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### **Geneva Emotion Wheel Rating Study**

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Emotions are an integral part of interactions with other people (e.g., colleagues) and objects (e.g. consumer goods). The assessment of emotional reactions is therefore important when striving to understand how to improve such interactions, e.g., when designing positive consumer experiences.

Emotions can be defined as multi-componential, including subjective feeling, appraisals, reactions in the service of action preparation and expressions, action tendencies (including expressions), and regulation (compare Scherer, 2005; Frijda, 2007). A central component of emotions, the “feeling component,” is inherently subjective and can only be assessed with self-report measures, such as the Geneva Emotion Wheel (GEW; Scherer, 2005).

The GEW (Figures 1 and 2) consists of discrete emotion terms corresponding to emotion families that are systematically aligned in a circle. Underlying the alignment of the emotion terms are the two dimensions valence (negative to positive) and control (low to high), separating the emotions in four quadrants: Negative/low control, negative/high control, positive/low control, and positive/high control. Note that the control dimension is also called control/power (Scherer, Shuman, Fontaine, & Soriano, in preparation), but we here refer to it simply as control for better readability. The response options are “spikes” in the wheel that correspond to different levels of intensity for each emotion family from low intensity (towards the center of wheel) to high intensity (toward the circumference of the wheel). Also, in the very center of the wheel, the response options “no emotion” and “other emotion” is offered. A detailed justification of the GEW design, in particular with regard to the choice of the underlying dimensions, is discussed in Scherer (2005) and Scherer et al. (in preparation).

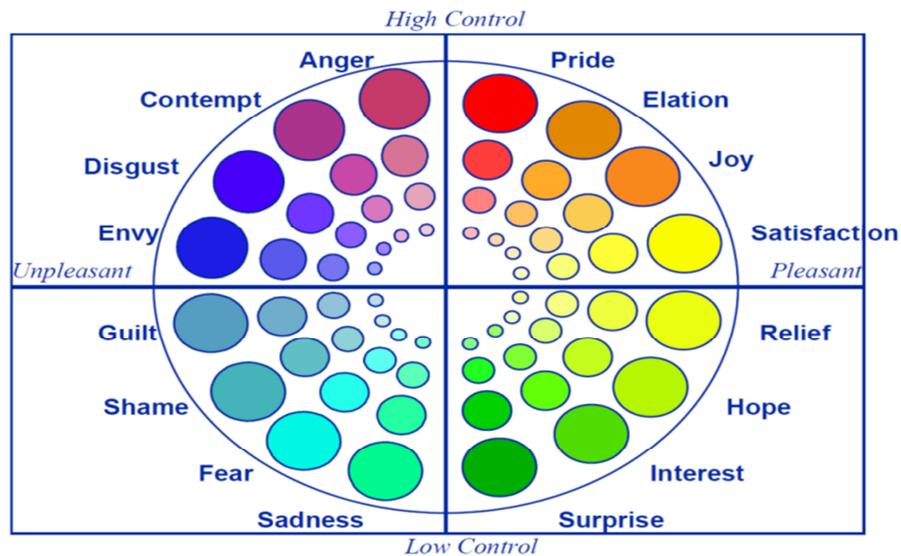


Figure 1. Prototype version (Version 1.0) of the GEW with 16 emotion terms. Bänziger et al. (2005); Tran (2004); Scherer (2005)

The design of the GEW has elements of a free response format, a discrete emotion response format, and a dimensional approach to emotions. The free response format is reflected in the response option “other emotion” and gives respondents much freedom to express themselves. Note that a pure free response format can be disadvantageous because there may be huge variation in how and how well respondents express themselves in their own words (e.g., Gohm & Clore, 2000), and the resulting variability in measurements across individuals and situations may reduce measurement reliability. Also, the results of this procedure are difficult to interpret because responses first need to be sorted before conclusions can be drawn. In the GEW, these problems are ameliorated because “other emotion” is just one response option besides particular discrete emotions.

The discrete emotion response format is reflected in the emotion terms on the circumference of the GEW. As with other discrete emotion response formats, respondents indicate their feelings with regard to a limited number of discrete emotions (e.g., anger, happiness) on a scale corresponding to the intensity of the feelings. This format is easy to use because discrete emotion terms correspond to the natural way of talking about emotions. Also, the results can readily be interpreted. Unlike other discrete emotion measures (e.g., the Differential Emotion Scale; Izard, 1991; Product Emotion Measuring Instrument, PrEmo, Desmet, Hekkert, & Jacobs, 2000), the emotions in the GEW are visually aligned based on underlying dimensions.

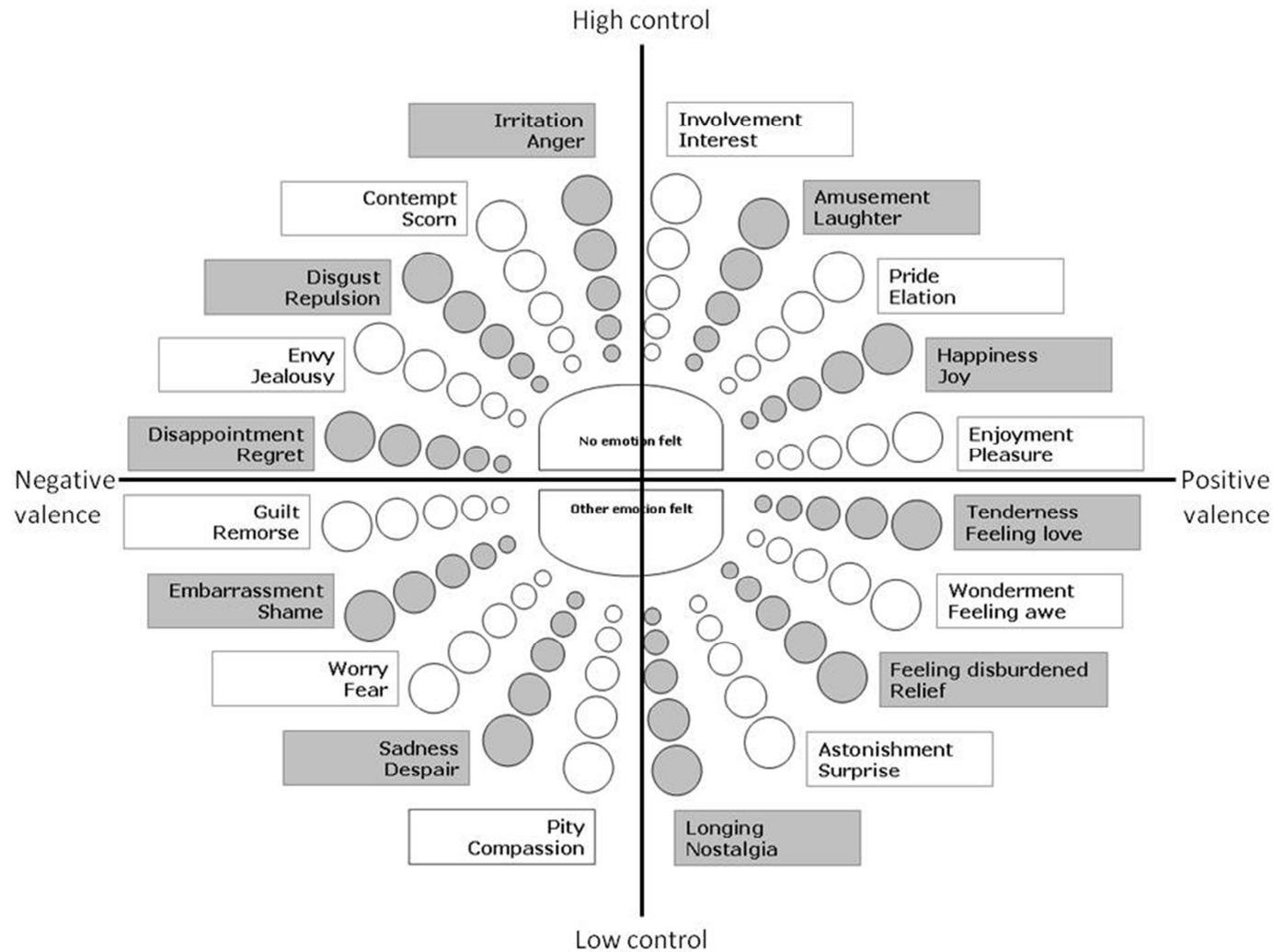


Figure 2. Version 2.0 of the GEW with 40 emotion terms arranged in 20 emotion families (distributed until March 2012 via the website <http://www.affective-sciences.org/researchmaterial>). The valence and control dimension, not visible when using the GEW as a measurement instrument, are indicated by black lines.

A dimensional approach is reflected in the valence and control dimensions that underlie the arrangement of the terms on the circumference. Generally, in a dimensional response format, respondents may indicate their feelings on abstract dimensions that are thought to constitute the basic structure of emotions (valence, arousal, dominance; e.g., Self Assessment Manikin Test, Bradley & Lang, 1994). On the one hand, this format is convenient for respondents because answers to only two or three dimensions, rather than multiple discrete emotion terms, are indicated. On the other hand, this format may be difficult for respondents because the dimensions are rather abstract and do not correspond to the way one naturally talks about emotions. The results are readily available for analysis, but this format provides the least fine grained results compared to the other methods. The combination of a discrete with a dimensional approach in the GEW is advantageous, because the discrete emotion terms correspond to the natural language and increase measurement specificity, while the underlying dimensional structure helps to locate the emotions in the instrument, increasing usability.

The GEW has previously been used in a variety of contexts, ranging from managers' affect during decision making (Tran, 2004) to the evaluation of body movements (Beck, Stevens, & Bard, 2009) and consumer experiences (Caicedo & van Beuzekom, 2006). See Table 1 for examples of applications. These studies already attest to the usability of the GEW; other studies examined the usability of the GEW even more directly. These studies show that the GEW is a particularly useful measurement instrument under time pressure and with repeated measurements (Tran, 2004). Furthermore, respondents overall prefer the GEW over alternative measures such as the PrEmo (Desmet et al., 2000) and judge the GEW as clear to understand, useful to differentiate between emotions, and appealing in its visual design (Caicedo & van Beuzekom, 2006). These studies encourage the further development of the GEW.

Table 1. Examples of applications of the GEW.

<b>Author(s)</b>	<b>Application</b>	<b>GEW</b>
Bardzell, Bardzell, & Pace, 2008	Consumer reactions to internet videos	?
Beck, Stevens, & Bard, 2009	Affective evaluation of body movements	2.0
Caicedo & van Beuzekom, 2006, 2008	Consumer reactions to products	2.0
Douglas-Cowie et al., 2007	Selection of emotion words	1.0
Longhi, Pereira, Bercht, & Behar, 2009	Emotions while learning in virtual environments	1.0
Tran, 2004	Emotions at the individual and team level and decision making	1.0
Tschan et al., 2010	Emotions in interactions with superiors	1.0
Pammi & Schröder, 2009	Affective meaning of listener vocalizations	2.0
Piolat & Bannour, 2009	Selection of emotion words	2.0
Santos, 2008	Emotions in virtual environments with different illumination	2.0
Wittgenstein, 2008	Emotional climate and readiness for change in a hospital	1.0

An outstanding issue in the development of the GEW is the empirical validation of the alignment of emotion terms in the negative/positive valence and low/high control quadrant resulting from the intersection of the underlying dimensions based on theoretical considerations. In a first prototype version, the number of emotion terms was 16 (Figure 1). After several empirical studies examining the structure of the prototype (Bänziger, Tran, & Scherer, 2005), a second prototype was developed that is the object of the current study. In the second prototype version, 40 terms are arranged in pairs of emotion terms to emphasize that each response option corresponds to an emotion family (e.g., the “irritation, anger” family, Figure 2). Also, some emotions are placed differently than in the first prototype after initial studies (e.g., “interest” moved from a low to a high control quadrant). The current study examines the alignment of the emotion terms in prototype version 2.0.

### **Objective of the current study**

The aim of the current study was to empirically justify the theoretically derived placement of 40 emotion labels in the GEW prototype version 2.0. The GEW predicts that 10 emotion pairs are placed in the negative valence – low control quadrant, the positive valence – low control quadrant, the negative valence – high control quadrant, and the positive valence – high control quadrant, respectively (Figure 2). To verify this placement, appraisals of valence and control were assessed for the GEW emotion terms. Note that in addition to the valence and control ratings of the 40 words from the GEW, participants rated other words and rated all words on further scales (arousal and impact). These additional measures are described in the measures section, but the results are not reported because they are not of primary interest in this report.

### **Participants**

Participants were recruited to participate in an online study via psychology website services (e.g., <http://psych.hanover.edu/research/exponnet.html>). Respondents who were native English speakers and who provided responses to at least 50% of the questions were included in the sample for analysis (exclusion of 100 respondents), resulting in a sample size of 40 with a mean age of 28 years (range 17 – 58 years). Gender information was available from 31 women and 7 men.

### **Procedure**

Participants were invited to a study about the meaning of emotion terms in the English language. After providing demographic information and responding to questions about their motivation for participating in the survey, they were randomly assigned to one of three response conditions that differed in which emotion terms were rated. Not all terms were rated by all participants to avoid participant fatigue. Before the ratings, a description of the appraisals was provided. The study lasted about 20 minutes.

## Measures

### Emotion terms

Across all conditions, participants rated the 12 emotion terms anger, contempt, disgust, elation, guilt, happiness, interest, pride, relief, sadness, shame, and surprise. For the remainder of the 28 terms from the GEW, the conditions differed as indicated in Table 2. Table 2 also lists the additional 31 emotion words that were rated.

Table 2

*Terms rated by n subjects in each response condition*

Condition 1, n = 12	Condition 2, n = 14	Condition 3, n = 14
*ANGER, *CONTEMPT, *DISGUST, *ELATION, *GUILT, *HAPPINESS, *INTEREST, *PRIDE, *RELIEF, *SADNESS, *SHAME, *SURPRISE		
ACTIVE	AFFECTION	AFRAID
ALERTNESS	*AMUSEMENT	ANNOYANCE
ANXIETY	AROUSAL	*ASTONISHMENT
AT EASE	*AWE	BEING HURT
BLUE	BOREDOM	CALMNESS
CHEERFULNESS	*COMPASSION	CONFIDENCE
CONTENTMENT	DELIGHT	DEPRESSED
*DESPAIR	DETERMINATION	*DISAPPOINTMENT
*DISBURDENED	DISTRESS	*EMBARASSMENT
*ENJOYMENT	ENTHUSIASM	*ENVY
EXCITEMENT	FATIGUE	*FEAR
GLADNESS	HATE	HAVING FUN
HOPE	HOSTILITY	*INVOLVEMENT
*IRRITATION	*JEALOUSY	*JOY
*LAUGHTER	LIVELINESS	LOATHING
LONELINESS	*LONGING	*LOVE
NERVOUSNESS	*NOSTALGIA	*PITY
*PLEASURE	*REGRET	RELAXATION
*REMORSE	*REPULSION	SCARED
*SCORN	SELF SATISFACTION	SERENTIY
SHYNESS	SLEEPINESS	SLUGGISHNESS
STARTLED	STRESS	*TENDERNESS
TENSENESS	TIREDNESS	UPSET
*WONDER	*WORRY	

*Note.* \*GEW emotion term.

## Ratings

Definitions of valence and control were provided before the rating task. The characterization of the valence dimension differs slightly in previous research. Valence can refer to (un)pleasantness and goal conduciveness (obstructiveness) (e.g., Frijda, Kuipers, & ter Schure, 1989). In previous GEW research, valence has been characterized as (un)pleasant (Tran, 2004) and as “positive” and “negative” (Bänziger et al., 2005). In Scherer (2005), the dimension orthogonal to control is described as goal conduciveness (obstructiveness) and valence lies between goal conduciveness and control. In this study, we characterized valence broadly as pleasantness and goal conduciveness (see also Scherer et al., in preparation).

The rating task and dimensions were described as follows:

“This is a study about the meaning of emotion terms in the English language. Specifically, we examine under which conditions certain words are used to describe emotions elicited by an event or a situation. In this survey, there are four major dimensions to characterize the respective events.

1. Valence or agreeableness
2. Coping potential or influence/control
3. Arousal or excitation
4. Impact

Here are definitions of the dimensions:

### 1. Valence or agreeableness of the situation

High: The situation is experienced as pleasant and enjoyable and/or is likely to have positive and desired consequences for the person.

Low: The situation is experienced as unpleasant and disagreeable and/or is likely to have negative and undesired consequences for the person.

### 2. Influence/control over the situation

High: The person believes that he/she can influence the situation to maintain or improve it (if desired).

Low: The person believes that he/she cannot influence the situation to maintain or improve it (if desired).

### 3. Physiological arousal or excitation

High: The person is excited/aroused with many bodily reactions (e.g., increase in heart beat or breathing rate).

Low: The person is placid/calm and shows no signs of physiological excitation or arousal.

#### 4. Impact

High: The situation has a strong impact on the person, changing thoughts and behaviors now and possibly in the future.

Low: The situation has little impact on the person and his/her thoughts and behaviors now and in the future."

The ratings were provided on scales ranging from -5 (very little) to 5 (very much) for the following questions:

**"Valence:** How positive is this situation?"

**"Influence/Control:** To what extent can you influence the situation (if desired)?"

**"Arousal:** How active/aroused are you in this situation?"

**"Impact:** How strong is the impact of the situation on you, your thoughts, and behaviors?"

### Results

To test if the 40 GEW emotion terms would fall in the predicted quadrant of negative/positive valence and high/low control, one sample t-tests were conducted at a Bonferroni corrected alpha level of .001 for valence and control ratings against 0 (see Figure 3 for a scatter plot).

For the valence ratings, 19 out of 20 predicted negative emotions were rated as significantly more negative than 0, all  $ps \leq .001$ . "Compassion," however, was rated as significantly more positive than 0,  $p < .001$ . 15 out of 20 predicted positive emotions were rated as significantly more positive than 0,  $ps < .001$ . "Nostalgia," "longing," "feeling disburdened," "astonishment," and "involvement" did not differ from 0, though "involvement" showed the predicted trend,  $p = .002$ .

For control ratings, 8 out of 20 predicted high control emotions were rated as high in control, all  $ps < .001$ . These were all positive emotions. "Amusement" and "laughter" did not differ from 0. Contrary to predictions, there was a trend for "disgust" to be rated as low in control,  $p = .002$ . Only 1 emotion out of 20 predicted low control emotions was rated as low in control, namely "sadness,"  $p < .001$ . There were trends for "surprise" to be rated as low in control,  $p = .003$ , and for "tenderness" to be rated as high in control,  $p = .003$ .

After computing the mean valence and control ratings for each word across raters, valence and control were positively associated as reflected in a positive correlation of valence and control ratings,  $r(40) = .718$ ,  $p < .001$ . After computing the standard deviation of valence and control ratings for each word across raters, a paired sample t-test showed that control ratings varied more than valence ratings (2.89, 1.51),  $t(39) = 11.68$ ,  $p < .001$ .



## Conclusion

The second GEW prototype displays discrete emotion terms representing emotion families in a circular structure with the underlying dimensions valence and control. Contrary to an orthogonal design of the valence and control dimension in the GEW, in the current study valence and control were highly correlated. To some extent, this may have been due to the definition of valence as (un)pleasant *and* goal conducive (obstructive). These two appraisals are traditionally perceived as valenced (e.g., Frijda, Kuipers, & ter Schure, 1989). However, in Scherer (2005), valence (positive – negative) and goal conduciveness (obstructiveness) are construed as two dimensions at a 45° angle, and valence is actually between goal conduciveness and control. Thus, one might conclude that the valence definition used in the current study led to the association with control, and that this association could have been avoided by defining valence more narrowly as goal conduciveness only. However, as will be described further below, it is more plausible that there have been issues with the measurement of the control dimension rather than the valence dimension.

Despite the potential problems with the valence definition, the alignment of the emotion terms on the valence dimension was overall very good. To improve the representation in the GEW, “compassion,” which is rated as a positive emotion, should be moved from the negative to the positive side of the GEW.

In contrast to the findings for the valence dimension, the alignment of emotion terms on the control dimension was much more problematic. The empirical data reflected the predictions from the GEW only for the cluster of positive high control emotions. No positive low control or negative high control emotion and only one negative low control emotion (“sadness”) was found.

Inspection of means and variance suggest that, to some extent, these results reflect a response bias in the use of the control dimension by some participants (e.g., judging low control for all negative emotions) but not others (e.g., judging low or high control for negative emotions), resulting in a large variance of control ratings across all participants. Using a larger sample size would ameliorate this problem.

However, it may be necessary to use an altogether different method than ratings of appraisals to assess the theoretically predicted alignment particularly of negative high control and positive low control emotions. This is indicated by our finding of a strong association of valence with control ratings. Indeed, it has recently been suggested that control appraisals are valenced (Shuman, Sander, & Scherer, submitted; Scherer, 2010). High power is associated with positive affect and low power with negative affect (e.g., Keltner, Gruenfeld, & Anderson, 2003). Thus, even with a larger sample size, one might at best identify more negative low control emotions

in addition to our finding of “sadness” in this cluster, and in addition to the positive high control emotions that were already identified in this study. In other words, it is not possible to confirm the prediction of positive low control and negative high control emotions by asking about appraisals when control appraisals are themselves valenced.

To empirically grasp the notion that negative and positive emotional experiences do come about with more or less control other methods may be needed that measure not only the appraisals associated with emotions but additional components of the emotional experience, such as action tendencies. In a forthcoming chapter (see Scherer et al., in preparation), the further development of the GEW based on ratings across emotion components (and even in different language groups) is described. The current version of the GEW will shortly be available at the website of the Swiss Center for Affective Sciences ([www.affective-sciences.org](http://www.affective-sciences.org)) as a .doc file.

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