

## Positive and Negative Emotions Related to a Circumplex Value Structure

William Montgomery  
University of Gothenburg, Göteborg

Henry Montgomery  
Stockholm University

Tommy Gärling  
University of Gothenburg, Göteborg

### Abstract

It has been suggested that some values are contrastive with opposites which also can be seen as values. These values form a circumplex structure. Other values are non-contrastive lacking opposite values. The hypothesis is tested that contrastive values activate both specific negative and positive emotions with a strength consistent with the proposed circumplex value structure. This hypothesis was confirmed in Study 1 by ratings of how values relate to different emotions obtained from 120 undergraduates. Ratings of emotions elicited by the values were obtained and submitted to multidimensional scaling yielding a circumplex structure similar to the structure of contrastive values. The results of Study 2 with 79 undergraduates as participants confirmed that non-contrastive values lead to more positive and less negative emotions than contrastive values. The emotions connected to the contrastive values differed in strength depending on the salience of the values.

Keywords: Values, emotions, circumplex structure

In the last 20 years the research by Schwartz (e.g. 1992) has had an immense impact on the understanding of human values. Schwartz hypothesized that human values can be divided into 10 value types which form a quasi-circumplex structure. The value types include *power*, *achievement*, *hedonism*, *stimulation*, *self-direction*, *universalism*, *benevolence*, *conformity*, *tradition*, and *security*. For instance, Schwartz and Bardi (2001) found support for the hypothesized value types and structure in a study including approximately 14,000 teachers from 56 countries and approximately 19,000 students from 54 countries. Multidimensional scaling (MDS) revealed the hypothesized quasi-circumplex structure. The structure was not strictly circumplex however, since tradition and conformity were overlapping each other. Schwartz and Bardi (2001) also excluded 11 values. The reason was that they differed in meaning across cultures.

Inspired by Schwartz' value theory, Montgomery, H. Montgomery and Gärling (2011) presented a model of value structures where they distinguished between contrastive values and non-contrastive values. The contrastive values were found to be more consistent with a pure circumplex structure than found in comparable studies testing Schwartz' value structure. The present study addresses how values are associated to emotions. The departure point is our circumplex value structure of contrastive values. A contrastive value has an opposite value. The eight contrastive values presented in Table 1 are proposed. The selection of contrastive values was largely based on Schwartz' (1992) values but with clearer pairs of opposites. Empirical support was obtained by collecting five measures of value salience for each value in an experiment with 144 participants (Montgomery et al., 2011). The measures were access, importance, evaluation, ability, and engagement. The contrastive values formed a circumplex structure as revealed by MDS of the means of the five salience measures obtained for each value. As Figure 1 shows, the structure can be described in terms of a number of overlapping

bipolar dimensions, person focus – social focus, comfort – challenge, independence – dependence, and self preservation – self transcendence.

A non-contrastive value does not have an opposite value. The non-contrastive values that were considered by Montgomery et al (2011) are displayed in Table 2. In a second experiment 143 participants were informed that a person had a high access to a specific value. Thereafter, participants were asked to rate how much access they believed that the person had to the other values. Both the contrastive and non-contrastive values were presented. MDS of these ratings revealed a circumplex structure of the contrastive values, similar to the one in Figure 1. The non-contrastive values were located in the middle of this structure except for the value deeper understanding of the world. This indicates that the non-contrastive values are related to all contrastive values.

Emotions are conscious states of feelings. They can be experienced alone but also be mixed with other emotions. They typically arise and dissipate slowly and depend on cognitive appraisals (Scherer, 1999). They are distinguished from core affects (Baumeister, 2007). Only a few studies have examined associations between values and emotions. Nelissen, Dijker, and de Vries (2007) investigated the relationship between Schwartz' (2001) value structure and basic emotions. The participants were asked to indicate the importance of Schwartz's (2001) values and how much they felt the basic emotions. Several correlations were found between values and emotions. Idson, Liberman, and Higgins (2000) examined how regulatory focus affected emotions. Different scenarios were presented which described success or failure of prevention or promotion focus asking participants how positively or negatively they felt. The results showed that the participants felt more positive when they succeeded with promotion focus than if they succeeded with prevention focus, but felt more negative if they failed with prevention focus than if they failed with promotion focus. However, a systematic way of uncovering negative and positive emotions connected to the access of specific values does not seem to have been reported.

In appraisal theories of emotions (e.g., Frijda, 1988; Lazarus, 1991; Oatley & Johnson-Laird, 1987; see Scherer, 1999, for an overview), the appraisal of a particular situation or event is related to one's personal goals or concerns. A connection is conceivable since values are regarded as motivational constructs that specify abstract goals guiding people's actions across different contexts and time (Rokeach, 1973; Schwartz, 1992). The elicitation of a particular emotional state signals opportunities or obstacles to the attainment of an emotion-specific goal. Appraisal-oriented research has mainly focused on mapping the specific cognitive dimensions of appraisal that differentiate the elicitation of distinct emotions (e.g., Smith & Ellsworth, 1985), instead of investigating appraisals at a "molar" level (cf. Smith & Lazarus, 1993) that is better suited to identifying associations between emotions and values.

*Table 1. Proposed Contrastive Values and Their Associated Emotions*

Value	Description	Positive emotion	Negative emotion	Schwartz
Management by your own	To manage things without help.	Feel independent	Feel lonely	Self direction
Own will	To get through your own will.	Feel powerful	Feel worry for responsibility	Power. Achievement
Prioritize your self	To strive for what is good for me.	Feel self acceptance	Feel bad conscience	Hedonism
Security	To be into security.	Feel safe	Feel bored	Security
Get help	To be helped by others.	Feel cared of	Feel dependent	-
Adaptation	To adapt to others wishes.	Feel free from responsibility	Feel powerless	Tradition. Conformity
Prioritize others	To strive for what is good for others.	Good conscience	Feel self denial	Benevolence. Universalism
Courage	To dare to take risks.	Feel excited	Feel afraid	Stimulation

*A Model of the Connection Between Values and Emotions*

In this paper we develop and test a model of how values are connected to emotions. Appraisals, which are closely associated with emotions, have many similarities with values and, as already noted, they have also been found to be related to emotions. Therefore it is hypothesized that values can be associated with different emotions. The present model is based on the assumption that all contrastive values are associated with positive and negative emotions as shown in Table 1 and Figure 2. When the access to a value is increasing, it will result in a positive emotion associated with attaining the value, but since the opposite value is simultaneously decreasing, it will also result in a negative emotion associated with not fulfilling that value. For instance, access to security is associated with feeling safe but also with feeling bored, which is a negative emotion that may be associated with little access to the opposite value. Conversely, access to the opposite value of courage may be associated with a feeling of excitement but also with fear since one has less access to security. In addition, it is assumed that each positive or negative emotion will have its strongest association to a specific value and have gradually weaker relations to other values further away in the circumplex structure from the value where the relation is peaking.



Figure 1. The theoretical circumplex of contrastive values.

Table 2. Non-Contrastive Values

Value	Opposite	Schwartz' values
Deeper understanding about the world	Lower understanding about the world	Universalism, Self direction (curiosity)
Health	Unhealthy	Healthy
Achievement	Low achievement	Achievement, Self direction (creativity), Benevolence (helpful), Conformity (self discipline)
To be respected	To be disrespected	-
Happiness	Unhappiness	-
Meaningfulness	Meaninglessness	Meaning in life
Love	No love	Mature love, True friendship
Enjoyment	Disgust	Hedonism

Thus, the values are more associated with emotions connected to neighboring values in the structure than to emotions connected to opposite values.

We will now examine how a circumplex structure of values follows from how emotions are related to values. Assume that emotions can be treated as cases in a  $V \times E$  matrix, where  $E$  are emotions that are more or less positively or negatively related to different values  $V$ . A common score correlation matrix  $P_c$  can be estimated by correlating values in terms of how they score on different emotions. A circumplex structure will exist if

$$[P_c]_{ij} = \tilde{n}(\theta_d) = \beta_0 + \sum_{k=1}^m \beta_k \cos(k \theta_d) \quad (1)$$

where  $\theta_d = (\theta_j - \theta_i)$ , that is the difference in angular position (in radians) on the circumference of the variables (emotion scores for a given value in our case) (Browne, 1995; Grassi, Ricardo, & DiBlas, 2010). By fitting Eq. (1) to empirical data it is possible to test whether these are described by a circumplex structure. The parameter  $m$  is then typically set to 3. To make sense, the correlation function in Eq. (1) should fulfill a number of requirements. In the present context, two requirements are particularly important. First, when testing the validity of Eq. (1) on our data it will be assumed that that  $\tilde{n}(0) = 1$ . Second,  $\tilde{n}(\theta_d)$  should be monotonous and monotonic decreasing in the interval  $0^\circ < \theta_d < -180^\circ$  implying that the correlation coefficient  $p(c_i, c_j)$  decreases as the point representing  $c_j$  on the perimeter of the circle moves further away from the point representing  $c_i$ .

We will now consider how emotions are related to values that are opposite pairs, as is the case in our conceptualization of a circumplex structure. The contrastiveness implies that the more access a person has to one value,  $V_1$ , the less access he or she will have to a value,  $V_2$ , that is located at an opposite position on the value circle. More precisely, the total access to  $V_1$  and  $V_2$  will be constant, say 1. That is,

$$\text{Access}(V_1) + \text{Access}(V_2) = 1 \quad (2)$$

The two values  $V_1$  and  $V_2$  may vary in salience resulting in that the person will distribute attention differently between the values. We stipulate that  $V_1$  is assumed to be more in focus or equally focused compared to  $V_2$ , which is assumed to be more or less in the background, depending on how much the person is aware of  $V_2$ . Thus,

$$\text{Salience}(V_1) + \text{Salience}(V_2) = 1 \quad (3)$$

where the salience of the more or equally focused value  $V_1$  is assumed to be  $\geq 0.5$ . Thus the sum of salience is assumed to be constant, arbitrarily assumed to be = 1.

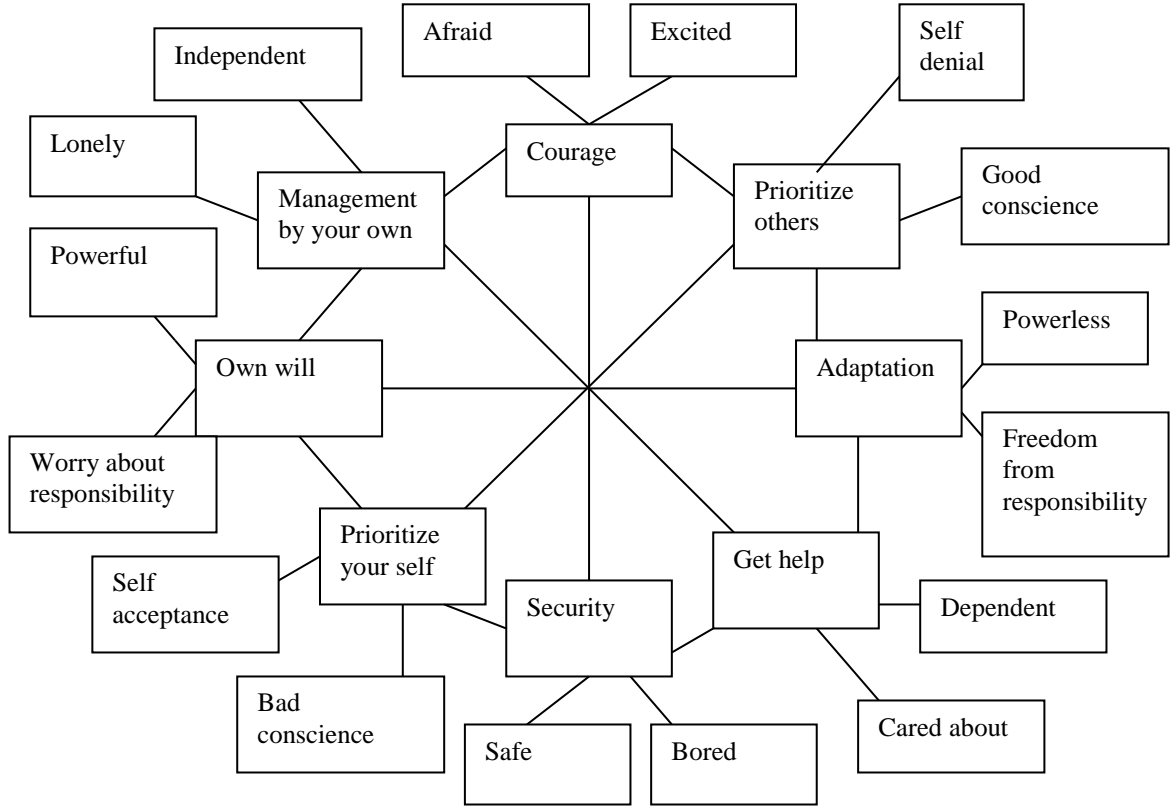


Figure 2. Contrastive values and their related emotions.

We now assume that the amount of positive emotion ( $E+$ ) associated with a value  $V$  is proportional to the access of this value multiplied with its salience plus the access to the opposite value multiplied with its salience. The access to  $V_2$  equals  $1 - \text{Access}(V_1)$  and the salience of  $V_2$  equals  $1 - \text{Salience}(V_1)$ . Then,

$$E+(V_1, V_2) = \text{Salience}(V_1) \times \text{Access}(V_1) + (1 - \text{Salience}(V_1)) \times (1 - \text{Access}(V_1)) \quad (4)$$

The amount of negative emotion associated with  $V_1$  is assumed to be associated with the access to the value that is *opposite* to  $V_1$  which we denote as  $V_2$  ( $1 - \text{Access}(V_1)$ ), multiplied with the salience of  $V_1$  plus the access of  $V_1$  multiplied with the salience of  $V_2$  ( $1 - \text{Salience}(V_1)$ ). Thus,

$$E-(V_1) = \text{Salience}(V_1) \times (1 - \text{Access}(V_1)) + (1 - \text{Salience}(V_1)) \times \text{Access}(V_1) \quad (5)$$

For example, if access to courage ( $V_1$ ) is 75%, and hence 25 % access to security ( $V_2$ ) and if the salience of courage is 1, then a person will experience a mixture of .25 feeling bored (negative emotion associated with security, which is opposite to courage) and .75 feeling excited (positive emotion associated with courage). The negative emotion associated with courage, fear, will not be felt because it results from a lack of security, which has no salience in this example. The positive emotion associated with security (feeling safe) will not be experienced either. But if the salience of courage is 0, the person will instead experience .75 fear because of the lack of security. The person will also experience .25 feeling safe because of .25 access to security. See Table 3 for more examples connected to security and courage.

Eqs. 4 and 5 are assumed to hold for means across all contrastive value pairs. For single value pairs, variations in how positive a value is experienced to be independently of salience and access (see Montgomery et al., 2008) is of importance for the strength of the associated emotions. However, this variation should be cancelled when the data are means across all contrastive pairs. If the relative salience is kept constant, E+ will be a positive linear function of Access( $V_1$ ) with the slope ( $2 * \text{Salience}(V_1) - 1$ ) and E- will be a negative linear function of Access( $V_1$ ) with the slope ( $1 - 2 * \text{Salience}(V_1)$ ) as long as Salience( $V_1$ ) is  $\geq .05$ , and with the additive constants being  $1 - \text{Salience}(V_1)$  and  $\text{Salience}(V_1)$ , respectively. Thus, the slope will come closer to zero the more evenly the relative salience of  $V_1$  and  $V_2$  is, with the slope being equal to zero in the limiting case when the Salience is evenly distributed (i. e.,  $\text{Salience}(V_1)$  and  $\text{Salience}(V_2) = .50$ ).

In summary, we postulate a dynamic interplay between positive and negative emotions associated with access to a contrastive value and its opposite as a function of the relative access and salience of the two values that determines the amount of positive and negative emotions that are actually experienced.

The positive and negative emotions connected to the non-contrastive values (when  $V_1$  lacks an opposite value) are assumed to differ. Here positive emotions are assumed to increase and negative emotions to decrease when access to the value increases. Salience of a non-contrastive value is not assumed to affect these emotions. Thus,

$$E+(V_1) = \text{Access}(V_1) \quad (6)$$

$$E-(V_1) = 1 - \text{Access}(V_1) \quad (7)$$

### Experiment 1

Experiment 1 examined if the proposed model implying a circular arrangement of eight contrastive values could be described in terms of how the emotions are related to the contrastive values. It is hypothesized that each of the eight contrastive values is associated with a positive and a negative emotion which is peaking at the value in question and then showing decreasing associations to other values as they come further away on the circumference of the value circle (Hypothesis 1). In line with this value-emotion structure, it is hypothesized that correlations between

Table 3. Predicted strength of activation of emotions depending on access and salience of the values courage and security

Access Security	Access Courage	Salience Security	Salience Courage	Feeling bored	Feeling safe	Feeling afraid	Feeling excited
0	1	0	1	0	0	0	1
.25	.75	0	1	.25	0	0	.75
.5	.5	0	1	.5	0	0	.5
0	1	.5	.5	0	0	.5	.5
.25	.75	.5	.5	.125	.125	.375	.375
.5	.5	.5	.5	.25	.25	.25	.25
0	1	1	0	0	0	1	0
.25	.75	1	0	0	.25	.75	0
.5	.5	1	0	0	.5	.5	0

contrastive values based on emotion scores for each value would be possible to describe in terms of series of cosine functions specified for a circumplex structure (Browne, 1995) (Hypothesis 2a) which assumes that the correlations function is monotonic decreasing in the interval  $0^\circ < \theta_d < -180^\circ$  where  $\theta_d$  is the angular difference between two values' positions on the assumed value circle (Hypothesis 2b). Finally, and also in line with the proposed value-emotion structure, it is hypothesized that MDS of the value correlations would yield a circumplex structure corresponding to the value circumplex structure (Hypothesis 2c).

### Method

*Participants.* One hundred and twenty psychology undergraduates at Stockholm University were recruited as participants. Twenty-six were male and 94 were female. Their mean age was 27.2 years and varied between 18 and 63 years. They were recruited through email and were compensated with either course credit or a lottery ticket worth the equivalent of approximately US\$ 4. For a control study testing whether the emotion words were perceived to be describing emotions, 21 undergraduates at University of Gothenburg were employed. These participants were compensated with a lottery ticket.

*Procedure.* To find emotion terms associated with each value, a number of pilot studies were performed. In each study emotions that were not associated as expected were replaced with new emotion terms. The main survey was made via Internet where a questionnaire was available. First, the participants were asked to report their age and gender. Then ratings were made for each value of a set of eight positive and eight negative emotion words (see Table 2) with respect to how much each of these emotions increased or decreased when the participants had access to the value. A scale was used ranging from -4 (maximal decrease) to 4 (maximal increase). A zero on the scale meant that access to the value did not change the emotions.

A control study was performed to investigate whether the words describing emotions are perceived as such. These words were contrasted to the words describing



the values. The eight contrastive values and 16 emotion words were presented in random orders to the participants who were asked to indicate the degree to which the words were perceived as describing positive or negative emotions. The participants used rating scales ranging from 1 (not at all) to 9 (to a very high extent).

### *Results and Discussion*

The three types of ratings that were obtained in the control study (i.e., ratings of positive emotions, ratings of negative emotions, and rating of how much the values were emotions) were subjected to one-way repeated-measures analyses of variance (ANOVAs). This was done to determine if there was a significant difference, in terms of how much the words were seen as emotions, between the values and the proposed emotions associated with them. *t*-tests were also performed on differences between the ratings of how much each value was an emotion related to the emotion words. It was found that all related emotion terms were seen more as emotions than their related values and the differences were significant for all comparisons except for adaptation and “feel free from responsibility”, and for “management by your own” and “feel independent”. As can be seen in Table 4, the ratings varied considerably across emotion words. The lowest mean score (3.8) was found for “feel free from responsibility” and the highest (8.7) for “feel afraid”.

Means and SDs of the ratings of each emotion word in relation to each value are given in Table 5. The ratings of the positive and negative emotion words largely were in line with the prediction of being highest in both the row and column for the associated value (Hypothesis 1). Exceptions were “feel bored”, “feel self denial”, and “feel powerful” in rows, and “feel self denial”, and “feel self affirmed” in columns. In these cases the mean ratings were second most highest.

In order to further test whether the value-emotion structure in Table 5 is circumplex, correlations were computed between the values in Table 5 using as cases the 16 mean emotion scores that were calculated for each value. Figure 3 shows the correlations as a function of angular distances between values according to the model in Figure 1. The distances were assumed to be equal between successive values. It can be seen that the scatter between the correlations is very large for all angular distances larger than zero (where the correlation was assumed to be = 1), but there is a tendency for correlations to be less positive or more negative as the angular distances increase with the lowest or most negative correlations found for angular distance 180° (see the negative slope of the fitted straight line). In addition, the function relating means of empirical correlations to angular distance is monotonic decreasing in line with Hypothesis 2b, means being 1 (stipulated), 0.48, 0.19, 0.13, and -0.30 for angular distances 0°, 45°, 90°, 135°, and 180°.

To assess the validity of the specification of a circumplex structure on the computed value correlations, the equation specified in Eq. 1 was fitted by means of linear regression analysis, with  $m = 3$  and with the beta weights  $\beta_k$  as free parameters, to the interval correlations that were computed with the emotion scores as cases (see Table 4). The multiple correlation was .699 and the cosine functions with  $k = 1$  and  $k = 3$  had significant beta weights ( $p < .05$ , betas being 0.448 and 0.223,

respectively). Figure 3 shows a plot of predicted values against the mean empirical correlations for each angular distance. In line with Hypothesis 2a, it can be seen that the fit is excellent ( $r = 0.999$ ), which may not be surprising since the number of free parameters (4) is only one unit less than the number of mean correlations. However, due to the large scatter of the empirical correlations for each angular distance, a strict statistical test of whether the data are in line with a circumplex structure (see Browne, 1992) was unfeasible. In any case, it seems reasonable to conclude that the systematic tendencies that can be found in the data are in line with a circumplex structure.

The means in Table 4 were used as input to MDS (PROXSCAL with z-transformation). Normalized raw stress was .019 indicating a satisfactory fit. As the plot in Figure 4 shows, the results were similar to the results of Montgomery et.al. (2011) although the values tend to be more scattered around the circumference. However, and in line with Hypothesis 2c, their clockwise order is completely in line with the expected order.

### Experiment 2

The aim of Experiment 2 is to find a general pattern of how emotions are connected to the access and salience of different values across specific contrastive or noncontrastive values and independently of specific positive or negative emotions. For this reason, the emotions were not labelled specifically for each value. Thus, we examine ratings of positive and negative emotions for contrastive and non-contrastive values as a function of access and salience of the focused value and its opposite. We hypothesize in accordance with Eqs. 4 and 5 that the salience of the values influences the slope of the functions relating positive or negative emotion to access to the contrastive values (Hypothesis 3). The slope of the functions relating positive or negative emotions to access to non-contrastive values is hypothesized to be the same as the maximum slope for contrastive values independently of salience, which means that high access to the non-contrastive values generally leads to more positive and less negative emotions than high access to the contrastive values. This follows from Eqs. 6 and 7 (Hypothesis 4).

### *Method*

*Participants.* Seventy-nine undergraduates at University of Gothenburg were recruited. Fifteen were men and 64 were women. Their mean age was 28.6 years and varied between 20 and 55 years. The participants received a lottery ticket worth US\$4 in compensation.

*Procedure.* The survey was conducted via Internet where a questionnaire could be accessed. First, the participants were asked to report their age and gender. Then they rated how much negative feelings they experienced on a scale from “no negative feelings at all” (0) to “much negative feelings” (8) and how much positive feelings they experienced on a scale from “no positive feelings at all” (0) to “much positive feelings” (8) when they had 0%, 25%, 50%, 75%, or 100% access to the different contrastive values presented in Table 2 and non-contrastive values presented in Table 3. The orders between the values were random.

*Table 4. Means, Standard Deviations (Within Parentheses), Cronbach's alphas, and Percent Variance Accounted for by Single-Factor Principal Component Analyses of Ratings of Contrastive Values (Study 1)*

Value	Self	Own will	Manage	Courage	Others	Adaptation	Get help	Security
Access	5.85 (1.73)	6.36 (1.29)	7.26 (1.37)	5.66 (1.61)	6.44 (1.56)	6.12 (1.57)	5.32 (1.84)	7.24 (1.66)
Importance	6.56 (1.50)	5.75 (1.50)	7.09 (1.61)	5.90 (1.55)	6.42 (1.57)	5.37 (1.55)	6.15 (1.51)	7.43 (1.48)
Positive	6.47 (1.57)	6.51 (1.37)	7.42 (1.54)	6.45 (1.48)	6.53 (1.56)	5.03 (1.53)	7.14 (1.61)	7.64 (1.42)
Ability	5.47 (1.94)	6.31 (1.70)	7.19 (1.66)	5.28 (1.73)	6.44 (1.61)	6.42 (1.55)	5.41 (1.94)	6.83 (1.36)
Engagement	5.56 (1.74)	6.28 (1.48)	6.85 (1.77)	5.16 (1.86)	6.31 (1.70)	5.90 (1.71)	4.88 (1.93)	6.28 (1.98)
Mean	5.98 (1.73)	6.24 (1.47)	7.16 (1.59)	5.69 (1.65)	6.43 (1.60)	5.77 (1.58)	5.78 (1.77)	7.08 (1.58)
SD	.51	.29	.21	.52	.08	.56	.89	.54
<u>Cronbach's alpha</u>	.78	.80	.76	.82	.84	.82	.83	.74
% variance	53.2	55.9	52.8	58.1	62.1	58.0	59.9	50.8

Table 5. Means of Ratings of Emotion Words Related to Values (-4 = Maximal Decrease, 4 = Maximal Increase)

	Secure	Help	Adapt	Others	Courage	Manage	Will	Self
Feel secure	3.15	1.04	.26	.88	-.58	2.03	.72	.97
Feel bored	.28	-.08	.48	-.38	-1.87	-1.02	-.90	-.81
Feel cared about	1.39	1.84	-.55	.53	.07	.01	.69	.26
Feel dependent	.04	1.19	1.11	-.39	-1.52	-2.82	-1.42	-1.46
Feel free from responsibility	.29	.23	.69	-.87	-.76	-1.02	-1.33	-.62
Feel powerless	-.81	.29	.81	-.64	-.98	-2.00	-1.74	-1.05
Good conscience	.44	-.46	.36	2.17	.92	1.78	-.04	.28
Feel self denial	-.29	-.07	.76	-.02	-1.00	-1.37	-.79	-1.08
Feel excited	-1.11	-.41	-.39	.40	2.79	1.31	1.19	.63
Feel afraid	-2.06	-.41	.00	-.51	1.23	-.76	.24	-.07
Feel independent	.55	-1.39	-1.66	.63	2.44	3.39	1.62	1.97
Feel lonely	-.82	-1.13	.13	-.88	.12	.22	-.14	-.03
Feel powerful	.33	-1.04	-1.22	.58	1.51	1.81	1.74	.62
Feel worry for responsibility	-.77	-.23	-.58	.12	1.07	.30	1.21	.49
Feel self affirm	.44	.03	-.89	.08	1.64	1.68	1.13	1.75
Bad conscience	-.26	.46	-.28	-1.45	-.42	-1.47	.34	.61

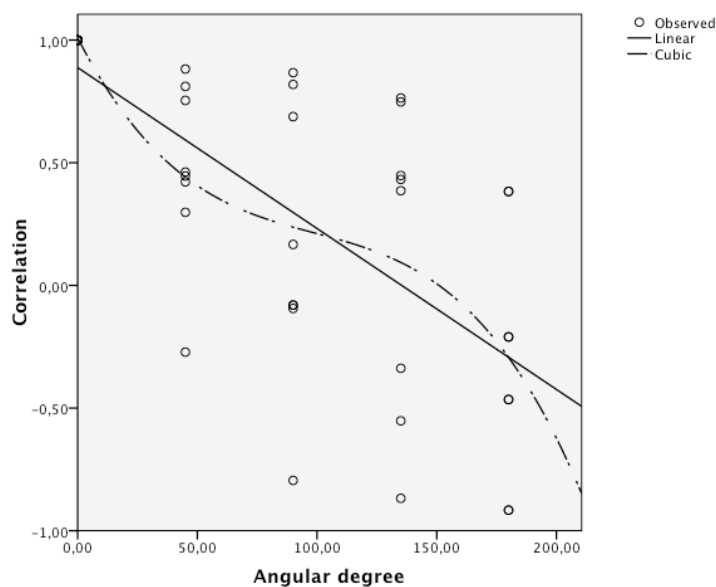


Figure 3. Correlations between value means as a function of angular distances between values.

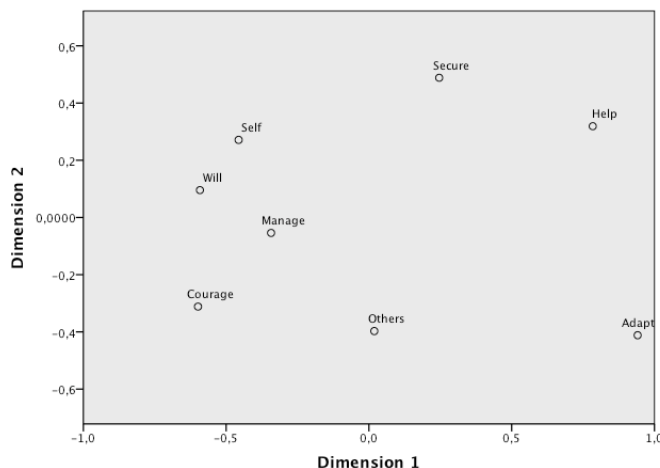


Figure 4. Multidimensional scaling of values connected to emotions.

The participants were randomly assigned to three equally large groups that differed in how much information was provided about the opposites. The first group received no information. The second group was told that their access to (unspecified) opposites was the complementary percentages (100%, 75%, 50%, 25%, 0%). The third group received the same information but the opposite values were specified.

### *Results and Discussion*

In all three groups the contrastive values yielded as expected significantly more positive emotions and significantly less negative emotions than the non-contrastive values when the access to them was 0%. Also in line with expectation, when the access to the values were 100%, non-contrastive values yielded more positive emotions and significantly less negative emotions than the contrastive values in all three experimental groups (see Figures 5 and 6). This follows since the non-contrastive values do not have value opposites inducing negative emotions and are therefore more positively loaded than the contrastive values.

Differences between the three groups were also observed. When the opposites of the values were presented, the difference between ratings related to contrastive and non-contrastive values were much larger than when the opposites were not presented. To examine this pattern in more detail, three-way ANOVAs were conducted on the ratings of positive and negative emotions, respectively, with salience of the opposite values as a between-groups factor and value type (contrastive vs. non-contrastive) and percentage of access to emotion as within-groups factors. There was a significant interaction effect of value type and percentage of access for both positive emotions,  $F(4, 73) = 140.10, p < .001$ , and negative emotions,  $F(4, 73) = 237.30, p < .001$ . The three-way interaction involving value type, percentage of access and salience was also significant for both positive emotions,  $F(8, 148) = 38.60, p < .001$ , and negative emotions,  $F(8, 148) = 69.10, p < .001$ . As can be seen in Figures 5 and 6, these interactions can be attributed to different patterns associated with contrastive and non-contrastive values, respectively.

In line with Hypothesis 3, the slope of the functions for the contrastive values are closer to zero the more equal the salience is for the contrastive value pairs. In contrast and in line with Hypothesis 4, the slopes of the functions for the non-contrastive values remained approximately the same at a high level independently of the salience of the values.

To confirm this pattern, straight lines were fitted to the emotion-value access functions. The slopes for the positive emotions connected to the contrastive values varied from 0 at equal salience for the opposite values over .378 at high salience to .560 at very high salience of the focused value. The slopes for the negative emotions connected to the contrastive values showed a corresponding variation, being 0 at equal salience, -.442 at high salience, and -.541 at very high salience of the focused value. The slopes for the non-contrastive values varied very little, between .643 at equal salience to .679 at very high salience for positive emotions, and between -.654 for equal salience and -.676 at very high salience for negative emotions.

Finally, it can be noted that when salience is equal for contrastive pairs, positive emotions are highest and negative emotions are lowest when access is 50%. In line with this observation, one-way repeated-measures ANOVAs on positive and negative emotions, respectively, yielded significant effects of access,  $F(4, 116) = 38.72, p < .001$  (positive emotions), and  $F(4, 116) = 50.84, p < .001$  (negative emotions).

### General Discussion

Our first hypothesis was that one specific positive emotion and one specific negative emotion would be associated with a contrastive value. This hypothesis was supported by the results of Experiment 1. The emotions did in most cases peak at the expected values. This implies that people feel more of the emotions when reaching access to the values connected to the emotions. There were a few exceptions however. “Feel bored” peaked at adaptation and not at security as was expected. “Feel self denial” also peaked at adaptation but it was supposed to peak at prioritize others. “Feel powerful” peaked at management by your own instead of own will. Still, all these exceptions were second close to the predictions. There were also some exceptions for the columns in the emotion x value matrix, where the emotions can be compared across values. “Feel self denial” came at second place in the Prioritize others column and “Feel self affirm” came at second place in the Prioritize oneself column. “Feel independent” was the most associated positive emotion with Prioritize oneself but “Feel self affirm” was more associated to Prioritize oneself than any other value. The only emotion which was increasing when the participants had high access to Prioritize Others was “feel worry for responsibility”. “Feel self denial” was highest when it was associated with Adaptation. Therefore it is possible that the model still can be slightly improved.

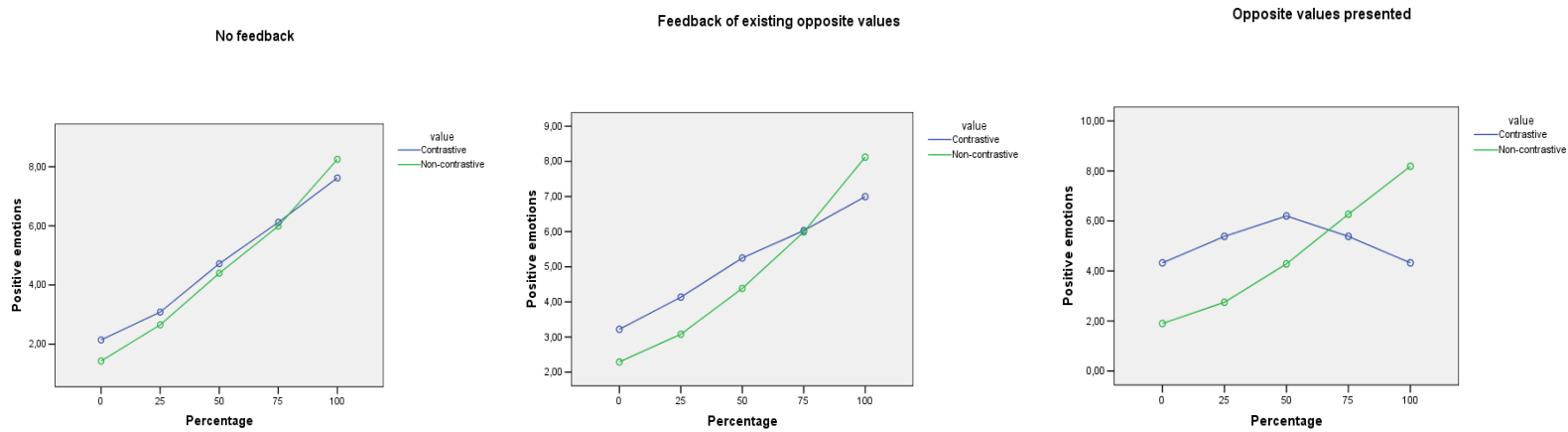


Figure 5. Positive emotions for different percentages of access to the contrastive and non-contrastive values.

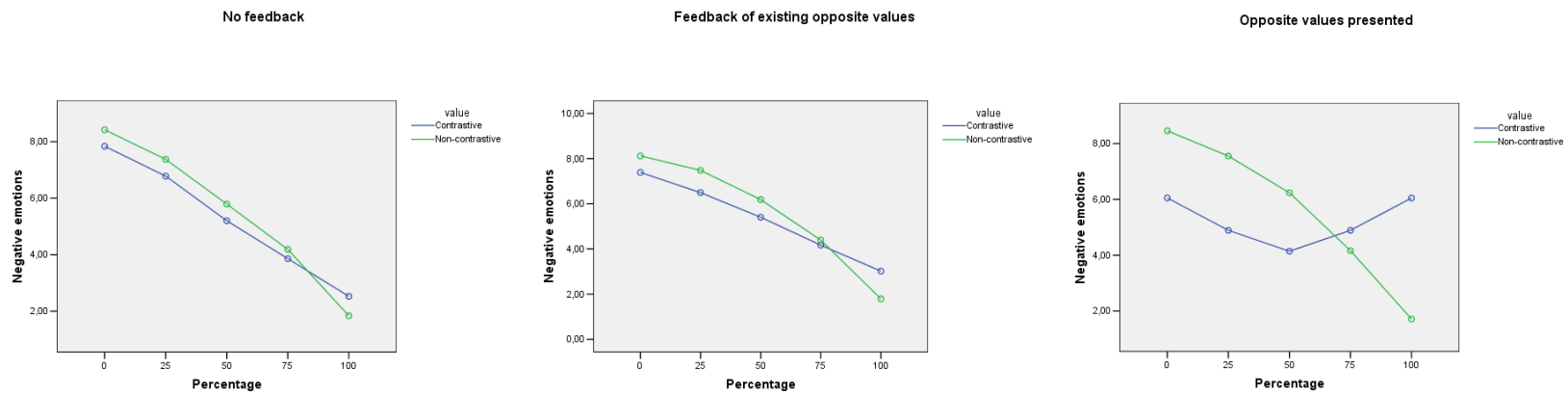


Figure 6. Negative emotions for different percentages of access to the contrastive and non-contrastive values.

It may be argued that the words describing values and emotions do not have different referents. Refuting this, almost all emotion terms were significantly more seen as emotions than the values to which they were associated. An exception was that “Feel free from responsibility” was not significantly more seen as an emotion than adaptation, and feel independent was not significantly more seen as an emotion than Management by your own.

To assess whether the results of Experiment 1 were in line with the hypothesized circumplex structure for contrastive values, correlations were computed between the values using mean emotion scores as cases. Three different measures based on these correlations (statistical fit of the series of cosine functions specified by Browne (1992), monotonicity of correlation function, that is intervalue correlations as a function of hypothesized angular distance between values), and multidimensional scaling all supported the proposed value-emotion circumplex structure (Hypotheses 2a, 2b, and 2c). However, the fit to theoretical values was not perfect for all three measures, possibly due to limitations in the sample of emotions.

In Experiment 2 the emotions were not labelled specifically for each value. The aim was to find a general pattern of emotions connected to the access and salience of different values, disregarding the specific kinds of positive or negative emotions. The non-contrastive values were associated more to positive emotions and less to negative emotions than the contrastive values when access to the values was 100%. The non-contrastive values were also associated more with negative emotions and less with positive emotions than was true for the contrastive values when access to them were 0%. Thus, the slope was steeper of the functions of the positive and negative emotions connected to the access to the non-contrastive values. The non-contrastive values are more positive than the contrastive values because they lack value opposites that detract positive value from the focused value. As expected and in line with Hypothesis 3, the slopes of the functions connected to the contrastive values were gradually getting closer to zero when the salience of the values was decreasing to 0.5. This follows from Eqs., 2, 3, 4, and 5 implying that the total amount of salience and access, respectively, of contrastive value pairs is constant and that access and salience are combined multiplicatively when determining the amount of positive and negative emotion felt in relation to a given contrastive value.

In contrast to what was found for contrastive values, the slopes of the curves of the non-contrastive values were approximately the same disregarding the salience of the opposite values. This was expected since for non-contrastive values no positive opposite values exist that could detract access and salience from a focused value (Hypothesis 4, and Eqs. 6 and 7).



There was one exception. Deeper understanding of the world was leading to lower level of positive emotions than was found for security. This value was also different from other non-contrastive values when MDS was performed on the contrastive and non-contrastive values (Montgomery et al., 2008). This value was located outside the circumplex instead of inside as was the case for the other non-contrastive values. Therefore, it seems that deeper understanding of the world is a special case among the non-contrastive values.

It can also be noted that when the salience was equal for contrastive pairs of values, the positive emotions were highest and the negative emotions were lowest when the access to these values were 50%. This is inconsistent with Eqs. 4 and 5 that predict a constant level of positive and negative emotion across different levels of access, when the salience is equally distributed across the contrasting values. The reason for this pattern could be that when the salience of two opposite values is equal, it is more negative and less positive to have extreme access to one of the values since one loses too much of the opposite value. Then a negative emotional signal occurs as a warning that the values are unbalanced. But when the values are balanced these negative emotions do not occur to the same extent. Therefore, it seems to be more positive and less negative to have a balanced value structure for an average individual when salience is equally distributed. Yet, if the salience is higher for one of the values in a contrastive value pair, it is more positive and less negative to have high access to this value. This is because one disregards the disadvantages of losing the access to the opposite value in this case.

All in all, the results were largely as expected. The hypothesis that there are specific negative and positive emotions connected to the contrastive values seems to have been demonstrated for the first time. This model of values and associated emotions implies that people have balanced value structures in terms of how they associate values with emotions. This should be contrasted with Schwartz (1992), who assumes that values only increase in being positive. If, for example, one only feels afraid when one takes risks and only safe when one is secure, it can indicate that one has problems with taking risks, and, hence, one's value structure is unbalanced. If one instead only feels excited when one takes risks and only bored when one is secure, it indicates that the value structure is unbalanced in the other direction. If a negative emotional signal occurs when one has too much access to a contrastive value and too little of its opposite, and if a positive emotional signal occurs when normal access to a contrastive value is reached, it indicates a more balanced and normal personality. According to the present results this seems to be the way people tend to handle access to contrastive values with emotions. On the other hand, the non-contrastive values seem to be values that one mostly feels

good of having a high access to as earlier research (Schwartz, 1992) suggests for all values. In future research it would be interesting to find out if there also is possible to find specific emotions which are associated with the non-contrastive values. It would also be interesting to explore the relationship between appraisals and values which have many things in common.

#### References

- Baumeister, R. F. (2007). How emotion shapes behavior: Feedback, anticipation, and reflection, rather than direct causation. *Personality and Social Psychology Review*, *167*, 167–203.
- Browne, M. W. (1995) CIRCUM: Satellite program to AUFIT for circumplex models, Psychology Department, Ohio State University, Columbus, OH (1995).
- Frijda, N. H. (1988). The laws of emotion. *American Psychologist*, *43*, 349-358.
- Grassi, M., Luccio, R., & Di Blas, L., (2010). CircE: An R implementation of Browne's circular stochastic process model. *Behavior Research Methods*, *210*, *42*, 55-73.
- Idson, L. C., Liberman, N., & Higgins, E. T. (2000). Distinguishing gains from non-losses and losses from non-gains. A regulatory focus perspective on hedonic intensification. *Journal of Experimental Social Psychology*, *36*, 252–274.
- Lazarus, R. S. (1991). *Emotion and adaptation* New York: Oxford University Press
- Montgomery, W., Montgomery, H., & Gärling, T. (2011). Purifying the Quasi-Circumplex Structure of Human Values. Unpublished manuscript. Göteborg, Sweden: University of Gothenburg, Department of Psychology.
- Nelissen, R. M. A., Dijker, A. J. M., de Vries, N. K. (2007). Emotions and goals: Assessing relations between values and emotions. *Cognition & Emotion*, *21*, 902-911.
- Oatley, K. and Johnson-Laird, P. N. (1987) Towards a cognitive theory of emotions. *Cognition and Emotion*, *1*, 29-50.
- Scherer, K. R. (1999) Appraisal theory. In T., Dalgleish and M., Power, (Eds.) *Handbook of cognition and emotion* (pp. 637-663). Chichester, UK: Wiley.
- Schwartz. S. H. (1992). Universals in the content and structure of values: Theoretical advances and empirical tests in 20 countries. In M. P. Zanna (Ed.), *Advances in experimental social psychology* (Vol. 24, pp. 1–65). San Diego: Academic Press.

- Schwartz, S. H. (2001). Value hierarchies across cultures, taking a similarities perspective. *Journal of Cross-Cultural Psychology, 32*, 268-290.
- Schwartz, S. H., & Bardi, A. (2001). Value hierarchies across cultures, taking a similarities perspective. *Journal of Cross-Cultural Psychology, 32*, 268-290.
- Smith, C. & Ellsworth, P. (1985) Patterns of cognitive appraisal in emotion. *Journal of Personality and Social Psychology, 48*, 813-838.
- Smith, C. & Lazarus, R. S. (1993) Appraisal components, core relational themes, and the emotions. *Cognition and Emotion, 7*, 233-269.

#### Author Note

This research was financially supported by grant 2006-7215-40797-22 from the Swedish Research Council to Henry Montgomery.