



Components of Emotional Meaning: A sourcebook

Johnny J. R. Fontaine (ed.) et al.

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CHAPTER

44 CoreGRID and MiniGRID: Development and validation of two short versions of the GRID instrument

Klaus R. Scherer (ed.), Johnny R. F. Fontaine (ed.), Cristina Soriano (ed.)

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Abstract

The GRID instrument has generated an extraordinary set of data specifying precise feature profiles for the meaning of emotion words in 24 different languages covering most of the major language families in the world. The extraordinary results are likely to generate further research using the GRID paradigm. To facilitate these efforts we have developed two short forms of the full GRID instrument, reducing the number of items to save administration time while allowing for comparable structural information on the emotion terms to be rated. The CoreGRID instrument consists of 68 items, which is sufficient to reproduce the overall four-factor structure and the factorial structure of the individual components, as well as to maintain a high degree of discrimination (a loss of only 2% in classification accuracy compared to the full GRID). The MiniGRID consists of only 16 of the most discriminative items. It allows to reproduce the overall structure with an extremely high degree of accuracy (CoreGRID factors correlated with FullGRID factors in a range of 0.87 to 0.97).

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The development of the GRID instrument has been strongly guided by theoretical considerations. Based on the Component Process Model (see Chapter 1), the five major emotion components that are recognized by most emotion theorists as essential building blocks of emotion processes, namely Appraisals, Bodily reactions, Expression, Action tendencies, and Feelings, have each been operationalized by one or more dominant theories. The empirical evidence across languages and cultural groups presented throughout this book demonstrates that the GRID instrument can, as predicted, be used to establish comprehensive and fine-grained semantic profiles for a representative selection of major emotion words. The 142 features that have been selected to cover major aspects of each of the emotion components allow mapping the meaning of emotion terms into a high-dimensional space, producing precise discriminations, both with respect to other emotion

terms in the same language and to similar terms in other languages. However, this high degree of resolution and precision comes at a price with respect to the time and effort needed to generate reliable profiles with large numbers of native language speakers. It takes one participant about one hour to rate only four emotion words. Because the level of precision and detail provided by the GRID instrument is not required for many psycholinguistic research questions, the mere size of the instrument might hamper its future use. Therefore, two shortened versions of the GRID instrument have been developed, namely the CoreGRID and the MiniGRID instruments. The shortening of the original GRID instrument, to which we will further refer in this chapter as the FullGRID instrument, has been strongly guided by the empirical results reported in the previous parts of this book.

p. 524

Throughout this book, three levels of semantic profiles have been presented that show a different trade-off between informativeness and cognitive economy, namely the feature level, the emotion component factor level, and the overall factor level. At the feature level, each of the 142 features is taken into account to identify the meaning of an emotion term. This is a fine-grained level of analysis, but not very economical. At a higher level, one can look at the component-specific *factors* that capture the semantic overlap of the features within each emotion component. This level is far more economical, as it only comprises 22 factors across the five emotion components (as opposed to 142 features). However, this level of analysis is also less fine-grained. The role that individual features play in the meaning of emotion terms is not fully represented by the emotion component factors. For instance, the feature “blushing” loads highly on the BODY TEMPERATURE factor, but BODY TEMPERATURE as a whole does not capture the particular relevance of “blushing” for the meaning of *shame*. Despite this limitation, in general the emotion component factors form a good level of analysis to identify differences in meaning between emotion terms. The 24 emotion terms can be almost as accurately classified based on only the 22 emotion component factors rather than on the 142 individual features (namely an accuracy of 79.8% vs 82.1%, see Chapters 7 and 13). Finally, among the 22 emotion component factors, there are also strong mutual relationships. They can at the highest level be represented by an overall four-factorial structure: VALENCE, POWER, AROUSAL, and NOVELTY. This highest level is very economical as one only looks at four factors, but it is also the least informative. It gives no information about how the different emotion components contribute to the meaning of the emotion term. Many research questions, however, are only formulated at this general level. As demonstrated in this book, the FullGRID instrument can be used at each of these three levels of analysis.

As a compromise between precision and economy the CoreGRID instrument has been developed, assessing the semantic profiles on the level of *emotion components* but with a much smaller number of features (less than 50% of the features). For research questions which are well served by knowing the dimensional coordinates of emotion words in four-dimensional space, we developed a MiniGRID, consisting of only 16 features. In the following sections, we first present the development of the CoreGRID instrument and then the development of the MiniGRID.

44.1 Development of the CoreGRID instrument

The CoreGRID instrument has been developed to assess the 22 emotion component factors (representing Feeling, Bodily reaction, Expression, Action tendency, and Appraisal) with a much smaller number of features than was the case in the FullGRID instrument.

The following guidelines were used to select the features for the CoreGRID from the complete set of 142 in the FullGRID:

- 1 The starting point was taking the factor structures for each of the emotion components reported in Part III of this book (see Chapters 8 to 12) and selecting features in such a way as to reproduce these emotion

component factors as faithfully as possible.

- 2 Each emotion component factor was to be represented by at least two emotion features.
- 3 If an emotion component factor was bipolar, at least one feature from both poles was to be included.
- 4 Emotion component factors that were defined by many features in the FullGRID were also to be represented by a proportionally larger number of features in the CoreGRID instrument.
- 5 The selected features were to robustly reproduce the overall four-factorial structure of VALENCE, POWER, AROUSAL, and NOVELTY.
- 6 The CoreGRID features were to represent the major theoretical concerns that informed the original selection of features in the FullGRID instrument. This required new features to be added for three of the emotion components, in order to improve the representation of certain factors from a theoretical approach (based on the hypotheses generated by the current empirical findings, notably in Chapter 8 on the Feeling component and in Chapter 12 on the Appraisal component).
- 7 The selected features per emotion component were to empirically reproduce the component factor structure identified by the FullGRID. After Procrustes rotation of the emotion component factors in the CoreGRID to the emotion component factors in the FullGRID, the χ^2 congruence (Tucker's ϕ) was to reach at least 0.85 per factor, and the factor scores should correlate at least 0.80.²
- 8 The features of the CoreGRID were to achieve a high accuracy level in classifying the 24 emotion terms by discriminant analysis.

p. 525

In the remainder of this section, we first present the selection of the features per emotion component (using the feature labels in the full GRID instrument described in this volume) and the congruence of the emotion component structures in the CoreGRID with the emotion component structures in the FullGRID. Then the overall structure of the CoreGRID is investigated. Subsequently, discriminant analyses on the CoreGRID features and emotion component factors are compared with the discriminant analyses on the FullGRID features and factors.

The CoreGRID Feeling component

A four-factorial structure was identified for the Feeling component based on the data obtained with the FullGRID (see Chapter 8). The first factor was a general VALENCE feeling factor with all feeling features having their highest or second highest loading on it. The three remaining factors were subsidiary, as the features that loaded high on these remaining factors also had a high or even higher loading on the first factor. The first subsidiary factor was a POWER feeling factor opposing strength and dominance (and control) to weakness and submissiveness. In the last two subsidiary factors, the expected AROUSAL dimension was split into a tense AROUSAL factor opposing restlessness to calmness and a tiredness factor which was characterized by exhaustion and fatigue. These four feeling factors were descriptively labeled as: BAD VS GOOD, WEAK VS STRONG, CALM VS RESTLESS, and TIRED.

For the CoreGRID Feeling component each pole of the first three factors was represented by one feeling feature. The fourth factor was represented by only one pole of the fourth dimension, namely “feel tired.” However, as it was hypothesized in Chapter 8 that the last feeling factor refers to the sleep-wake cycle, a new feature—“felt awake”—was added to operationalize it. Thus, the four feeling factors were operationalized by the following eight feeling features in the CoreGRID:

BAD VS GOOD

- felt bad
- felt good

WEAK VS STRONG

- felt weak
- felt strong

CALM VS RESTLESS

- felt calm
- felt restless

TIRED VS AWAKE

- felt tired
- felt awake (new feature)

p. 526 A factor analysis on the first seven feeling features (omitting “felt awake,” as it was a new feature) with Procrustes rotation reproduced the feeling factors of the FullGRID very well, with a Tucker’s phi of 0.99 and higher in all cases, and with the factor scores correlating higher than 0.83 (see Table 44.1).

Table 44.1 Loadings of the CoreGRID feeling features in a three-factorial Procrustes rotated structure and congruence with FullGRID feeling structure

	BAD VS GOOD	WEAK VS STRONG	CALM VS RESTLESS	TIRED
CoreGRID feeling features				
felt good	0.95	0.20	−0.13	0.06
felt bad	−0.91	−0.29	0.08	−0.12
felt strong	0.82	0.51	−0.07	0.16
felt weak	−0.71	−0.64	0.01	−0.25
felt restless	−0.45	−0.04	0.86	−0.23
felt calm	0.90	0.04	−0.36	−0.14
felt tired	−0.76	−0.10	−0.13	−0.62
Congruence				
Tucker’s phi	1.00	0.99	1.00	1.00
<i>r</i> factor scores	0.97	0.83	0.94	0.88

Concerning feeling, there is also emerging evidence of the existence of systematic differences in the modal levels of intensity and duration for specific emotions (Sonnemans & Frijda, 1994; Wallbott & Scherer, 1995; Scherer et al., 2004; Verduyn et al., 2009a, b). In Chapter 8, it was demonstrated that emotion terms are especially differentiated on intensity and duration within the four major emotion clusters of joy, anger,

sadness, and fear. These differences might therefore be important when deciding what emotion word out of a family of terms should be used to refer to a specific instance of the emotion—for example, for the anger family there probably are systematic intensity differences between “irritation” and “rage.” In order to allow for the documentation of such systematic differences in future research, the following two FullGRID feeling features were maintained in the CoreGRID:

Intensity

- was in an intense emotional state.

Duration

- experienced the emotion for a long time.

Thus the Feeling component, which was operationalized by 22 features in the FullGRID, is represented by 10 features in the CoreGRID.

The CoreGRID Bodily reaction component

On the basis of earlier reports in the literature (Rimé & Giovannini, 1986; Rimé, Philippot, & Cisamolo, 1990; Scherer & Wallbott, 1994, p. 313), a three-factor structure was expected in the Bodily reaction component. After orthogonal Procrustes rotation, this structure was by and large confirmed (see Chapter 9). The three Bodily reaction factors were labeled as follows: DISTRESS SYMPTOMS, AUTONOMIC AROUSAL, and BODY TEMPERATURE. As the Bodily reaction component was particularly important for defining the arousal factor in the overall factor structure, this component—and especially the AUTONOMIC AROUSAL factor—has been more extensively represented in the CoreGRID than the other emotion components. Of the 18 Bodily reaction features in the FullGRID the following 11 were retained in the CoreGRID instrument:

DISTRESS SYMPTOMS

- felt weak limbs
- got pale
- had stomach troubles

AUTONOMIC AROUSAL

- muscles tensing (whole body)
- breathing getting faster
- sweat
- heartbeat getting faster
- heartbeat slowing down
- breathing slowing down

BODY TEMPERATURE

- felt warm
- felt cold

A factor analysis on the 11 Bodily reaction features of the CoreGRID with Procrustes rotation reproduced the Bodily reaction factor structure of the FullGRID very well, with a Tucker's phi of 1.00 in all cases, and factor scores correlating at 0.94 or higher (see Table 44.2).

Table 44.2 Loadings of the CoreGRID bodily reaction features in a three-factorial Procrustes rotated structure and congruence with FullGRID bodily reaction structure

	DISTRESS SYMPTOMS	AUTONOMIC AROUSAL	BODY TEMPERATURE
CoreGRID bodily reaction features			
felt weak limbs	0.90	0.08	−0.06
got pale	0.76	0.26	−0.52
had stomach troubles	0.66	0.41	−0.41
muscles tensing (whole body)	0.27	0.84	−0.14
breathing getting faster	0.13	0.81	0.44
sweat	0.45	0.71	0.20
heartbeat getting faster	0.07	0.61	0.70
heartbeat slowing down	0.28	−0.82	−0.22
breathing slowing down	0.10	−0.92	0.09
felt warm	−0.30	0.08	0.84
felt cold	0.63	0.00	−0.66
Congruence			
Tucker's phi	1.00	1.00	1.00
<i>r</i> factor scores	0.96	0.98	0.94

p. 528 The CoreGRID Expression component

As discussed in Chapter 10, facial and vocal expressions were analyzed separately to acknowledge the different nature of these two expression modalities and to extract the most representative factors in each modality. In contrast to the two emotion components described above, we had no prior expectations about the underlying structure of the Expression component for theoretical or empirical reasons, as there have been few attempts in the expression literature to link individual expression features to underlying dimensions or factors. Using the FullGRID, we could empirically identify a stable three-factorial facial expression structure and a two-factorial vocal expression structure. The three facial expression factors were descriptively labeled FROWN VS SMILE, JAW DROP/EYEBROWS UP, and EYES CLOSED/TEARS. The two vocal expression factors were labeled VOCAL ENERGY and firm vs perturbed speech. For the final selection of the expression features, we relied on both statistical information and on earlier qualitative interpretations of studies on facial and vocal expressions (Goudbeek & Scherer, 2010; Scherer & Ellgring, 2007a; Scherer, Johnstone, & Klasmeyer, 2003). The original 21 facial and vocal expression features included in the FullGRID were reduced to the following 12 in the CoreGRID:

FROWN VS SMILE

- frowned
- smiled

JAW DROP/EYEBROWS UP

- had the jaw drop
- had the eyebrows go up.

EYES CLOSED/TEARS

- closed her or his eyes
- had tears in the eyes.

VOCAL ENERGY

- spoke louder
- spoke faster
- spoke more slowly.

FIRM VS PERTURBED SPEECH

- had an assertive voice
- had a trembling voice
- had speech disturbances

A factor analysis on the CoreGRID facial and vocal expression features largely replicated the original structures in the FullGRID. For facial expression, the Tucker's phi were all 1.00 and the factor score correlations were higher than 0.82 (see Table 44.3). For the vocal expression factors the Tucker's phi were higher than 0.87 and the factor score correlations higher than 0.95 (see Table 44.4).

Table 44.3 Loadings of the CoreGRID facial expression features in a three-factorial Procrustes rotated structure and congruence with FullGRID facial expression structure

	FROWN VS SMILE	JAW DROP/EYEBROWS UP	EYES CLOSED/TEARS
CoreGRID facial expressions			
frowned	0.96	−0.03	−0.10
smiled	−0.94	0.07	−0.22
had the jaw drop	−0.12	0.94	−0.02
had eyebrows go up	−0.17	0.70	−0.55
closed her or his eyes	−0.01	−0.05	0.83
had tears	0.03	0.04	0.84
Congruence			
Tucker's phi	1.00	1.00	1.00
<i>r</i> factor scores	0.98	0.82	0.95

Table 44.4 Loadings of the CoreGRID vocal expression features in a three-factorial Procrustes rotated structure and congruence with FullGRID vocal expression structure

	VOCAL ENERGY	FIRM VS PERTURBED SPEECH
CoreGRID vocal expression features		
spoke faster	0.88	−0.32
		spoke louder
	0.78	−0.46
spoke slower	−0.90	0.23
had speech disturbances	0.25	0.88
had a trembling voice	−0.01	0.91
had an assertive voice	0.29	−0.80
Congruence		
Tucker's phi	0.87	0.99
<i>r</i> factor scores	0.94	0.95

The CoreGRID Action tendency component

p. 529 The features in this component were based on the work of Frijda (Frijda, 1987; Frijda, Kuipers, & ter Schure, 1989; Frijda, Markam, Sato, & Wiers, 1995), who has given much attention to the issue ↵ of classifying Action tendencies (see Chapter 11). While he and his collaborators have enumerated quite a large number of such Action tendencies, as reflected in the large number of items in the FullGRID, there has been little effort so far to determine the underlying structure or the superordinate categories. In the GRID study, a three-factorial structure was identified comprising one general Action tendency factor on which almost all action tendencies had their highest or second highest loading, and two subsidiary factors. The first factor opposed appetitive versus defensive action tendencies, in line with the recent theorizing by Frijda (2010). On the two subsidiary factors, disengagement action tendencies were opposed to intervention action tendencies, and submit action tendencies were opposed to attack action tendencies, respectively. Each pole of the three factors was represented by the two most appropriate action tendency features. Moreover, for ↵ its theoretical relevance for fear emotions, two action tendency features were additionally selected, namely “wanted to run away in whatever direction” and “wanted to disappear or hide from others.” Thus, the Action tendency component was operationalized in the CoreGRID by 14 features out of the 40 features in the FullGRID:

p. 530

DEFENSIVE VS APPETITIVE

- wanted the ongoing situation to last or be repeated
- wanted to sing and dance
- wanted to run away in whatever direction
- wanted to disappear or hide from others
- felt the urge to stop what he or she was doing
- wanted to undo what was happening.

DISENGAGEMENT VS INTERVENTION

- wanted to tackle the situation
- wanted to overcome an obstacle
- lacked the motivation to pay attention to what was going on
- wanted to do nothing.

SUBMIT VS ATTACK

- wanted to oppose
- wanted to do damage, hit, or say something that hurts
- wanted to hand over the initiative to someone else
- wanted to comply to someone else's wishes

After orthogonal Procrustes rotation, the selected 14 features accurately reproduced the Action tendency structure of the FullGRID, with a Tucker's phi of 0.99 and higher in all cases and factor score correlations of 0.91 and higher (see Table 44.5).

Table 44.5 Loadings of the CoreGRID action tendency features in a three-factorial Procrustes rotated structure and congruence with FullGRID action tendency structure

	DEFENSIVE VS APPETITIVE	DISENGAGEMENT VS INTERVENTION	SUBMIT VS ATTACK
CoreGRID action tendency features			
wanted the ongoing situation to last or be repeated	0.93	0.15	0.21
wanted to sing and dance	0.93	0.10	0.22
wanted to run away in whatever direction	−0.86	−0.34	0.09
wanted to disappear or hide from others	−0.87	−0.39	0.01
felt the urge to stop what he or she was doing	−0.91	−0.20	0.16
wanted to undo what was happening	−0.92	−0.10	0.03
wanted to tackle the situation	0.16	0.87	0.04
wanted to overcome an obstacle	−0.10	0.85	0.25
lacked the motivation to pay attention to what was going on	−0.56	−0.57	0.10
wanted to do nothing	−0.58	−0.61	0.00
wanted to oppose	−0.73	0.11	0.57
wanted to do damage, hit, or say something that hurts	−0.66	0.03	0.65
wanted to hand over the initiative to someone else	−0.45	−0.35	−0.69
wanted to comply to someone else's wishes	0.50	0.06	−0.71
Congruence			
Tucker's phi	1.00	0.99	0.99
<i>r</i> factor scores	0.98	0.91	0.92

The CoreGRID Appraisal component

The features in the Appraisal component in the FullGRID were mostly based on the appraisal criteria or checks postulated by appraisal theorists of emotion (as described and justified in Chapter 1 and Chapter 12). Both the scree plot and the stability of the structure across language groups seemed to point to only a two-factor structure in the Appraisal component, namely VALENCE APPRAISAL and NOVELTY APPRAISAL (see Chapter 12). This could be explained by the fact that virtually all appraisal criteria, except the NOVELTY appraisals, are strongly valenced in and of themselves (e.g., having POWER is positive, and violations of norms are bad; see also Chapter 1) and therefore all load on a single factor. This suggests that there is a VALENCE superfactor or general factor and a number of lower order appraisal factors. We computed the superfactor on the basis of four Appraisal features (positive and negative intrinsic pleasantness and goal conduciveness) and regressed this factor on the other theoretically postulated appraisal items. A subsequent factor analysis on the residual scores yielded six factors that corresponded well to the theoretically postulated groups of appraisal checks, namely NOVELTY/CHANCE CAUSE, COPING ABILITY, EXPECTED/FAMILIAR, GOAL RELEVANCE, NORM VIOLATION, and SELF VS OTHER CAUSE. This structure with one VALENCE APPRAISAL superfactor and six specific appraisal factors was also operationalized in the CoreGRID.

p. 531 The VALENCE APPRAISAL superfactor was operationalized by the following two appraisal features:

VALENCE APPRAISAL

- in itself pleasant for the person
- consequences negative for person

The factor scores derived from these two features correlated almost perfectly with the original valence appraisal factor ($r = 0.99$).

For each of the six specific appraisal factors two features were selected for the CoreGRID. Only the UNEXPECTED/CHANCE factor was represented by four features, because of the importance of NOVELTY appraisals to define the overall NOVELTY factor. Additionally, the COPING ABILITY factor was represented by three features, because of its theoretical importance for the POWER factor. The following 15 appraisal features were selected:

UNEXPECTED/CHANCE

- suddenly
- unpredictable
- caused by chance
- required an immediate response.

p. 532 ↳ COPING ABILITY

- enough resources to avoid or modify consequences
- consequences avoidable or modifiable
- consequences able to live with.

EXPECTED/FAMILIAR

- confirmed expectations

- consequences predictable.

GOAL RELEVANCE

- important and relevant for person's goals
- important and relevant for goals of somebody else.

NORM VIOLATION

- violated laws or socially accepted norms
- incongruent with own standards and ideals.

SELF VS OTHER CAUSATION

- caused by the person's own behavior
- caused by somebody else's behavior

After orthogonal Procrustes rotation, the selected 15 features reproduced the action tendency structure of the FullGRID very well, with a Tucker's phi of 0.98 and higher for all factors and factor score correlations of 0.87 and higher (see Table 44.6).

Table 44.6 Loadings of the residual CoreGRID appraisal features in a six-factorial Procrustes rotated structure and congruence with FullGRID appraisal structure

	NOVELTY/CHANCE CAUSE	COPING ABILITY	EXPECTED/FAMILIAR	GOAL RELEVANCE	NORM VIOLATION	SELF VS OTHER CAUSE
Residual CoreGRID appraisal features						
suddenly	0.88	-0.10	0.03	0.0-0	-0.02	0.03
unpredictable	0.84	-0.18	-0.12	0.00	0.04	0.11
caused by chance	0.78	-0.10	0.05	0.09	0.10	0.07
required an immediate response	0.66	0.24	-0.29	0.14	0.05	-0.06
enough resources to avoid or modify consequences	-0.05	0.84	0.12	-0.12	0.06	-0.17
consequences avoidable or modifiable	-0.03	0.80	0.18	-0.04	0.25	-0.14
consequences able to live with	0.00	0.71	0.11	0.32	-0.07	0.20
confirmed expectations	-0.24	0.01	0.75	0.32	-0.03	-0.09
consequences predictable	-0.22	0.38	0.71	0.09	-0.11	-0.18
important and relevant for person's goals	0.11	0.00	-0.05	0.89	-0.06	-0.19
important and relevant for goals of somebody else	0.04	0.05	0.13	0.80	-0.02	0.25
violated laws or socially accepted norms	0.11	0.02	0.00	-0.11	0.84	-0.22
incongruent with own standards and ideals	0.06	0.15	-0.06	0.06	0.84	0.22
caused by somebody else's behavior	0.34	0.01	0.34	0.16	0.03	0.70
caused by the person's own behavior	-0.06	0.24	0.36	0.07	0.09	-0.72
Congruence						
Tucker's phi	0.99	0.99	0.98	0.98	0.99	0.99
<i>r</i> factor scores	0.98	0.99	0.87	0.97	0.98	0.97

For theoretical reasons, the three coping ability items reported above were reformulated in the CoreGRID instrument with respect to the FullGRID, and three new appraisal items were added to them. In Chapter 12, it was observed that the appraisal features selected for the coping potential check only moderately predicted the overall POWER and the overall AROUSAL factors. Theoretically the coping ability features should have been the

most important predictors of the POWER factor. The fact that this was not observed can be reasonably attributed to the formulation of these features. Therefore it was decided to reformulate the above three COPING POTENTIAL features as follows:

- the person had POWER over the consequences of the event
- the person could control the consequences of the event
- the person could live with the consequences of the event.

In addition, the following two items were added to capture the powerless pole of the dimension:

- the event that caused this emotion was uncontrollable (new feature)
- the person was powerless in the situation (new feature)

Furthermore, one appraisal feature was added to represent dominance:

- the person had a dominant position in the situation (new feature)

As there was only one appraisal item that loaded on the overall AROUSAL factor, namely “required an immediate response,” the following feature was added to better capture the potential need for an urgent response:

- there was no urgency in the situation (new feature)

p. 533 Thus, in the CoreGRID the Appraisal component was operationalized by 21 features. In total, the final version of the CoreGRID instrument contains 68 features (of which four appraisal features ↵ and one feeling feature were added anew for theoretical reasons). This represents a substantial reduction from the original 144 items of the FullGRID, allowing a more economical rating procedure as more words can be processed in a given amount of time. The final CoreGRID instrument with instructions can be found in Appendix 3 of this volume. In the interest of making the chosen features as comprehensible and easily translatable as possible, we decided to slightly rephrase certain items without changing their meaning, following the suggestions of several English native-speaker advisers³. In consequence, the formulation of some items in the new CoreGRID instrument differs from those in the selection lists provided above for each of the components.

p. 534 In addition to questions about the five components discussed so far (Appraisal, Bodily reaction, Expression, Action tendencies, and Feeling), the original FullGRID also included questions concerning emotion regulation. These were not included in the CoreGRID instrument because, although systematic differences have been observed in the regulation features (see Chapter 10), ↵ regulation is not regarded as a separate component of emotion by most theorists and it adds very little to the meaning of emotion words over and above the five major emotion components. Rather than being highly constitutive for the semantic profiles of emotion words, regulation is better understood as a modifier that varies across individuals, groups, and contexts.

The overall structure of the CoreGRID instrument

After the selection of the CoreGRID features, it was also investigated whether they reproduced the overall four-factorial structure. A factor analysis on the 63 features with four factors accounted for 67.14% of the total variance. A simple VARIMAX rotation already revealed the expected structure of VALENCE, POWER, AROUSAL, and

p. 535 NOVELTY (see Table 44.7). Moreover, the scores of the emotion ↵

p. 536 ↵

terms on these CoreGRID factors correlated very highly with the factor scores on the FullGRID overall factors, namely 0.99, 0.96, 0.95, and 0.92 for VALENCE, POWER, AROUSAL, and NOVELTY, respectively. Thus, the CoreGRID faithfully reproduces the overall factor structure of the FullGRID.

Table 44.7 Loadings of the 63 CoreGRID features in a four-factorial structure after VARIMAX rotation

CoreGRID features	VALENCE	POWER	AROUSAL	NOVELTY
felt good	0.95	0.25	-0.03	0.06
in itself pleasant for the person	0.95	0.20	-0.01	0.08
wanted to sing and dance	0.94	0.20	0.02	0.07
smiled	0.94	0.22	-0.01	0.08
wanted the ongoing situation to last or be repeated	0.93	0.26	-0.04	0.06
felt calm	0.86	0.16	-0.34	-0.05
important and relevant for person's goals	0.85	0.18	0.00	0.03
important and relevant for goals of somebody else	0.79	0.21	-0.12	0.06
felt strong	0.78	0.53	0.09	-0.03
consequences able to live with	0.76	0.22	-0.15	-0.06
confirmed expectations	0.73	0.26	-0.13	-0.24
wanted to comply to someone else's wishes	0.71	-0.16	-0.12	-0.06
felt warm	0.59	0.25	0.42	-0.07
consequences predictable	0.50	0.22	-0.21	-0.41
caused by the person's own behavior	0.48	0.02	-0.06	-0.35
consequences avoidable or modifiable	-0.37	0.09	-0.12	-0.24
wanted to do nothing	-0.52	-0.49	-0.43	-0.14
produced speech disturbances	-0.53	-0.49	0.37	0.11
lacked the motivation to pay attention to what was going on	-0.54	-0.35	-0.36	-0.17
felt restless	-0.57	-0.07	0.36	-0.03
felt cold	-0.58	-0.51	-0.23	0.14
muscles tensing (whole body)	-0.65	0.09	0.60	0.14
felt weak	-0.68	-0.63	-0.16	-0.06
felt tired	-0.68	-0.36	-0.24	-0.20
got pale	-0.70	-0.56	0.04	0.21
had stomach troubles	-0.72	-0.41	0.21	-0.01
wanted to disappear or hide from others	-0.79	-0.50	-0.10	-0.12
violated laws or socially accepted norms	-0.81	-0.07	-0.03	0.06
wanted to run away in whatever direction	-0.81	-0.45	0.06	-0.02
wanted to undo what was happening	-0.84	-0.27	-0.08	-0.10

wanted to do damage, hit, or say something that hurts	-0.85	0.26	0.03	-0.11
frowned	-0.88	0.18	-0.07	-0.04
wanted to oppose	-0.88	0.25	0.02	-0.10
incongruent with own standards and ideals	-0.89	-0.07	-0.12	0.07
felt the urge to stop what he or she was doing	-0.89	-0.28	-0.02	-0.05
felt bad	-0.91	-0.32	-0.07	-0.10
consequences negative for person	-0.92	-0.19	-0.07	0.01
had an assertive voice	0.28	0.78	-0.01	-0.08
spoke louder	0.11	0.70	0.39	0.20
wanted to tackle the situation	0.22	0.57	0.12	-0.15
wanted to overcome an obstacle	0.08	0.35	0.17	-0.19
wanted to hand over the initiative to someone else	-0.15	-0.60	-0.10	-0.08
had tears	-0.00	-0.62	-0.08	-0.16
had a trembling voice	-0.44	-0.66	0.20	0.04
closed her or his eyes	0.01	-0.69	-0.25	-0.13
felt weak limbs	-0.29	-0.75	0.17	0.20
breathing getting faster	-0.08	0.13	0.89	0.21
heartbeat getting faster	0.23	0.11	0.87	0.18
sweat	-0.36	-0.16	0.72	0.07
spoke faster	0.25	0.51	0.67	0.19
was in an intense emotional state	0.14	-0.17	0.45	-0.07
spoke slower	-0.01	-0.51	-0.67	-0.17
breathing slowing down	0.40	-0.18	-0.69	-0.09
heartbeat slowing down	0.08	-0.29	-0.75	-0.05
unpredictable	0.01	-0.16	0.14	0.79
suddenly	0.16	-0.08	0.19	0.73
had the jaw drop	0.14	-0.00	-0.11	0.73
caused by chance	0.43	-0.00	0.07	0.63
had eyebrows go up	0.18	0.47	0.04	0.59
required an immediate response	-0.09	0.11	0.36	0.50
caused by somebody else's behavior	-0.15	0.28	-0.12	0.40
enough resources to avoid or modify consequences	-0.04	0.19	-0.14	-0.29

experienced the emotional state for a long time	0.26	-0.23	-0.11	-0.58
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Classification accuracy

p. 537 Finally, the accuracy of the classification of the 24 emotion terms on the basis of the CoreGRID and the FullGRID was compared. The accuracy of the classification was computed on the basis of the 63 CoreGRID features, the 22 CoreGRID emotion component factors, the four overall CoreGRID factors, the 142 FullGRID features, the 22 FullGRID emotion component factors, and the four overall FullGRID factors. The comparisons of the cross-classified accuracy in the multiple discriminant analyses show there is virtually no loss going from the FullGRID to the CoreGRID on each of the three levels of analysis, namely the level of the individual features, the level of the emotion component factors, and on the level of the four overall factors (see Table 44.8). The loss in overall accuracy is 2% or less. Looking at the accuracy percentages for the individual emotions, the picture shows more variation. For some emotion terms, the discrimination by the CoreGRID features is higher than for the FullGRID features; for other emotion terms the reverse is observed. This suggests that some of the features *not* included in the CoreGRID might in fact facilitate confusions. This is the case for some of the positive emotions, which are often confused among each other in the classification as well as for *irritation*, often confused with *anger*.

Table 44.8 Comparison between the CoreGRID and the FullGRID with respect to the classification accuracy for the 24 emotion words in discriminant analyses based on individual features, emotion component factor scores, and overall factor scores

Emotion words	FullGRID 142 features	CoreGRID 63 features	FullGRID Component factor scores	CoreGRID Component factor scores	FullGRID Overall factor scores	CoreGRID Overall factor scores
being hurt	85.3	82.4	70.6	70.6	41.2	50.0
sadness	88.2	85.3	94.1	94.1	82.4	82.4
shame	91.2	88.2	88.2	82.4	79.4	58.8
guilt	94.1	97.1	91.2	91.2	97.1	97.1
compassion	94.1	91.2	88.2	88.2	79.4	85.3
disappointment	85.3	85.3	79.4	82.4	76.5	82.4
love	97.1	97.1	97.1	91.2	97.1	88.2
contentment	73.5	70.6	70.6	73.5	67.6	67.6
happiness	38.2	47.1	38.2	47.1	58.8	50.0
pride	91.2	94.1	91.2	91.2	82.4	82.4
pleasure	67.6	70.6	61.8	61.8	38.2	29.4
joy	44.1	61.8	64.7	64.7	67.6	61.8
interest	97.1	94.1	91.2	91.2	79.4	88.2
surprise	100.0	100.0	100.0	100.0	100.0	97.1
despair	91.2	70.6	76.5	61.8	35.3	29.4
stress	91.2	85.3	82.4	79.4	70.6	52.9
anxiety	76.5	67.6	70.6	61.8	50.0	41.2
fear	94.1	94.1	91.2	91.2	82.4	79.4
jealousy	91.2	97.1	91.2	100.0	73.5	70.6
hate	79.4	73.5	79.4	85.3	67.6	61.8
irritation	58.8	70.6	61.8	64.7	11.8	38.2
anger	70.6	73.5	70.6	70.6	67.6	67.6
disgust	88.2	85.3	85.3	79.4	94.1	88.2
contempt	82.4	85.3	79.4	79.4	64.7	67.6
<i>Total</i>	82.1	82.0	79.8	79.3	69.4	67.4

All in all the comparisons between the CoreGRID and the FullGRID clearly indicate that both the emotion component factors and the overall factors are adequately reproduced by the CoreGRID, and that the CoreGRID feature patterns allow for almost as good an identification of the associated emotion terms as the one afforded by the FullGRID.

44.2 Development of the MiniGRID instrument

The MiniGRID, designed as a rapid screening instrument, was developed to assess the position of emotion terms on the four overall factors valence, power, arousal, and NOVELTY with only three to four features per dimension.

The construction of the MiniGRID was based on the following guidelines:

- 1 The MiniGRID features had to be a subset of the features selected for the CoreGRID.
- 2 Features from all emotion components (except Feeling, for reasons explained below) were to be represented. The Feeling component was not included for theoretical and pragmatic reasons. From a theoretical standpoint, the Feeling component is an emergent component triggered by activity in the Appraisal, Bodily reaction, Expression, and Action tendency components, which directly determines the feeling dimensions (see Chapter 1 and Chapter 8). The pragmatic reason is that the Feeling component factors add very little to the discriminative POWER of the component factors (see Chapter 13).
- 3 Features should be selected to represent the information in the four overall dimensions of VALENCE, POWER, AROUSAL, and NOVELTY, as well as possible.
- 4 The selected features per emotion component should empirically reproduce the overall factor structure of the FullGRID. After Procrustes rotation of the overall factors in the MiniGRID to the overall factors in the FullGRID, the congruence (Tucker's phi) should be at least 0.85 per factor and the factor scores should correlate at least at 0.80.⁴
- 5 The features of the MiniGRID had to achieve a good accuracy level in classifying the 24 emotion terms by discriminant analysis.

Based on these guidelines, the following 14 features were selected (the minus sign shown after some features indicates that they represent the negative pole of the respective dimension):

VALENCE

- event in itself pleasant for the person
- frowned (-)
- wanted to sing and dance.

POWER

- spoke louder
- felt weak limbs (-)
- closed his or her eyes (-)
- wanted to tackle the situation.

AROUSAL

- breathing getting faster
- sweat
- heartbeat getting faster.

NOVELTY

- suddenly
- unpredictable
- caused by chance
- had the jaw drop

As for the CoreGRID, in the interest of documenting systematic differences in intensity and duration in future research, we included the following two GRID features in the MiniGRID, bringing the number of features to 16:

Intensity

- was in an intense emotional state.

Duration

- experienced the emotion for a long time

The complete version of the MiniGRID, together with the suggested instructions, is reproduced in Appendix 4 of this volume (a Word document that can be duplicated directly for paper administration is available in Appendix 5). As described earlier, some of the original features were slightly reworded in the CoreGRID for easier readability. These improved versions were also used in the MiniGRID.

The overall structure of the MiniGRID instrument

A factor analysis was executed on the 14 component-related MiniGRID features (excluding intensity and duration, as these additional items would take too much weight in analysis with only 14 component-related features). A four factor solution accounted for 76.71% of the total variance. After orthogonal Procrustes rotation these four factors were highly congruent with the overall FullGRID factors (see Table 44.9). The Tucker's phi were 1.00, 0.99, 0.99, and 0.99 for VALENCE, POWER, AROUSAL, and NOVELTY, respectively. Moreover, also the factor scores were highly correlated between both versions. The Pearson correlations between them were 0.97, 0.89, 0.91, and 0.87 for VALENCE, POWER, AROUSAL, and NOVELTY, respectively.

Table 44.9 Loadings of the 14 MiniGRID features in a four-factorial structure after Procrustes rotation

MiniGRID features	VALENCE	POWER	AROUSAL	NOVELTY
in itself pleasant for the person	0.95	0.17	−0.03	0.07
wanted to sing and dance	0.95	0.16	0.00	0.05
frowned	−0.91	0.19	−0.09	−0.06
spoke louder	0.15	0.74	0.32	0.13
wanted to tackle the situation	0.25	0.66	−0.05	−0.17
felt weak limbs	−0.32	−0.72	0.33	0.20
closed her or his eyes	−0.00	−0.82	−0.13	−0.08
breathing getting faster	−0.06	0.27	0.90	0.13
heartbeat getting faster	0.25	0.24	0.88	0.11
sweat	−0.34	−0.06	0.81	0.00
unpredictable	−0.02	−0.08	0.17	0.85
suddenly	0.14	0.03	0.20	0.84
had the jaw drop	0.13	0.06	−0.06	0.72
caused by chance	0.46	0.05	0.07	0.68

Classification accuracy

The accuracy of the classification of the 24 emotion terms on the basis of the 14 component-related MiniGRID features (excluding intensity and duration, for the same reason given above) and the four overall MiniGRID factors has been compared with the accuracy of classification achieved on the basis of the 142 FullGRID features and the four overall FullGRID factors, respectively. ↵ The comparison of the accuracy in the multiple discriminant analyses shows there is a loss when going from the FullGRID to the MiniGRID for each of the two levels of analysis (see Table 44.10). However, the accuracy with the MiniGRID is still very high and much higher than the 4.2% that can be expected with random classification. With only 14 features, 69.9% of the terms could still be correctly classified (instead of the 82.1% achieved by the 142 features of the FullGRID), and with the four overall factors of the MiniGRID, 61.4% could still be correctly classified, instead of the 69.4% afforded by the overall factors in the FullGRID. The loss in accuracy is thus relatively minor, given that there are almost ten times fewer features. But, interestingly, in the case of the MiniGRID, there are disproportionally high losses for some of the less frequently studied emotions like *being hurt*, *despair*, and *compassion*, as well as for some of the most common ones, like *anger* and *anxiety*.

Table 44.10 Comparison between the MiniGRID and the FullGRID with respect to the classification accuracy for the 24 emotion words in discriminant analyses based on individual features, overall factor scores, and scale scores

Emotion words	FullGRID 142 features	MiniGRID 14 features	FullGRID overall factor scores	MiniGRID overall factor scores	MiniGRID overall scale scores
being hurt	85.3	38.2	41.2	35.3	26.5
sadness	88.2	85.3	82.4	73.5	70.6
shame	91.2	73.5	79.4	50.0	52.9
guilt	94.1	88.2	97.1	88.2	82.4
compassion	94.1	79.4	79.4	67.6	67.6
disappointment	85.3	73.5	76.5	76.5	70.6
love	97.1	94.1	97.1	82.4	82.4
contentment	73.5	61.8	67.6	67.6	61.8
happiness	38.2	50.0	58.8	38.2	32.4
pride	91.2	91.2	82.4	88.2	91.2
pleasure	67.6	64.7	38.2	29.4	32.4
joy	44.1	61.8	67.6	70.6	67.6
interest	97.1	91.2	79.4	85.3	88.2
surprise	100.0	100.0	100.0	100.0	100.0
despair	91.2	41.2	35.3	38.2	32.4
stress	91.2	73.5	70.6	55.9	55.9
anxiety	76.5	52.9	50.0	50.0	47.1
fear	94.1	85.3	82.4	79.4	88.2
jealousy	91.2	73.5	73.5	44.1	44.1
hate	79.4	64.7	67.6	67.6	64.7
irritation	58.8	38.2	11.8	26.5	20.6
anger	70.6	61.8	67.6	67.6	61.8
disgust	88.2	67.6	94.1	38.2	47.1
contempt	82.4	64.7	64.7	52.9	58.8
<i>Total</i>	82.1	69.9	69.4	61.4	60.3

Scale scores for the MiniGRID factors

Finally, as the MiniGRID is meant to be used as a screening instrument, we also looked at the simple scale scores to estimate the position of emotion terms on each of the four dimensions. The scale scores are computed as the sum of the respective feature scores. The scales are fairly reliable for each of the four factors. The Cronbach's alpha is 0.93, 0.72, 0.86, and 0.79 for VALENCE, POWER, AROUSAL, and NOVELTY, respectively. Moreover, the scales scores are very highly correlated with the overall factor scores of the MiniGRID (namely 0.99, 0.97, 0.97, and 0.96 for VALENCE, POWER, AROUSAL, and NOVELTY, respectively) and with the overall factor scores of the FullGRID (namely 0.97, 0.89, 0.91, and 0.84 for VALENCE, POWER, AROUSAL, and NOVELTY, respectively). Furthermore, there is almost no loss when the scale scores are used instead of the MiniGRID factor scores in a multiple discriminant analysis (only a loss of 1.1% cross-classified accuracy). Thus, simple scale scores can be used to assess the position of emotion terms in the four-factorial structure.

44.3 Conclusions

p. 540

The analyses on the two short versions of the GRID instrument, the CoreGRID (68 items), and the MiniGRID (16 items), confirm the extraordinary stability of the componential structure of the emotion terms and of the internal factors within each component. The fact that the very high discriminability of the emotion terms is conserved, after a drastic reduction in the number of features used, testifies to the robustness, but also the shared prototypical core of the meaning of major emotion terms. While an individual's emotions might vary widely in a complex manner [↳] based on subjective appraisal and salient aspects of the context, the representation of what types of antecedents and responses should be represented in the componential meaning of common emotion terms seems to be highly constrained. This is to be expected, of course, for words in a language constitute a code used for communication in a given culture, which requires conciseness and stability of meaning.

p. 541

The CoreGRID may become the default instrument for most research purposes in the future. It offers a highly satisfactory trade-off between economy and informational value. With only 68 features, it accurately captures the major factors in each of the emotion components put forward by the Component Process Model, and it affords a very good accuracy in the discrimination of emotion terms on the basis of their feature profile. If one is only interested in identifying the position of a large set of emotion terms in the overall four-dimensional space of VALENCE, POWER, AROUSAL, and NOVELTY, the MiniGRID constitutes a good alternative. However, if one is interested in identifying differences between related emotion terms within or between languages, or is interested in a more exhaustive representation of one or more emotion components, the FullGRID instrument remains the best choice.

Notes

- 1 Corresponding author: Klaus R. Scherer. Swiss Center for Affective Sciences—University of Geneva. 7, Rue des Batoirs, CH-1205 Geneva, Switzerland. Klaus.Scherer@unige.ch
- 2 All analyses have been executed on the 142 by 816 data matrix, with the 142 columns representing the 142 features in the FullGRID and the 816 rows representing the 24 emotion terms in the 34 samples (see Chapter 5 for a full description).
- 3 The authors would like to thank Tony Manstead, Paula Niedenthal, Jenefer Robinson, and Gerhard Stemmler for their valuable input on this matter.
- 4 See note 2.