



Components of Emotional Meaning: A sourcebook

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CHAPTER

8 From emotion to feeling: The internal structure of the Feeling component

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Abstract

We explain the operationalization of the feeling component, which was based on five frequently used approaches: the positive affect / negative affect model, the pleasure–arousal model, the tense arousal and energetic arousal model, the pleasantness–activation model, and the evaluation–potency–activation model. A dimensional analysis of the feeling features revealed a four-factor structure accounting for 90.7% of the total variance. A very strong BAD VS GOOD factor emerged followed by three smaller subsidiary factors: WEAK VS STRONG, CALM VS RESTLESS, and TIRED. BAD VS GOOD and WEAK VS STRONG were strongly related to the overall VALENCE and POWER dimensions respectively. both CALM VS RESTLESS and TIRED were strongly related to the overall AROUSAL factor. it was possible to correctly classify 47.2 % of the emotion terms across the 34 samples into one of the 24 emotion term categories on the basis of only these four feeling factors.

Keywords: [Feeling](#), [positive affect](#), [negative affect](#), [pleasure](#), [arousal](#), [energetic arousal](#), [tense arousal](#), [evaluation](#), [potency](#), [activation](#)

Subject: [Developmental Psychology](#), [Social Psychology](#)

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It is self-evident for emotion experts, as well as for laymen, that to have an emotion means to “feel” the emotion. Emotions and feelings are considered inextricably linked with one another. There is a consensus that feelings play a key role in emotions, but confusions loom large about their defining and differentiating characteristics, as well as about their role in the emotion process. In daily language, people use these terms in an interchangeable way. Also, in the scientific literature there have been, and still are, vigorous debates about what feelings precisely are and how they are to be differentiated from emotions. Probably the most notorious example is the debate started by William James who stated that: “the bodily changes follow directly the perception of the exciting fact, and that our feelings of the same changes as they occur is the emotion” (James,

1884, pp. 189–190). This statement has been severely criticized for defining emotion as the subjective, conscious experience of an ongoing process in the organism (e.g., Ellsworth, 1994).

Before presenting the meaning structure of the Feeling component, we first present how feelings and the differentiation between feelings and emotions have been conceptualized in the Component Process Model, which formed the basis of the GRID paradigm. We further discuss the operationalization of the Feeling component in the GRID instrument. Then we present the dimensional emotion theories that were used to hypothesize about the structure of the Feeling component. We finally present the features that were used in the GRID instrument to operationalize the Feeling component.

8.1 The differentiation between emotions and feelings in the Component Process Model

According to the Component Process Model (CPM) (Scherer, 1984b, 2009c, Chapter 1), an emotion process consists of synchronized activities between five emotion components, namely the Appraisal, the Bodily reaction, the Action tendency, the Expression, and the Feeling component. In the emotion process, each of these subsystems is characterized by a particular function, namely evaluation of objects and events for Appraisal, preparation of the bodily system for reacting, preparation and direction of action for the Action tendencies, and communication of behavioral intentions for the Expression component. The function of the Feeling component within the CPM is to make the person aware of the ongoing emotion process with the purpose to monitor it. From an evolutionary perspective, emotions developed out of action programs triggered by characteristic stimulus configurations that were adaptive for survival. However, for the survival of humans who have complex concerns and who live in complex (social) environments, a rigid execution of these action programs would be maladaptive in many concrete situations as they would interfere with the various personal goals of the individual (e.g., it is not adaptive to run away from each exam one fears to fail) and the requirements of the environment (e.g., it is not adaptive to aggress one's boss if one feels unjustly treated). The assumption is that these action programs triggered by characteristic stimulus configurations have developed evolutionarily into open and flexible mechanisms that can be adapted to situational constraints and to the complex concerns of the organism.

Because of its presumed role as a monitoring system, the Feeling component is hypothesized to be an emerging component during the emotion process. The Feeling component receives information about the synchronized activity in the other four emotion components and brings this to conscious awareness of the person (or the information can at least easily be made conscious). As explained in Chapter 1, Scherer proposes this process to consist of three strongly interrelated parts, namely: (1) a centralized representation of the synchronized activity in all subsystems in the central nervous system; (2) a conscious, but preverbal awareness of this process, and; (3) finally a verbal categorization of the experience which allows communication. Thus, it is hypothesized that feelings do not drive the emotion process. This is done by the Appraisal component evaluating the ongoing event. Through the Feeling component, the person becomes only aware of the emotion process, which allows him or her to actively regulate it, for instance by reappraising (e.g., the hurt was unintentional), masking (e.g., covering disgust by a smile), relaxation (e.g., in a stressful situation), or suppressing an action tendency (e.g., count till 10 when really angry).

Within the CPM, the concept of emotion and the concept of feeling can be clearly differentiated. Emotion IS the synchronization of activity in the five organismic subsystems that prepare the person to deal (in principle) in an adaptive way with an event that is relevant for its concerns. Feeling IS AN AWARENESS of this process. There is thus a part-whole relationship between the two concepts, with the concept “emotion” referring to the whole, and the concept “feeling” referring to a part of it. Moreover, feelings do not necessarily represent the ongoing emotion processes adequately. In the course from a central representation of the emotion process in the central

nervous system to a verbalization of the subjective experience, information from the original process might get lost and new information might become added. Thus, the fact that the Feeling component has the emotion process as its object does not mean it is the emotion process. While many parts of the emotion process can and often are unconscious, feelings are (sub)conscious. Each of the emotion components can in principle be studied independently from one another and independently from the person who experiences the emotion. Furthermore, when an observer infers an emotion process in others, he or she has no access to their feelings. The emotion process is inferred on the basis of a coordinated activity between those components that are observable (e.g., the inferred appraisal from the antecedent situation, the expression, the motivated behavior, and possibly bodily reactions). When emotions and feelings are defined and differentiated according to the CPM, it becomes clear that emotions are eminently transactional. Their goal is to prepare the individual for action in a goal-relevant situation. Feelings are in the first place internal. They reveal information to the person about his or her internal functioning.

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A huge variability can be identified within the Feeling component with respect to the complexity and richness of the verbalization of the (sub)conscious experience of the emotion process (Frijda, 2005; Scherer, 2009). We summarize this variability in three hierarchically ordered levels of verbalization. At the highest level, detailed descriptions can be given of what the person experiences in several or all emotion components during the emotion process. At an intermediate level the use of emotion words is likely. Emotion words represent recurrent types of synchronization between the emotion components. By using emotion words information about what happens specifically in each of the components is lost. However, emotion words are very economical as they convey information about the most salient aspects of the synchronization process that is taking place. At the lowest level only the general quality of the emotional process one is experiencing, is verbalized. These three levels of complexity and richness correspond to the three views on meaning that can be found in psycholinguistic emotion research (see Chapter 2). The highest level corresponds to the feature profile view: the rich verbalization consists of how each of the emotion components are involved in the emotion process. The second level corresponds to the categorical view. The person categorizes the subjective experience of the emotion process into an emotion category, and thereby focuses on what his or her experience shares with typical and recurrent types of synchronization between the emotion components. The lowest level corresponds to the dimensional view. The dimensions correspond to the general quality of the emotional experience.

8.2 The representation of the Feeling component in the GRID

Theoretically, a very clear distinction can thus be made between the concept of “emotion” and the concept of “feeling” within the CPM, with feeling being the specific component of the emotion process which brings the emotion process into consciousness at different levels of richness and complexity. When this approach is applied to emotion language and the use of words to describe other’s and one’s own emotions, it becomes clear why there has been so much confusion between the concept of emotion and the concept of feeling both in daily life and in psychological theorizing. The very same words can be used to describe “objectively” (aspects of) an emotion process and to describe the “subjective experience” of (aspects of) that emotion process. Just like one can see someone hurting his toe and the person feels his toe being hurt. This implies that an instrument that studies the meaning of emotion words from a componential emotion approach cannot operationalize the Feeling component completely independently from the other emotion components and the emotion words themselves. The emotion features that operationalize the Appraisal, the Bodily reaction, the Action tendency, and the Expression components can be used to denotatively describe an aspect of the emotion, but can also be used to refer to the subjective experience of that process. Moreover, the emotion words that constitute the GRID instrument are words that can be used to denotatively describe and categorize the emotion process, but can also be used to describe one’s own personal experience of the emotion process. Still, with the emotion words and with the operationalization of the Appraisal, the Bodily reaction, the Action tendency, and the Expression components, one aspect of the Feeling component is not being represented, namely the low level representation of the emotional experience in terms of its general quality. Therefore we have operationalized the Feeling component in the GRID instrument exclusively in terms of this low level representation of the subjective experience. As already presented, the general quality of the emotional experiences has been most extensively studied by the dimensional approach to emotion. This approach has therefore been used to operationalize the Feeling component in the GRID.

8.3 Dimensional approaches

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There is a long-standing dimensional tradition in the emotion literature that can be traced back to Aristotle (Rhetorica), who considered VALENCE as a key characteristic of the emotional experience, and to Wundt (1896) at the beginning of psychology as a discipline, who proposed the dimensions of pleasure–displeasure, AROUSAL–calming, and tension–relaxation (Lust–Unlust, Erregung–Hemmung, and ↳ Spannung–Lösung). In current emotion psychology, the dimensional models are very prominent in assessment approaches and in psycholinguistic approaches to emotion. From an assessment approach, different dimensional models have been proposed. The four most important models are the positive affect–negative affect model (Watson & Tellegen, 1985), the pleasure–AROUSAL model (Russell, 1980), the tense AROUSAL and energetic AROUSAL model (Thayer, 1989), and pleasantness–activation model (Larsen & Diener, 1992). While being very different at first sight, it has been demonstrated that they are psychometrically equivalent (Yik, Russell, & Feldman Barrett, 1999). They consist of a VALENCE and an AROUSAL dimension, or of a rotation of these two dimensions.

Osgood and colleagues (Osgood, May, & Miron, 1975; Osgood, Suci, & Tannenbaum, 1957) have demonstrated that it is possible to assess the connotative meaning of nouns in a language with simple bipolar adjectives across cultural groups. They found evidence for three overarching affective dimensions, namely evaluation (from bad to good), potency (from weak to strong), and activation (from deactivated to highly activated). These three dimensions have also been identified in the cognitive structure of emotion terms across cultural groups (e.g., Fontaine, Poortinga, Setiadi, & Markam, 2002; Shaver, Schwartz, Kirson, & O’Connor, 1987; Shaver, Wu, & Schwartz, 1992). The assessment models and the psycholinguistic models agree that the emotion domain is structured according to a VALENCE and an AROUSAL dimension. They disagree about the existence of a third dimension, POWER.

For the operationalization of the Feeling component in the GRID instrument we decided to start from each of the four dominant assessment models that have been proposed in the assessment literature, as well as the three-dimensional VALENCE, POWER, and AROUSAL model that was identified in psycholinguistic research. Before introducing the specific features that operationalized the Feeling component in the GRID instrument, we briefly present these models (see Chapter 2, for a more detailed discussion on these models). According to the positive affect–negative affect model (Watson & Tellegen, 1985), positive and negative feelings are not organized along a single bipolar dimension, but according to two rather independent unipolar dimensions. Positive VALENCE and negative VALENCE are considered to vary rather independently from one another. This model is robustly identified by factor analyses on intensity and frequency ratings of positively and negatively valenced feeling and emotion terms. Not a bipolar, but two uncorrelated or slightly negatively correlated unipolar factors typically emerge from this assessment procedure (e.g., Watson & Clark, 1997). The contention of proponents of this model is that positive and negative VALENCE, while being conceptually opposite, are being registered by two different mechanisms in the emotional architecture (e.g., Watson, Wiese, Vaidya, & Tellegen, 1999).

The pleasure–AROUSAL model (Russell, 1980) and the pleasantness–activation model of Larsen and Diener (1992) are highly comparable. They recognize the centrality of the hedonic quality of the feelings, but add a second, bipolar dimension to it, namely AROUSAL or activation. Feelings would also vary from low AROUSAL or deactivation to high AROUSAL or activation. These models receive empirical support from both self-reports and similarity sorting of feeling and emotion terms.

The fourth two-dimensional model is the tense AROUSAL and energetic AROUSAL model of Thayer (1989). Thayer has exclusively studied the feeling domain from the perspective of AROUSAL, and identified two independent AROUSAL systems. They are represented by two bipolar AROUSAL dimensions, namely a tense AROUSAL dimension where feelings of tenseness are opposed to feelings of relaxation and an energetic AROUSAL dimension where feelings of energy are opposed to feelings of exhaustion.

The last model that was taken into account is the three-dimensional model of VALENCE, POWER, and AROUSAL that emerges from psycholinguistic research. As already presented, this model is based on the seminal work of Osgood and colleagues (Osgood et al., 1957, 1975), who studied not feelings, but the connotative meaning structure of words. The relevance of the three dimensions of VALENCE, POWER, and AROUSAL for the emotion domain was further confirmed by similarity research with emotion terms (e.g., Fontaine et al., 2002; Shaver et al., 1987, 1992). On the VALENCE dimension, positive emotion terms are opposed to negative emotion terms; on the POWER dimension, anger terms are opposed to fear and sadness terms; and on the AROUSAL dimension, sadness terms are opposed to fear and anger terms. Moreover, it has been demonstrated that the POWER dimension consists of three facets, namely control, strength, and dominance (e.g., Russell, 1978).

It is important to note the difference between how these models have been operationalized and investigated in the emotion and assessment literature, and how they have been operationalized in the GRID instrument. In the emotion and assessment literature, emotion terms, which are assumed to describe the process of synchronization between various emotion components (e.g., angry and sad), and feeling terms that describe the general quality of the emotional experience (e.g., strong and nervous) are used interchangeably. In the GRID, a very strong distinction is made between these two types of words. Only the feeling words that describe the general quality of the emotional experience have been used to operationalize the Feeling component of the GRID instrument. Only these words could be conceptually distinguished from the emotions words as well as from the features of the Appraisal, Action tendency, Bodily reaction, and Expression components.

According to the CPM, the Feeling component receives information on the synchronization in all other components, and integrates that information into conscious representation. It is therefore expected that the dimensions that structure the emotion domain will also structure the general quality of the emotional

experience. It is thus hypothesized that the feeling words that describe the general quality of the emotional experience, represent the three dimensions of VALENCE (pleasantness, pleasure), POWER (potency, strength, dominance, control), and AROUSAL (activation).

8.4 Operationalization of the feeling features

The Feeling component was operationalized by means of 20 features that represent general feelings according to the positive affect–negative affect model (Watson & Tellegen, 1985), the pleasure–AROUSAL model (Russell, 1980), pleasantness–activation model (Larsen & Diener, 1992), the tense AROUSAL and energetic AROUSAL model (Thayer, 1989), and the evaluation–potency–activation model of Osgood (Osgood et al., 1957, 1975).

The VALENCE dimension was operationalized by the terms:

- felt good
- felt positive
- felt bad
- felt negative.

Besides the AROUSAL dimension (Russell, 1980) and the activation dimension (Larsen & Diener, 1992), the two AROUSAL dimensions proposed by Thayer (1989), namely tense AROUSAL and energetic AROUSAL, were also taken into account. As the tense and the energetic AROUSAL dimensions also include items that fit the general AROUSAL or activation dimension, it was decided to operationalize AROUSAL by the two Thayer dimensions. The tense AROUSAL was operationalized by the terms:

- felt restless
- felt nervous
- felt at ease
- felt calm.

p. 134 The energetic AROUSAL was operationalized by the terms:

- felt energetic
- felt alert
- felt exhausted
- felt tired.

The POWER dimension was operationalized using the three facets of strength, control, and dominance (e.g., Russell, 1978). The terms for the POWER dimension were:

- felt dominant
- felt powerful
- felt strong
- felt in control

- felt out of control
- felt powerless
- felt weak
- felt submissive.

8.5 Intensity and duration

Besides the 20 feeling features, we investigated also two more general aspects of feeling, namely intensity and duration. Emotions are defined as dynamic episodes of subsystem synchronization (see Chapter 1) and are thus extended in time. Subjectively, an emotion episode is delimited in the flux of experience as a discrete entity (often categorized and labeled as such) with a certain duration. In addition, again subjectively, there is a felt intensity associated with the experience that individuals experiencing an emotion often report spontaneously. In consequence, duration and intensity are two central aspects of emotional feeling. Despite some early work (Frijda, Mesquita, Sonnemans, & Van Goozen, 1991; Sonnemans & Frijda, 1994), there has been little systematic work on these issues, except for a few emotion recall studies (see Verduyn, Delvaux, Van Coillie, Tuerlinckx, & Van Mechelen, 2009; Verduyn, Van Mechelen, Tuerlinckx, Meers, & Van Coillie, 2009; Verduyn, Van Mechelen, Tuerlinckx, & Scherer, 2013). In the context of the GRID study, we were interested in examining to what extent differential intensities and durations are encoded in the semantic profiles of emotion words. To this effect, we included the following two features in the feeling section of the GRID instrument:

- was in an intense emotional state
- experienced the emotional state for a long time.

8.6 Results

The analyses on the Feeling component have been executed on data from 34 samples representing 27 countries and 24 languages (see Chapter 6, for a detailed account of the samples). For a description of the design, the instrument, and the data-analytic methods, the reader is referred to Chapter 5. Moreover, the same steps were taken as with the analyses of the overall structure, which were presented in the previous chapter (see Chapter 7). We first report on the factor structure of the Feeling component. We then present the relationships between the feeling factors and the overall factors that have been identified across all emotion components. We continue by investigating how well the Feeling component allows the differentiation of the 24 emotion terms from one another across languages, countries, and samples. We end by presenting the results on duration and intensity.

The internal structure of the Feeling component

In preliminary factor analyses, the feature “felt alert” behaved very differently from the other 19 feeling features. Therefore, the analyses on the Feeling component reported in this chapter were executed on the remaining 19 feeling features. In a first factor analysis on the feeling features across all emotion words and all samples, the scree plot pointed to a single dominant factor (see Figure SM 1)². The first factor alone accounted for 77.30% of the total variance. However, the investigation of the stability of the factor structure across the German, Latin, Slavic, and East-Asian language groups (see Chapter 5, for a detailed explanation of the language groups) pointed to four stable factors (see Table SM 1) that accounted for 90.68% of the total variance. Given the stability of the first four factors, we investigated the one- up to the four-factorial solution.

The first factor opposed positively valenced feelings to negatively valenced feelings (see Table 8.1). All features either had substantially positive or substantially negative loadings on this factor (the lowest absolute loading was 0.587).

Table 8.1 Loadings of the feeling features in a one-factorial structure

Feeling features	BAD VS GOOD
felt positive	0.97
felt good	0.96
felt at ease	0.96
felt strong	0.95
felt in control	0.95
felt energetic	0.95
felt powerful	0.95
felt dominant	0.88
felt calm	0.85
felt restless	−0.59
felt submissive	−0.67
felt out of control	−0.73
felt nervous	−0.73
felt tired	−0.81
felt exhausted	−0.90
felt weak	−0.91
felt negative	−0.93
felt powerless	−0.94
felt bad	−0.96

As the four self-report models that are dominant in the literature expect a two-factorial VALENCE–AROUSAL structure, the two-factorial structure was orthogonally Procrustes rotated toward a VALENCE–AROUSAL structure, with the VALENCE and the POWER features only loading on the first factor and the tense and energetic AROUSAL features only loading on the second factor. The rotated structure, however, did not confirm the expectation of a two-factorial VALENCE–AROUSAL structure. Of the eight a priori AROUSAL features, only one feature had its highest loading on the second dimension, namely “felt restless” (see also Table SM 2).

As there was a clear theoretical expectation that the three dimensions of VALENCE, POWER, and AROUSAL would structure the Feeling component, the three-factorial structure was orthogonally Procrustes rotated to the a-priori VALENCE, POWER, AROUSAL structure. The orthogonally rotated structure, however, did not confirm the a-priori expectation. Of the 19 features, only nine features had the highest loading on the predicted factors (see also Table SM 3).

As a four-factorial structure was not expected, the four-factorial structure was VARIMAX rotated (see Table SM 4). In that structure, most POWER features had their highest loadings on the first factor, most VALENCE features had their highest loadings on the second factor, “felt tired” and “felt exhausted” had their highest loadings on the third factor, and “felt nervous” and “felt restless” had their highest loadings on the fourth factor. This structure thus most resembled the a priori construction of the feeling features which operationalized VALENCE, POWER, tense AROUSAL, and energetic AROUSAL. The structure was, however, not optimal because many features were characterized by cross-loadings.

p. 136 Thus, the inspection of the one- up to a four-factorial structure could not confirm the a priori VALENCE, POWER, AROUSAL structure, with each indicator representing one of these dimensions. Moreover, the four-factorial VARIMAX solution suffered from many cross-loadings. A close inspection of these structures indicated that independent of the number of factors, all features tended to have ↪ their highest, or second still, very high loading on only one factor. Thus, the original model, where each feature formed an indicator of only one of the four feeling factors, was disconfirmed. The model, which was suggested by the data, was a model with one main bipolar factor on which all features have a high loading and additional subsidiary factors on which specific features load. This model was of course already suggested by the fact that the one-factorial structure accounted for more than three quarters of the total variance.

To investigate whether a model with a general feeling factor and additional subsidiary factors could describe the feeling structure, the two-, three-, and four-factorial structures were rotated to a theoretical structure with all features loading, either positively or negatively on the first strong VALENCE factor, and with cross-loadings on one of the other subsidiary factors. The two-factorial model was orthogonally Procrustes rotated toward a general VALENCE factor and a subsidiary AROUSAL factor (see Table 8.2). Still, the AROUSAL factor was not confirmed. Of the seven a priori AROUSAL items, only three had a cross-loading exceeding 0.30 (or -0.30) on the subsidiary factor, namely “felt restless,” “felt nervous,” and “felt calm.” Moreover, two POWER items (“felt submissive” and “felt out of control”) also had a cross-loading exceeding 0.30 (or -0.30) on the subsidiary factor. The second orthogonally Procrustes rotated factor is thus not an AROUSAL factor, but a combination of tense AROUSAL and POWER.

Table 8.2 Loadings of the feeling features in a two-factorial Procrustes rotated structure

Feeling features	BAD VS GOOD	LOW VS HIGH AROUSAL
felt positive	0.97	-0.10
felt good	0.96	-0.12
felt strong	0.96	0.16
felt in control	0.95	-0.08
felt powerful	0.95	0.15
felt dominant	0.88	0.20
felt submissive	-0.67	-0.47
felt out of control	-0.72	0.44
felt weak	-0.91	-0.28
felt negative	-0.93	0.04
felt powerless	-0.94	-0.13
felt bad	-0.96	0.01
felt restless	-0.58	0.61
felt nervous	-0.73	0.41
felt energetic	0.95	0.18
felt exhausted	-0.90	-0.10
felt at ease	0.96	-0.14
felt tired	-0.81	-0.23
felt calm	0.85	-0.40

Note: bold font indicates the feature was expected to have its highest loading or a secondary loading on this factor.

p. 137 The three-factorial structure was orthogonally Procrustes rotated toward a structure with a first general VALENCE factor, a subsidiary POWER factor, and a subsidiary AROUSAL factor (see Table 8.3). That structure fitted reasonably well. Of the eight POWER items, seven also had a cross-loading exceeding 0.30 (or -0.30) on the subsidiary POWER factor. Only the feature “out of control” loaded higher on the third factor. On the subsidiary AROUSAL factor, four of the seven a priori AROUSAL items had a cross-loading exceeding 0.30 (or -0.30). “Felt at ease” and “felt exhausted,” however, only loaded on the first overall factor and the feature “felt energetic” only had a cross-loading on the POWER factor.

Table 8.3 Loadings of the feeling features in a three-factorial Procrustes rotated structure

Feeling features	BAD VS GOOD	WEAK VS STRONG	LOW VS HIGH AROUSAL
felt good	0.96	0.19	−0.02
felt positive	0.96	0.21	−0.02
felt bad	−0.93	−0.27	−0.05
felt negative	−0.94	−0.16	−0.08
felt dominant	0.70	0.62	0.03
felt powerful	0.81	0.53	0.05
felt strong	0.83	0.50	0.08
felt in control	0.87	0.37	−0.11
felt out of control	−0.80	0.05	0.31
felt powerless	−0.85	−0.41	−0.10
felt weak	−0.75	−0.58	−0.15
felt submissive	−0.43	−0.73	−0.21
felt restless	−0.61	−0.04	0.61
felt nervous	−0.65	−0.33	0.55
felt energetic	0.86	0.40	0.18
felt at ease	0.95	0.20	−0.06
felt exhausted	−0.86	−0.28	−0.15
felt calm	0.88	0.09	−0.32
felt tired	−0.80	−0.17	−0.37

Note: bold font indicates the feature was expected to have its highest loading or a secondary loading on this factor.

The four-factorial structure was orthogonally Procrustes rotated toward a structure with a general VALENCE factor and three subsidiary feeling factors, namely a POWER factor, a tense AROUSAL factor and an energetic AROUSAL factor (see Table 8.4). The rotated structure fitted the subsidiary model very well: of the 19 features, only three features did not display the expected cross-loading. “Felt out of control” had no cross-loading on the POWER factor, but had a cross-loading on the tense AROUSAL factor. “Felt at ease” only loaded on the first VALENCE factor and had no cross-loading on any of the three subsidiary factors. “Felt energetic” did not display the expected cross-loading on the energetic AROUSAL factor. Instead, it had a cross-loading on the POWER factor. Because of this latter observation, it is problematic to continue calling the fourth factor “energetic AROUSAL.” It is basically a unipolar factor defined by “felt tired” and “felt exhausted.” Therefore this factor was reversed and labeled TIRED.

Table 8.4 Loadings of the feeling features in a four-factorial Procrustes rotated structure

Feeling features	BAD VS GOOD	WEAK VS STRONG	CALM VS RESTLESS	TIRED
felt good	0.96	0.19	-0.12	0.06
felt positive	0.95	0.21	-0.12	0.06
felt bad	-0.93	-0.26	0.06	-0.11
felt negative	-0.94	-0.16	0.03	-0.10
felt dominant	0.67	0.61	-0.12	0.21
felt powerful	0.79	0.53	-0.09	0.16
felt strong	0.81	0.50	-0.07	0.20
felt in control	0.87	0.37	-0.19	0.01
felt out of control	-0.80	0.06	0.31	0.19
felt powerless	-0.83	-0.41	0.04	-0.18
felt weak	-0.73	-0.58	0.01	-0.25
felt submissive	-0.47	-0.74	-0.19	-0.02
felt restless	-0.46	-0.03	0.82	-0.22
felt nervous	-0.61	-0.32	0.58	0.17
felt at ease	0.95	0.20	-0.15	0.03
felt calm	0.86	0.09	-0.37	-0.09
felt energetic	0.85	0.40	0.01	0.26
felt tired	-0.75	-0.17	-0.09	-0.56
felt exhausted	-0.80	-0.28	0.09	-0.42

Note: bold font indicates the feature was expected to have its highest loading or a secondary loading on this factor.

p. 138 Because the orthogonally Procrustes rotated four-factorial structure fitted the a priori selection of the feeling features the best and was stable across language groups, this structure was finally selected. We labeled these four factors BAD VS GOOD, WEAK VS STRONG, CALM VS RESTLESS, and TIRED.

After orthogonal Procrustes rotation, BAD VS GOOD accounted for 64.47%, WEAK VS STRONG accounted for 14.05%, CALM VS RESTLESS for 7.42%, and TIRED for 4.79% of the total variance of the feeling features. When we compare the importance of each feeling factor with the factors in the global structure (in which the feeling features were removed, see Chapter 7), it is clear that the VALENCE factor is much more important in the Feeling component than in the other components. In the overall structure with all features except the feeling features, the VALENCE factor accounted for 36.58% of the total variance, the POWER factor accounted for 13.20%, the AROUSAL factor for 8.92%, and the NOVELTY factor for 4.97%. Thus, in the Feeling component, the VALENCE factor

(BAD VS GOOD) accounts for about double the amount of the variance than in all the other components combined.

To further investigate the meaning of the four Procrustes rotated feeling factors, plots were made with the average factor scores of the 24 emotion terms on the four factors (see Figure 8.1 to Figure 8.4). The plots of the terms fit the interpretation of the features very well. On the first factor, positively valenced emotion terms are opposed to negatively valenced emotion terms (with *surprise* and *compassion* in the middle). On the second factor, anger terms (and *pride*) are opposed to fear and sadness terms (and to *love*). The positions on the third and the fourth factor look very much alike: anger and fear terms (and *surprise*) are opposed to sadness terms (and *compassion*), as can be expected from AROUSAL dimensions. To explore the differences between the two AROUSAL dimensions, the 24 emotion terms were also plotted separately on these two dimensions in Figure 8.4. It is observed that the fear and the self-conscious emotion terms are the most differentiated on these two AROUSAL factors. *Fear*, *anxiety*, and *stress*, all score very high on the CALM VS RESTLESS factor. However, they vary hugely on the TIRED factor: *fear* scores low on TIRED, *stress* scores high, and *anxiety* is situated in between. The two self-conscious emotion terms, *guilt* and *shame*, score equally high on the CALM VS RESTLESS factor (at the restlessness pole of the factor, but less extreme than the fear terms). However, they are differentiated on the TIRED factor: *shame* scores low on TIRED, while *guilt* scores almost one and a half standard deviation higher on this factor.

Plot of the average factor scores for the 24 emotion words on BAD VS GOOD and WEAK VS STRONG.

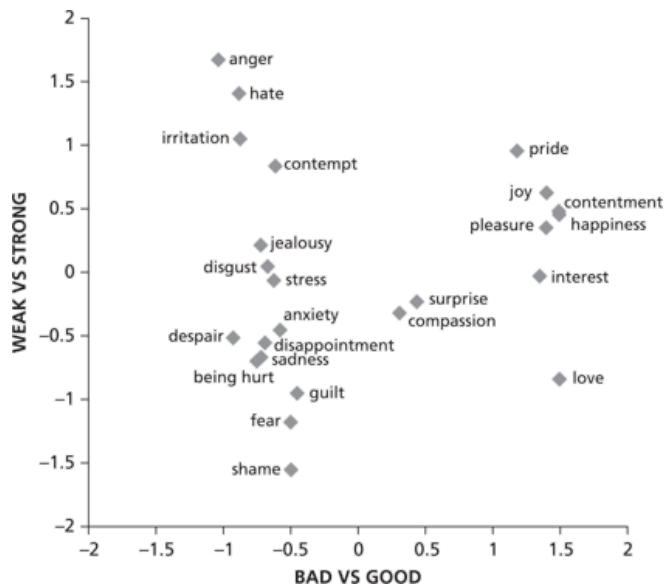


Figure 8.1

Plot of the average factor scores for the 24 emotion words on CALM VS RESTLESS and TIRED.

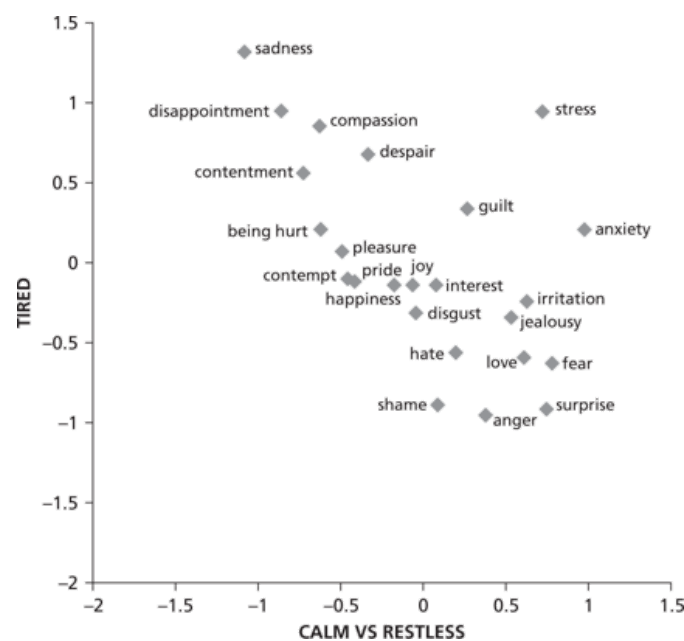


Figure 8.4

Plot of the average factor scores for the 24 emotion words on BAD VS GOOD and CALM VS RESTLESS.

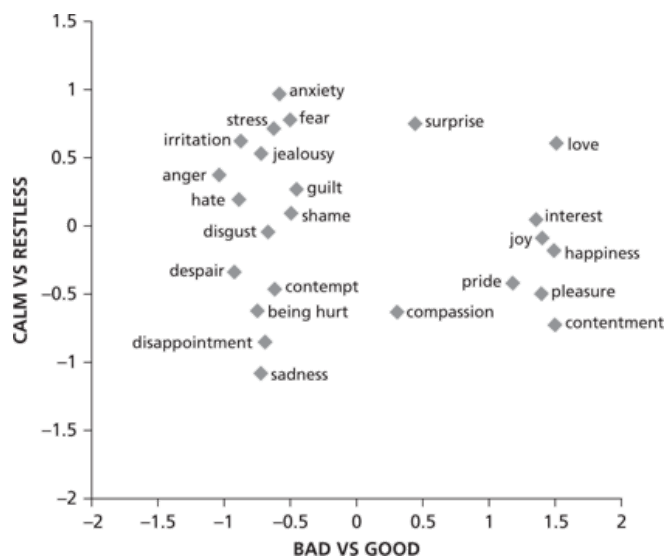


Figure 8.2

Plot of the average factor scores for the 24 emotion words on BAD VS GOOD and TIRED.

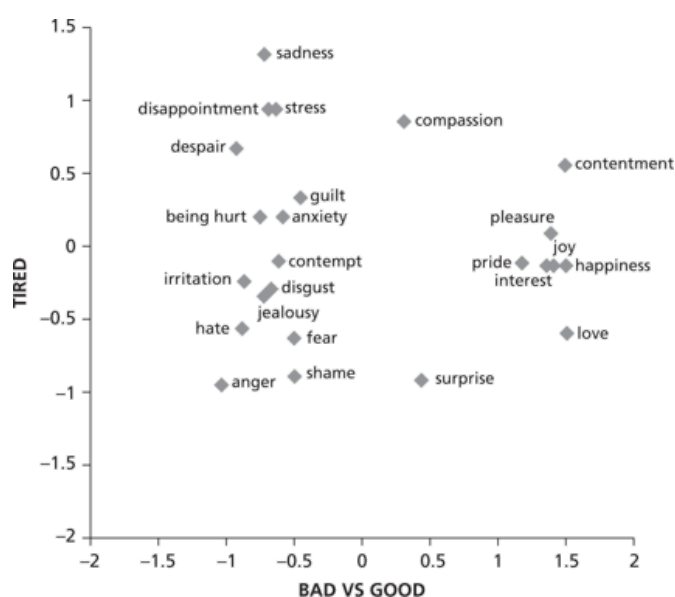


Figure 8.3

Mapping the feeling structure onto the overall structure

To further explore the relationships between the overall factorial structure and the internal structure of the Feeling component, we have regressed the four feeling factors on the four overall factors (after omitting all feeling features). Table 8.5 shows the standardized regression weights and R^2 of the factors regressed on the four overall factors. The values for R^2 show that VALENCE is predicted most accurately (mainly by the BAD VS GOOD feeling factor), followed by POWER (mainly by the

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WEAK VS STRONG feeling factor) and AROUSAL (mainly by both the CALM VS RESTLESS and the TIRED feeling factors), which largely confirms expectations. The NOVELTY factor is virtually unrelated to the feeling factors (R^2 is only 0.013). NOVELTY relates slightly negatively to TIRED.

Table 8.5 Standardized regression weights and R^2 of the feeling factors regressed on the four overall factors

Overall factors	β BAD VS GOOD	β WEAK VS STRONG	β CALM VS RESTLESS	β TIRED	R^2
VALENCE	0.95***	0.02	-0.10***	0.00	0.91
POWER	0.12***	0.75***	0.11***	-0.28***	0.66
AROUSAL	-0.07*	-0.02	0.58***	-0.42***	0.52
NOVELTY	0.05	0.00	0.05	-0.09*	0.01

Note: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. The feeling features were removed from the four overall factors.

Emotion category differentiation based on the Feeling component

Having identified the factorial structure for this component, we now examine to what extent the four feeling factors in isolation allow the discrimination of the 24 emotion terms, that is, classify them correctly on the basis of the four feeling factor scores (as compared to classification success based on all 19 feeling features). The classification accuracy is shown in Table 8.6 Using the four feeling factor scores as independent variables, 47.2% of cross-validated grouped cases could be correctly classified, which is far above chance level (which is 1/24 or 4.2%). In comparison, the results for the MDA classification that used all 19 feeling features as dependent variables achieved a correct classification of 58.5% of cross-validated grouped cases. This is an improvement of 11.3% in classification accuracy. The last column of Table 8.6 allows inspecting the patterns of the most frequent classification errors in the classification based on all features. There were particularly frequent confusions among *happiness*, *joy*, *pleasure*, and *contentment* for the positive emotions. For the negative emotions there were frequent confusions among a) *anger*, *irritation*, *hate*, and *contempt*; and among b) *disappointment*, *sadness*, *being hurt*, and *despair*. The confusions thus occurred within three of the four major emotion clusters (positive emotion cluster, anger cluster, and sadness cluster). There were no major confusions within the fear cluster.

Table 8.6 Classification accuracy (in percent) for the 24 emotion words in discriminant analyses based on the four feeling factors and the feeling features

Emotion words	Classification based on <i>feeling factors</i>	Classification based on <i>feeling features</i>	
	Accuracy	Accuracy	Confusion > 15% with
being hurt	26.5	47.1	disappointment
sadness	50.0	52.9	disappointment
shame	64.7	70.6	
guilt	47.1	58.8	
compassion	70.6	70.6	
disappointment	20.6	38.2	sadness
love	76.5	82.4	
contentment	61.8	55.9	
happiness	26.5	20.6	joy
pride	55.9	91.2	
pleasure	23.5	32.4	joy, happiness, contentment
joy	14.7	38.2	happiness, pleasure
interest	44.1	82.4	
surprise	88.2	94.1	
despair	47.1	52.9	sadness
stress	61.8	82.4	
anxiety	44.1	61.8	
fear	61.8	64.7	
jealousy	47.1	47.1	disgust
hate	17.6	38.2	anger, irritation
irritation	26.5	44.1	anger
anger	64.7	58.8	hate
disgust	41.2	61.8	
contempt	50.0	55.9	hate
Total	47.2	58.5	

Intensity and duration

The effects of intensity and duration have been investigated in two ways. First, it has been investigated whether the four major emotion clusters (joy, sadness, fear, and anger) differed from one another in intensity and duration using an ANOVA randomized block design with the emotion cluster being the independent factor and the sample the block factor. Second, it has been investigated whether and to what extent the 24 emotion terms differed from one another also using an ANOVA randomized block design with the emotion terms being the independent factor and the sample the block factor. The differences between the emotion terms have then been further investigated with Tukey's pairwise comparisons.

The four emotion clusters differed from one another significantly in intensity, but the effect was small [$F(3,711) = 6.41, p < 0.001, \text{partial } \eta^2 = 0.03$]. Post-hoc pairwise comparisons showed that sadness terms ($M = 1.78$) and fear terms ($M = 1.82$) are a bit less intense than positive emotion terms ($M = 2.03$) and anger terms ($M = 2.05$). There was a significant and larger difference, in duration, between the emotion clusters [$F(3,711) = 39.24, p < 0.000, \text{partial } \eta^2 = 0.14$]. The post-hoc comparisons revealed that fear terms ($M = 0.55$) and anger terms ($M = 0.69$) were associated with a shorter duration than sadness terms ($M = 1.20$) and positive emotion terms ($M = 1.27$).

The differences between the 24 emotion terms were significant and much larger than the emotion cluster differences for both intensity [$F(23,759) = 19.16, p < 0.000, \text{partial } \eta^2 = 0.37$] and duration [$F(23,759) = 44.72, p < 0.000, \text{partial } \eta^2 = 0.58$]. The pairwise comparisons revealed gradual differences between emotion terms in intensity. Table 8.7 shows the means and standard deviations of the mean centered scores (see Chapter 5 for more information on the centering of the scores) for the 24 emotion words sorted from low to high intensity. Moreover, significant differences were observed within emotion clusters. In the joy cluster, *happiness*, *love*, *joy*, and *pleasure* were more intense than *contentment*, and *contentment* more intense than *interest*. In the anger cluster, *hate* was significantly more intense than *irritation* and *contempt*, with *anger* and *jealousy* in between. *Fear* was significantly more intense than *stress*, with *anxiety* in between. In the sadness cluster, *despair* was significantly more intense than *disappointment* and *guilt*. *Being hurt* and *sadness* were significantly more intense than *disappointment*, with *shame* and *guilt* in between.

Table 8.7 Intensity means and standard deviations for the 24 emotion words

Emotion words	Mean	Standard deviation
interest	0.83	0.68
disappointment	1.23	0.74
compassion	1.35	0.79
contempt	1.46	0.83
stress	1.49	0.53
contentment	1.54	1.13
guilt	1.55	0.52
pride	1.69	0.90
surprise	1.71	0.65
shame	1.75	0.62
irritation	1.77	0.74
anxiety	1.81	0.62
disgust	1.87	0.69
sadness	1.96	0.92
being hurt	2.03	0.64
fear	2.10	0.81
despair	2.14	0.77
jealousy	2.22	0.61
anger	2.32	0.64
pleasure	2.35	0.73
joy	2.47	0.71
hate	2.47	0.60
love	2.66	0.47
happiness	2.68	0.77

The pairwise comparisons revealed that *surprise* had a significantly shorter duration than all the other 23 emotion terms. Table 8.8 shows the means and standard deviations of the mean centered scores (see Chapter 5) for the 24 emotion words sorted from short to long duration. Moreover, significant differences were observed between terms within the same emotion cluster. *Love* had a significantly longer duration than *happiness*, and *happiness* had a significantly longer duration than *interest*, with *contentment*, *pleasure*, and *joy* being in between. In the anger cluster, *jealousy*, *hate*, and *contempt* had a significantly longer duration than *anger* and *irritation*.

p. 145 Stress had a significantly longer duration than *fear* and *disgust*, with *anxiety* in between. In the sadness cluster, *sadness* had a significantly longer duration than all the other sadness terms (except *guilt*); *guilt* had a significantly longer duration than *disappointment* and *shame*.

Table 8.8 Duration means and standard deviations for the 24 emotion words

Emotion words	Mean	Standard deviation
surprise	-1.38	0.79
irritation	0.11	0.61
disgust	0.12	0.77
anger	0.22	0.59
shame	0.32	0.82
fear	0.34	0.72
anxiety	0.76	0.57
contempt	0.80	0.67
interest	0.87	0.60
disappointment	0.87	0.68
pride	0.94	0.74
stress	0.99	0.61
joy	1.08	0.78
hate	1.09	0.62
pleasure	1.11	0.71
contentment	1.14	0.77
compassion	1.22	0.79
despair	1.24	0.94
jealousy	1.26	0.57
being hurt	1.30	0.65
happiness	1.46	0.75
guilt	1.54	0.80
sadness	1.91	0.64
love	2.30	0.50

8.7 Discussion

The internal structure of the Feeling component

On the basis of the theoretical assumption that the Feeling component receives input from the other four components and transforms that information at a low level into consciousness, it was hypothesized that the Feeling component would mimic the overall structure across all emotion components, which was reported in the previous chapter. This hypothesis was only partly confirmed. While evidence was found for a VALENCE, a POWER, and an AROUSAL factor in the Feeling component, the structure differed in substantial ways from the overall structure.

p. 146 As predicted, the first factor that structures the feeling domain is a bipolar VALENCE factor. Thus, when it comes to meaning, there is no evidence at all for a model with separate positive and negative feeling factors. The more an emotion word refers to feeling good, the less it refers to feeling bad, and vice versa. While a VALENCE factor was expected, its overwhelming salience was not. VALENCE was not only the most important factor, but it accounted for almost double the variance in the Feeling component compared to the four other components taken together. Moreover, only a model with a general bipolar VALENCE factor and subsidiary factors described the factor structure of the Feeling component well. All feeling features had a very high (or even their highest) loading on the VALENCE factor, and loaded only then on the predicted factor. This effect was particularly strong for the positively valenced items of the tense AROUSAL factor. “Felt at ease” turned out to be a mere VALENCE item. It gave no information on tense AROUSAL. “Felt calm” still loaded negatively on the tense AROUSAL factor, but this loading was far less important than expected. The VALENCE factor thus overshadowed the other factors.

The fact that the VALENCE factor is twice as important in the Feeling component than the three other components taken together, calls for an explanation. From the perspective of the lexical sedimentation hypothesis, which assumes that genuine differences in emotion processes have been encoded in language, the current findings could indicate that the information about what is going on in the Appraisal, Action tendency, Expression, and Bodily reaction components is not only registered and summarized at a low level of representation in the Feeling component, but that the information is also weighted with the VALENCE aspect receiving much more weight than the other aspects of the emotional experience. The centrality of VALENCE could be accounted for by the hypothesized function of the Feeling component, namely becoming aware of the emotion process in order to monitor and regulate it. Given the fact that many sources of information constantly compete for conscious attention, only a clear signal is likely to enter consciousness easily. By amplifying VALENCE, the Feeling component would give a clear signal about the nature of the ongoing emotion process.

A separate POWER factor emerged that was defined by feelings of dominance, strength, and control as predicted. Still, two notable deviations from the expectations were observed. First, “felt out of control” did not define the WEAK VS STRONG factor, but loaded on the CALM VS RESTLESS factor. The opposite of control on the POWER dimension is probably “lack of control” rather than “out of control.” “Out of control” likely refers to hectic activity that tries to ward off an unwanted situation. Second, “felt energetic” systematically defined the WEAK VS STRONG factor and not the hypothesized energetic AROUSAL factor. Taken together, these deviations seem to indicate that the WEAK VS STRONG factor can be best interpreted as the subjective experience of having the POWER to proactively realize one’s goals versus having to surrender oneself to the situation.

In the three-factorial solution, an AROUSAL factor emerged. However, this factor was mainly defined by tense AROUSAL features. One AROUSAL factor did not suffice to represent the AROUSAL items. Not one, but two AROUSAL factors could be stably identified in the four language groups as predicted by Thayer (1989). These two factors were not just a rotation of a general VALENCE and a general AROUSAL factor, as the two AROUSAL factors emerged after a general VALENCE factor was identified. The first AROUSAL factor could be very well interpreted as

Thayer's tense AROUSAL factor. The second AROUSAL factor, however, could not be interpreted as energetic AROUSAL. The two features, namely "felt alert" and "felt energetic," that were a priori hypothesized to define the positive pole of the energetic AROUSAL factor did not do so. Except for its VALENCE, "felt alert" turned out to be very different from all the other features. Alertness is probably not a feeling at all, but is rather a form of attention. "Felt energetic" defined the WEAK VS STRONG FACTOR, and not the second AROUSAL factor. This excludes an interpretation of the second AROUSAL factor as energetic AROUSAL. That factor was only defined by "felt $\hookrightarrow$ tired" and "felt exhausted." Given the fact that feeling awake is the antonym of feeling tired, it could be hypothesized that the second AROUSAL factor just refers to a wake-sleep dimension.

From the perspective of the lexical sedimentation hypothesis, the question arises what the existence of two AROUSAL factors, which emerge even after an overwhelming first VALENCE factor and a POWER factor were identified, means. It could mean that two separate AROUSAL systems exist, although somewhat different than the one proposed by Thayer (1989). Based on the more narrow interpretation of the second AROUSAL factor as a sleep-wake factor, a hypothetical interpretation of the two AROUSAL systems could be in terms of a constant AROUSAL system and an ad hoc AROUSAL system. The constant AROUSAL system would take care of the wake-sleep cycle. It would be characterized by circadian rhythms and would be thus constantly in a state of change. It is reasonable to expect that this AROUSAL system would not be triggered by the emotion, but would only be influenced by it. For example, when intensely sad, one does not want to wake up in the morning, or the experience of a threatening event in the evening suddenly chases away sleepiness. The ad hoc AROUSAL system would be elicited when particular action is needed. In the present study, we see that the two AROUSAL factors are especially differentiated in the fear and the self-conscious emotion terms. They point to the duration of the emotion process as a key difference between the two AROUSAL factors. If a high-arousal emotion is a short-lived emotion (like in fear), both forms of AROUSAL would complement one another: the sleep-wake cycle would be interrupted, and additional activation would be freed. However, if the emotion process is extended over longer time periods (like is the case for stress and guilt), both AROUSAL systems could get dissociated. The constant AROUSAL system would then indicate that the transition from wake to sleep cannot be further postponed, while the hoc AROUSAL system would remain active.

While feeling factors were observed that corresponded to the VALENCE, POWER, and AROUSAL factors in the overall structure, no feeling factor was identified that corresponded to NOVELTY ("felt alert" had a zero correlation with the NOVELTY factor). An obvious explanation is that such a factor was not identified, because it was not operationalized. Three factors were a priori expected and only those were operationalized. However, a deliberate attempt to identify feeling terms for the NOVELTY dimension (see the research reported in Chapter 14) could neither come up with convincing candidates. A possible explanation is that there is no need in NOVELTY for general feelings that represent the overall quality of the emotional process, because it directly triggers the conscious attentional system. Surprise cannot be dealt with in an automatic way, unlike for instance fear. A threatening object can be automatically detected and an action program can be automatically started to avoid the danger. The awareness can come later, when the fear process has already started. With surprise the persons conscious attention is drawn to the source of NOVELTY, because the nature of the event is unclear. The organism first has to identify what is going on and this requires the full attention of the organism. Thus, rather than signaling that an important process is occurring that possibly needs regulation, attention is immediately and consciously drawn to the source of NOVELTY. Once the meaning of the novel event has been identified, the surprise emotion can convert into another emotion with its accompanying feelings (what happened is positive, threatening, unjust, . . .).

Mapping the feeling structure onto the overall structure

The relationships of the four feeling factors with the overall factors spanning the emotion domain, further confirm the interpretation of the feeling factors. BAD VS GOOD was strongly related to VALENCE, WEAK VS STRONG to POWER, and both CALM VS NERVOUS and TIRED to AROUSAL in the overall structure. Thus, in the feeling structure the overall AROUSAL factor splits up in two separate AROUSAL factors.

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Emotion category differentiation based on the Feeling component

Despite the fact that the Feeling component was operationalized by feeling terms that only conveyed information about the general quality of the emotion process, it was still reasonably easy to identify an emotion term on the basis of its respective feeling profile. Almost half of the emotion terms could be correctly identified on the basis of their feature profile on the four feeling factors. Thus, just knowing the feeling pattern substantially constrains the number of possible emotions a person can experience. Becoming aware of the general quality of the ongoing emotion process gives already good indications about the nature of the process. The general feelings thus form a good starting point to further explore one's emotional experience.

Intensity and duration

The analyses on intensity and duration clearly indicate that prototypical duration and intensity differences are encoded in language. A comparison between the data reported here and earlier results from some of the cross-cultural recall studies (e.g., Ricci-Bitti & Scherer, 1986; Scherer & Wallbott, 1994; Scherer, Wranik, Sangsue, Tran, & Scherer, 2004) suggests a great deal of convergence. In previous cross-cultural studies, differences in duration were found to be substantially more pronounced than differences in intensity. Moreover, for the four basic emotions of joy, sadness, anger, and fear, comparable differences were observed with joy and sadness being subjectively experienced much longer than fear and anger. Furthermore, differences in duration and intensity differentiate emotion terms much more within language families than between language families. Because information about duration and intensity is encoded in language, it can be hypothesized that the precise emotion label that is used for recalling emotions will have a substantial impact on the reported intensity and duration of the recalled episodes.

8.8 General discussion

The operationalization of the Feeling component was based on a conceptual distinction between emotion terms, which represent the synchronization between different components, and general feeling terms that represent the subjective quality of the emotion process. The current results confirm that both types of terms do not convey the same information, and should therefore not be used interchangeably. Two findings are especially important for the Feeling component, namely: (1) that the VALENCE dimension is much more salient in the Feeling component than in the other emotion components; and (2) that the overall AROUSAL factor splits up into a CALM VS RESTLESS and a TIRED feeling factor. A final observation is that the Feeling component, even at this general level is more complex than the two-dimensional feeling and affect models that dominate the assessment literature. The present findings raise the hypothesis that each of these models assesses the four feeling dimensions in a confounded way. In the present study, the scree plot only pointed to one big and a second smaller factor, and the second factor in the two-factor solution was a combination of POWER, tense AROUSAL, and tiredness. At least when it comes to the meaning of emotion terms, the four feeling models do not just differ from one another in terms of the rotation of the factors, but also in the dimensionality in which they have to be represented. There are already indications in the literature that this does not only hold for the feeling structure in language, but also holds for interindividual differences in emotional experience. The current results are in line with the empirical observation of Schimmack and Reisenzein (2002) that energetic AROUSAL and tense AROUSAL could not be fully reduced to a combination of VALENCE and activation. The present findings call for further and focused research on the dimensionality of interindividual differences in feelings.

Notes

- 2 All supplementary materials (SM) are available at the GRID website: <http://www.affective-sciences.org/GRID>. See Appendix 1 ("Availability") for further details.