], Goetz, Frenzel [16], Ortony, Clore [27], Scherer [32]