European Journal of Personality, *Eur. J. Pers.* **26**: 484–495 (2012)
Published online 4 October 2011 in Wiley Online Library (wileyonlinelibrary.com) **DOI**: 10.1002/per.847

Capturing the Structure of Distinct Types of Individual Differences in the Situation-specific Experience of Emotions: The Case of Anger

EVA CEULEMANS*, PETER KUPPENS and IVEN VAN MECHELEN
Katholieke Universiteit Leuven, Belgium

Abstract: The aim of this paper was to understand why some people experience certain emotions in a specific situation, whereas others do not. We postulate that these individual differences arise from individual differences in two underlying processes of emotion elicitation: (i) individual differences in the emotion components (appraisals and action tendencies) that situations activate in a person and (ii) individual differences in how these emotion components are related to subjective emotional experience. In this paper, we re-analysed data from two studies on anger to capture the structure of these two types of individual differences by using clustering modelling techniques. Consistent results across the two studies demonstrated that individuals differ in anger because they (i) differ in how easy they experience anger-relevant appraisals (Studies 1 and 2) and action tendencies (Study 2) in increasingly negative situations and (ii) differ in which of these components are necessary to experience anger. Copyright © 2011 John Wiley & Sons, Ltd.

Key words: statistical methods; antisocial behaviour; anger; personality types; emotions

For practitioners, behavioural researchers and laypeople, it is self-evident that emotional life can dramatically differ across individuals: next to dispositional differences in how often individuals experience specific emotions, individuals can vary considerably in how they respond emotionally to a given situation (Lazarus, 1994). As an example, when a partner ends a romantic relationship, this can elicit the feeling of anger in one individual but the feeling of sadness in another individual. As the subjective experience of emotions may have important personal and interpersonal consequences, understanding why some persons experience a particular emotion in a specific situation whereas others do not is a major challenge for emotion research (Griner & Smith, 2000; Roseman & Smith, 2001; Smith & Pope, 1992). To address this issue, a theory about the psychological processes that govern emotion elicitation is required. On the basis of such a theory, individual differences in subjective emotional experience could be accounted for by empirically investigating which of the implied psychological processes are subject to individual differences and in what way.

Two-step process of emotion elicitation

In search for such psychological processes underlying emotion elicitation, we start from componential theories, which have gained widespread acceptance in the field of emotion (for overviews, see, e.g. Gross, 1999; Reisenzein, 2000). Central to these theories is the assumption that every emotion involves a distinct pattern of experiential emotion components, including appraisals, action tendencies and subjective experience (cognitive–evaluative theory of emotion; e.g. Frijda, 1986; Scherer, Schorr, & Johnstone, 2001), or a mapping of beliefs and desires (cognitive–motivational theory of emotion; e.g. Reisenzein, 2009). This leads to the following process analysis of emotion elicitation (Figure 1; e.g. Kuppens & Tong, 2010; Kuppens, Van Mechelen, & Rijmen, 2008): (i) When a person faces a specific situation, this situation activates a number of emotion components in that person. For instance, according to appraisal/cognitive–motivational theories, the situation is appraised as a function of the characteristics of or beliefs about the situation and the person's own goals, concerns and desires. (ii) Particular patterns of emotion components are necessary and/or sufficient to experience specific emotions. At this point, we would like to note that in this paper, we use the terms necessity and sufficiency in a logical sense, without implying any causal claims about the relationships among the different experiential emotion components. Our analyses therefore speak to how such components are associated with the experience of certain emotions, and as such shed light on what people experience when they experience, say, 'anger'. Several authors (e.g. Frijda, 1993; Solomon, 1988) indeed argue that emotion components constitute the content of an emotion.

Although all componential theorists endorse the central assumption that the subjective experience of a specific emotion is related to a distinct pattern of emotion components, they debate a number of other issues. One important topic of discussion regards the distinct patterns that should be viewed as central to specific emotions. Considering the emotion of anger, some theories state that the experience of anger is related to a specific combination of appraisals or belief–desire combinations (goal relevance, goal incongruence, other-blame) that all have to be present for people to experience anger (e.g. Reisenzein, 2009; Smith & Lazarus, 1993). Others, for example, Berkowitz and Harmon-Jones

*Correspondence to: Eva Ceulemans, Katholieke Universiteit Leuven, Andreas Vesaliusstraat 2, B-3000 Leuven, Belgium.
E-mail: eva.ceulemans@ppw.kuleuven.be

Copyright © 2011 John Wiley & Sons, Ltd.

Received 12 October 2010
Revised 30 August 2011, Accepted 31 August 2011

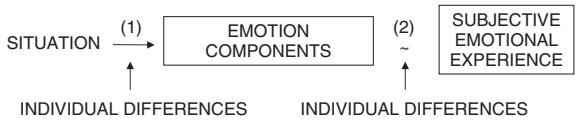

Figure 1. Process analysis of emotion elicitation: (i) situations activate patterns of emotion components and (ii) patterns of emotion components are associated with the subjective experience of emotions. Both processes may be subject to individual differences (Kuppens & Tong, 2010).

(2004), postulate a minimal theory about the determinants of anger in which negative arousal is the only component that is necessary.

Two sources of individual differences

The two psychological processes as distinguished previously may in principle be subject to individual differences (Figure 1). As such, it can be argued that individual differences in the emotions that people experience in specific situations may arise from at least two different sources: (i) individual differences in the emotion components that situations activate in persons and (ii) individual differences in how these emotion components are related to subjective emotional experience (for a review, see Kuppens & Tong, 2010). Previous research provides support for this conjecture, indeed. Regarding the first source, Kuppens and Van Mechelen (2007), for instance, revealed individual differences in the ease with which anger-relevant appraisals are elicited by specific unpleasant situations; similar differences were reported by Smith and Pope (1992) and Griner and Smith (2000). Regarding the second source, Kuppens, Van Mechelen, Smits, De Boeck, and Ceulemans (2007) and Van Mechelen and Hennes (2009) recently reported evidence that suggests the existence of individual differences in which appraisals are necessary and sufficient to experience anger. Along similar lines, independent research by Silvia and Tong has demonstrated individual differences in the strength of the association between particular appraisals and the subjective experience of specific emotions (e.g. Silvia, 2005; Silvia, Henson, & Templin, 2009; Tong, 2010a, 2010b). In a way, including such individual differences may provide a solution for the controversies between componential theorists. For instance, whereas many appraisal researchers argue about which specific set of appraisals is necessary for all individuals to subjectively experience a particular emotion, it may very well be that many of these theories are in fact correct in that they each hold for a specific subset of individuals.

In sum, it should be clear that emotional experience is a function of a multitude of factors: how context shapes emotion components, how emotion components shape emotional experience and how people differ in these respects. A theory aimed at explaining emotional experience must therefore take all of these factors into account, as well as should a full empirical test. In contrast, most studies regarding these two sources of individual differences focus on how one particular appraisal is related to subjective emotional experience and often do not take into account context. However, as componential theories argue that the subjective experience of a specific emotion involves a distinct pattern of emotion components, investigating emotion component patterns instead of individual emotion components seems crucial (Tong, 2010a).

Quantitative and qualitative perspectives

Within the process analysis framework outlined previously, our original research question—how can we account for individual differences in subjective situation-specific emotional experience—may be further refined into a quantitative and a qualitative question. From a quantitative point of view, one may wonder how much of the individual differences variability in emotional experience is to be attributed to each of the two postulated sources of individual differences, without further describing the content of these individual differences. From a qualitative point of view, one may wish to gain insight into the nature of the two types of individual differences under study by investigating their structure.

To answer the quantitative question, Kuppens et al. (2008) recently presented findings that decompose the overall amount of individual differences variance in subjective situation-specific emotional experience into three variance components: (i) individual differences in how one appraises one's circumstances, (ii) individual differences in how appraisals relate to emotional experience and (iii) individual differences independent from situation and appraisal. Kuppens et al. (2008) demonstrated that variability in the subjective experience of anger primarily stems from variability in how a situation is appraised by the individual, although they found the two other sources of variance to be non-negligible either. The qualitative question, however, has received only scant research attention up till now. Exceptions include initial attempts to answering this question for the emotions of anger and sadness (Kuppens et al., 2007; Vansteelandt & Van Mechelen, 2006; see also Tong, 2010b), albeit without disentangling the distinct sources of individual differences. Most probably, this lack of empirical research is mainly caused by the lack of a methodology capable of simultaneously studying and disentangling both types of individual differences.

CLASSI approach

Recently, a method called CLASSI (Ceulemans & Van Mechelen, 2008) has been proposed, which was explicitly designed to disentangle and simultaneously summarize different sources of individual differences in sequential processes. In particular, on the basis of the emotion components and emotional experiences that people report in a set of standardized situations, CLASSI induces two person typologies, with the first typology describing individual differences in the emotion components that are activated by the situations and the second typology summarizing individual differences in how emotion components are related to subjective emotional experience. As such, CLASSI was tailor-made to study the qualitative research question as outlined previously: by examining the situation–emotion component associations and the emotion component–emotional experience associations that characterize the different person types of the two person typologies as

Copyright © 2011 John Wiley & Sons, Ltd.

DOI: 10.1002/per

derived from a CLASSI analysis, we can gain insight into the content of both types of individual differences.

The principal aim of the present paper was to use CLASSI to shed light on the two types of individual differences in subjective situation-specific emotional experience as distinguished previously. In pursuit of this aim, we will present two studies that focus on the emotion of anger. Both studies rely on data that have been reported in previous studies of the relations between anger and appraisals (Study 1: Kuppens & Van Mechelen, 2007; Study 2: Kuppens et al., 2007). Yet, the present study goes beyond these previous studies: first, by systematically analysing the structure of the two types of individual differences; second, by allowing these two types of individual differences to be qualitatively different (see higher); third, by studying component patterns instead of focusing on individual components separately; and fourth, by taking into account the situational context in which components and emotions are elicited. As a result, the two studies paint a more comprehensive picture of how the experience of anger is simultaneously determined by emotion components, context and individual differences.

Specifically, we will first report on a study that relied on a directed imagery task: participants were presented with several scenarios depicting unpleasant situations. For each scenario, they were asked to vividly imagine themselves in this situation and to rate their reactions in terms of anger and of the following anger-related appraisals: motivational relevance, frustration, other accountability, disrespect, hostile attribution and threat to self-esteem. These appraisals were selected on the basis of a systematic review of the componential theories of anger as formulated by Ellsworth and Smith (1988), Frijda (1986, 1993), Scherer (1993) and Smith and Lazarus (1993), to capture most if not all of the appraisals that are considered central to the emotion of anger. Study 2 focused on the appraisals of frustration, other accountability, unfairness and threat to self-esteem, and also included the action tendency most closely related to anger, antagonism (Frijda, 1986).

As an additional aim, in our analyses, we will examine whether the two person typologies as revealed by CLASSI are related to trait anger (the general proneness to experience anger). Although trait anger is a widely used individual differences dimension with consequential correlates (in terms of heart disease, relationship satisfaction, etc.), fairly little is known about the processes underlying individual differences in trait anger. As such, relating trait anger to individual differences in the two considered processes of emotion elicitation may help to gain more insight into why some people are more prone to experiencing anger than others. Regarding the relation between trait anger and the first person typology (individual differences in activated emotion components across situations), we expect that an unpleasant situation will elicit more anger-relevant appraisals for individuals with higher trait anger scores. In other words, high levels of trait anger are related to a heightened tendency to appraise events in anger-eliciting ways. This hypothesis has firm empirical backing (for an overview, see Kuppens & Tong, 2010) and also resonates with the Appraisal Tendency Framework discussed by Lerner and Keltner (2000, 2001) and Lerner and Tiedens (2006) in which it is postulated that the subjective experience of an emotion activates a cognitive predisposition to appraise future events in line with the central appraisal dimensions that triggered the emotion. Regarding the relation between trait anger and the second person typology (individual differences in emotion component–emotion experience relationships), we hypothesize that the higher trait anger, the less conditions that have to be met for the individual to experience anger (e.g. Kassinove & Eckhardt, 1994; Muran, Kassinove, Ross, & Muran, 1989). For instance, the appraisal of frustration and an anger-related action tendency could be sufficient to elicit anger from participants with a high trait anger score, whereas participants scoring low on trait anger could also need the appraisal of other accountability to get angry.

STUDY 1

The aim of this first study was to obtain a first assessment of how individual differences in the subjective experience of anger across different situations are related to individual differences in the two distinguished processes. To this aim, we re-analysed data reported by Kuppens and Van Mechelen (2007). These authors set up a study to examine the determinants of specific anger-relevant appraisals. Although Kuppens et al. (2008) re-analysed a subset of these data[1] to determine which amount of variance the two types of individual differences under study explain (i.e. the quantitative question discussed higher), our CLASSI analysis addresses a different question, namely the qualitative nature of the structure of individual differences in both the anger-relevant appraisals that are activated by unpleasant events and the necessity of appraisal patterns for experiencing anger. Note that in this study, no action tendencies were included. Furthermore, we will investigate whether both these types of individual differences relate to trait anger as hypothesized.

Method

Participants

A total of 361 psychology students participated in return for course credit. Participants with missing data on the directed imagery task were removed from further analyses, resulting in a total number of 357 participants who were included in the present study. The sample consisted of 296 men and 59 women (two participants did not report their sex), with an average age of 18.6 years.

Materials

Scenarios. A list of 24 scenarios was used that depict unpleasant situations easily encountered by university students during daily life. As the descriptions were initially designed to evaluate theoretical models of anger appraisals (Kuppens & Van Mechelen, 2007), they encompass a broad range of contents intended to elicit or not to elicit a variety of anger-related appraisals. A summary description of the 24 scenarios can be found in Table 1.

[1]Kuppens et al. (2008) only used the appraisals of motivational relevance, frustration and other accountability.

Copyright © 2011 John Wiley & Sons, Ltd.

DOI: 10.1002/per

Appraisals and anger experience items. Eleven items were included to measure six appraisals: to what degree 'is what is happening in the situation important to you?' (motivational relevance); 'do you feel threatened in your self-esteem?' (threat to self-esteem); 'does this situation personally affect you?' (threat to self-esteem); 'do you feel attacked by someone else?' (hostile attribution); 'do you think that someone else has bad intentions towards you?' (hostile attribution); 'do you feel treated disrespectfully by someone else?' (disrespect); 'do you think that someone else does not take your feelings into account?' (disrespect); 'do you blame someone else for what has happened?' (other-blame); 'do you hold someone else responsible for what is happening?' (other-blame); 'do you think that this situation obstructs your goals or plans?' (frustration); and 'do you find this situation frustrating?' (frustration). The experience of anger was measured by the following item: 'to what degree do you feel angry in this situation?'

Trait anger. Trait anger was measured by means of the Dutch adaptation of the Spielberger Trait Anger Scale (van der Ploeg, Defares, & Spielberger, 1982). This scale consists of 10 items, such as 'I have a fiery temper' and 'I am a hotheaded person', rated on a 4-point scale (from 1 = *almost never* to 4 = *almost always*).

Procedure

The participants received a booklet containing the instructions and all materials. In particular, for each scenario, the participants were instructed to vividly imagine how they would feel and think if they found themselves in the situation, and then to rate the presented appraisals and anger experience items accordingly, making use of a 7-point scale (ranging from 1 = *not at all*, 3 = *a bit* and 5 = *rather strong* to 7 = *very strong*). Additionally, the participants had to fill out the trait anger questionnaire.

Analyses

The obtained data on the situation-specific appraisals and subjective anger experience of persons were analysed by means of CLASSI (Ceulemans & Van Mechelen, 2008), a method that was explicitly designed for disentangling and simultaneously summarizing individual differences in sequential processes. In the following paragraphs, we will introduce the most essential aspects of CLASSI analysis.

Required data. CLASSI requires data on the appraisals and the subjective experience of anger in a number of situations, for a number of persons. Note that to disentangle whether differences in appraisal patterns are due to person or situation characteristics, it is essential that the same set of situations is studied for each person (otherwise, found

Table 1. Summary of situation descriptions used in Study 1, grouped according to the situation typology of the CLASSI solution of rank (5,3,4,2)

Summary situation description	Fit percentage
Situation type 1	
You miss a popular party because you fall asleep.	86.9
A floppy disc holding an important school appointment is destroyed by your computer.	86.7
Your clock failed to wake you up in the morning, and you miss the final class of a course.	86.3
You did not study hard for an exam, and you fail.	83.7
On holiday with friends, each in turn has to carry the heavy tent gear. One day, the tent gear is missing.	79.8
Upon leaving class, you notice that a police officer is removing your bike because it was illegally parked.	75.2
You are in love with someone, but he or she is more interested in someone else.	72.5
Your friend is in coma after an accident.	69.1
Situation type 2	
A swimming appointment is cancelled because your friend falls ill.	87.8
You are hit on your bike by another biker. He or she apologizes and proposes to pay back the damage.	82.0
The restaurant waiter informs you that it is a busy evening. You are served after 50 minutes waiting.	75.6
Situation type 3	
You arrange with your roommates that each in turn has to put out the garbage. When it is someone else's turn, you noticed that he or she did not clean up.	78.3
You bump into someone on the street.	78.3
You are out for a drink after a hard day's work, and you have to wait 30 minutes before you are served.	76.7
Situation type 4	
You have a group assignment. The others do not work hard, and you all get a bad grade.	81.4
A fellow student fails to return your notes when you need them for studying.	80.2
You arranged for a hotel room with sea view. Upon arrival, you are given a room with no sea view.	75.6
A friend returns your CD player. Without notice, it turns out to be broke afterwards.	75.0
You arrange with a good friend to go out together, but you do not hear from him or her.	73.8
You are hit by a car on your way to an important appointment, causing you to miss the appointment.	73.6
Your roommates went to the movies without informing you.	66.8
Situation type 5	
A friend spreads gossip about you.	86.4
A friend lets you down on a date and lets you know that he or she did not feel like meeting with you and went out with other people instead.	83.4
You are fired from your holiday job.	73.4

Copyright © 2011 John Wiley & Sons, Ltd.

DOI: 10.1002/per

differences could either be due to differences in the situations that people report upon or to differences in how people appraise these situations; Vande Gaer, Ceulemans, Van Mechelen, & Kuppens, in press).

As the CLASSI method was only developed for binary data (i.e. 0/1 data), the data values of the present study were dichotomized by replacing values ranging from 1 to 3 by 0 and values ranging from 4 to 7 by 1. This choice implies that we consider appraisals and anger to be present if they are at least of moderate intensity.

Model. A CLASSI model offers a summary description of the relationships available in the data: which appraisals are elicited in particular contexts, which appraisals are related to the subjective emotional experience and how these relationships differ across people. Specifically, a CLASSI model identifies (i) situation types, that is, types of functionally equivalent situations that activate the same appraisals in all persons under study; (ii) appraisal types, that is, types of appraisals that co-occur across persons and situations; (iii) types of persons that have similar appraisal profiles across the situations (and which are further called situation–appraisal person types); and (iv) types of persons for which the same appraisal patterns are necessary for the subjective experience of anger (and which are called appraisal–anger experience person types). Note that (iii) and (iv) directly correspond to the two types of individual differences of interest.

Data analysis. Given a pre-specified number of situation types, appraisal types, situation–appraisal person types and appraisal–anger experience person types, a model that optimally describes the data can be obtained using the algorithm proposed by Ceulemans and Van Mechelen (2008).

Model selection. In most cases, it is not known beforehand how many appraisal, situation and person types are needed to obtain a parsimonious yet adequate (i.e. good fitting) summary description of the data. Therefore, Ceulemans and Van Mechelen (2008) suggest to analyse the data with varying number of types and use the data-driven, numerical convex hull based model selection procedure (Ceulemans & Kiers, 2006, 2009) to retain a solution that describes the data well without being overly complex. The key idea behind the convex hull procedure is that one should select a solution that is located on the lower boundary of the convex hull of a scree-like plot (sum of the number of situation, emotion component types and person types on the *X*-axis, and sum of the squared prediction errors of the different solutions on the *Y*-axis). Among these solutions, a final solution is selected by considering the decrease in sum of squared errors and the interpretability of the solutions. Specifically, as we were interested in understanding individual differences, we selected the least complex solution that has minimum two person types for the situation–appraisal relations and the appraisal–emotion relations.

Relation to existing methods. CLASSI has features in common with a number of existing exploratory multiway methods. Like three-mode component analysis (Kroonenberg, 2008), it is a method for three-mode data. Like clusterwise regression (De Sarbo, Oliver, & Rangaswamy, 1989), it allows to study individual differences in underlying regression models. Like three-mode partitioning (Schepers, Van Mechelen, & Ceulemans, 2006) and Tucker3-HICLAS (Ceulemans, Van Mechelen, & Leenen, 2003), it clusters the different modes of the data. However, CLASSI differs from all these models in that it is the only method that allows to disentangle the two sources of individual differences that we want to shed light on in this paper in the same analysis. For instance, Tucker3-HICLAS, a clustering method for binary three-mode data that Kuppens et al. (2007) used to analyse the data of Study 2, induces only one person typology that does not discriminate between appraisals and emotion experience (i.e. appraisals and emotion experience are treated identically in the analysis).

Results and discussion

Model selection

On the basis of the model selection procedure described previously, a solution that included (i) five situation types, (ii) three appraisal types, (iii) four situation–appraisal person types and (iv) two appraisal–anger experience person types was selected. This (5,3,4,2) CLASSI model reconstructed 78.7% of the data correctly (i.e. for 78.7% of the data cells, the predicted score equals the observed score). Figure 2 provides a graphical representation of the selected model; more information on how to read these figure will be given in the succeeding text.

Situation typology

Table 1 presents summary descriptions of the 24 unpleasant situations, grouped according to the situation typology of the selected CLASSI model. The rightmost column of Table 1 gives fit percentages for each situation, reflecting how well the data concerning each situation are reconstructed by the CLASSI model. The situation typology may be interpreted as follows. First, a distinction is made between unpleasant situations, almost all of which are caused by oneself (type 1), and unpleasant situations that are caused by others (types 2 up to 5). Second, the other-caused situations are further differentiated in terms of how personally negative these situations are for the persons under study: situations that belong to types 2, 3, 4 and 5 are increasingly negative for the protagonist, although one could argue that the difference between types 2 and 3 is rather small. This intuitive interpretation of the four other-caused situation types was empirically corroborated by asking eight experts (researchers in personality and social psychology) to evaluate each situation (on a scale ranging from 1 = *does not apply* to 7 = *applies very strong*) with respect to how negative it is for the protagonist. The average (i.e. averaged over experts) negativity rating of the situations is strongly positively correlated to the abovementioned ordering of the situations ($r = .80$, $p = .0006$; for type 2 up to type 5, the average negativity rating equalled 3.96 ($SD = 0.21$), 3.92 ($SD = 0.12$), 4.96 ($SD = 0.31$) and 5.25 ($SD = 0.51$), respectively).

Copyright © 2011 John Wiley & Sons, Ltd.

DOI: 10.1002/per

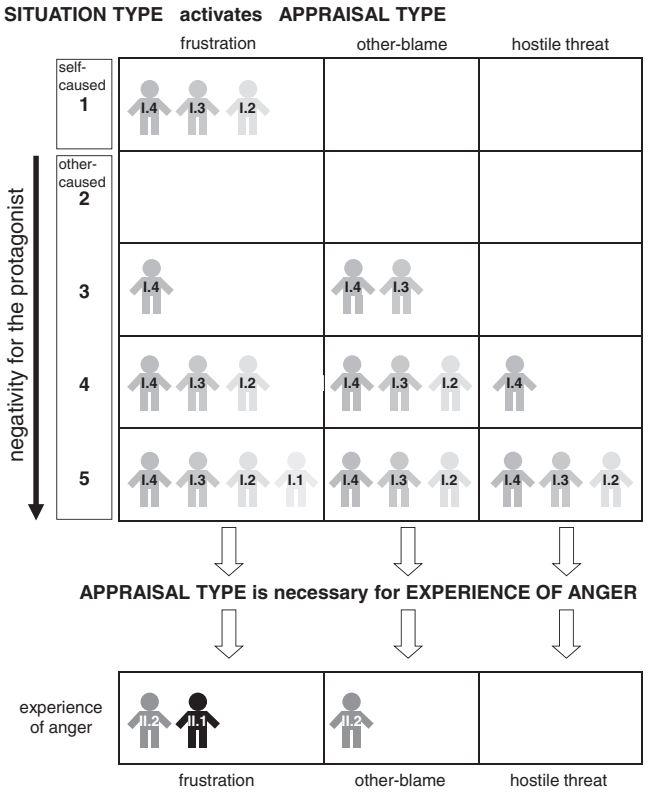

Figure 2. CLASSI solution for Study 1. The upper grid displays individual differences in situation/appraisal relations: person types I.1 ($n = 41$), I.2 ($n = 107$), I.3 ($n = 134$) and I.4 ($n = 75$) experience an appraisal type (column) in a situation type (row) if the associated manikin shows up in the corresponding cell of the grid. The lower grid displays individual differences in appraisal/emotional experience relations: an appraisal type is necessary to become angry for person types II.1 ($n = 231$) and/or II.2 ($n = 126$) if the corresponding cell of the grid contains the associated manikin. Note that darker colours are used for person types that experience more appraisals or more anger.

Appraisal typology

Three different types of appraisals were identified by the model. The type memberships and associated fit percentages of the appraisals are presented in Table 2. The first type of appraisals includes frustration and importance as the most defining elements (cf. fit percentages) and goal blocking as additional element. We will refer to this appraisal type as *frustration*. The second type includes appraisals that imply *other-blame*, such as other accountability, other-blame and disrespect. Finally, the third appraisal type reflects both hostile attributions as personal threats and the personal significance this entails, and was labelled *hostile threat*.

Individual differences in the appraisals that are activated by the situations

The selected CLASSI model identifies four person types for the first process of anger elicitation. These person types, labelled as person types I.1 up to I.4, consisted of 41 (11.5%), 107 (30.0%), 134 (37.5%) and 75 (21%) participants, respectively, and differ from one another in how easy increasingly negative other-caused situations elicit the different appraisal types, with person type I.1 experiencing the least appraisals and person type I.4 experiencing the most. This can be derived from the manikins in the upper grid in Figure 2, which should be read as follows: a particular situation type (row) elicits a specific appraisal type (column) in a person type (manikins) if the corresponding manikin shows up in the corresponding cell of the grid. For instance, it can be seen that person type I.1 only reacts to the most negative other-caused situations (type 5) by experiencing frustration whereas person type I.2 experiences all three appraisal types in these situations. Note that these individual differences in the experience of appraisals are also indicated by the colour of the manikins, where darker colours are used for person types that experience more appraisals. Finally, the rank order of person types in terms of amount of appraisals experienced is positively related to trait anger across participants ($r = .25$, $p < .0001$): the more easily a participant experiences the different appraisals in the different situations, the higher his or her trait anger score.

Individual differences in the necessity of specific appraisals for the experience of anger

With respect to individual differences in the second process of anger elicitation, that is, in the necessity of the appraisals to experience anger, the model extracts two types of participants, labelled as person types II.1 and II.2. These two types contain 231 (64.7%) and 126 (35.3%) participants, respectively, and are only moderately related to the person types

Table 2. Appraisals used in Study 1, grouped according to the appraisal typology of the CLASSI solution of rank (5,3,4,2)

Appraisal	Fit percentage
Appraisal type 1: frustration	
To what degree do you find this situation frustrating?	78.9
To what degree is what is happening in the situation important to you?	76.3
To what degree do you think that this situation obstructs your goals or plans?	64.8
Appraisal type 2: other-blame	
To what degree do you think that someone else does not take your feelings into account?	80.9
To what degree do you feel treated disrespectfully by someone else?	79.9
To what degree do you blame someone else for what has happened?	78.7
To what degree do you hold someone else responsible for what is happening?	77.3
Appraisal type 3: hostile threat	
To what degree do you think that someone else has bad intentions towards you?	88.1
To what degree do you feel threatened in your self-esteem?	85.7
To what degree do you feel attacked by someone else?	81.2
To what degree does this situation personally affect you?	74.7

Copyright © 2011 John Wiley & Sons, Ltd.

DOI: 10.1002/per

for the first process (correlation between both typologies: $r = -.25$, $p < .0001$). The manikins in the lower grid in Figure 2 indicate that these person types differ with respect to the appraisals that are necessary to become angry: whereas for person type II.1 only frustration is necessary to experience anger (the manikin of person type II.1 only shows up in the frustration cell), person type II.2 in addition requires other-blame (the manikin of person type II.2 shows up in both the frustration and the other-blame cells). In other words, person type II.1 has a lower threshold for experiencing anger (frustration is sufficient), and person type II.2 has a higher threshold (requiring other-blame in addition to frustration). This implies that person type II.1 more frequently experiences anger than person type II.2. Interestingly, participants assigned to the lower threshold type (II.1) also had significantly higher trait anger scores than the participants belonging to person type II.2 ($t = 5.86$, $p < .0001$, $r_{pb} = -.30$). A multiple regression analysis further revealed that the obtained individual differences in both considered processes of anger elicitation independently contribute to individual differences in trait anger (first process: $\beta = .19$, $t = 3.64$, $p < .001$; second process: $\beta = -.25$, $t = -4.86$, $p < .001$).

STUDY 2

Study 1 revealed that individual differences in the subjective situation-specific experience of anger result from a complex yet intelligible interplay of individual differences in the two considered processes of emotion elicitation. One may wonder, however, to what extent this complex CLASSI structure is determined by particularities of Study 1, such as the set of situations or the sample of participants, which consisted of psychology students only, or the particular wording of the appraisal items (which may have had particular connotations that contributed to shaping the results without being necessarily relevant to the underlying processes). Therefore, the main aim of this study was to replicate the findings of Study 1, by using a different set of unpleasant situations, a more representative sample of participants and a set of largely overlapping but differently worded appraisal items. To this end, we re-analysed data of Kuppens et al. (2007) by means of CLASSI. As discussed previously, these data were previously analysed with Tucker3-HICLAS, a method that does not allow disentangling the two types of individual differences as appraisals and anger experience have the same role in the analysis. Furthermore, Kuppens et al. (2008) re-analysed a subset of these data[2] to determine which amount of variance the two types of individual differences explain (i.e. the quantitative question discussed higher). Study 2 also relied on a directed imagery task but focused on the appraisals of frustration, other accountability, unfairness and threat to self-esteem. Moreover, Study 2 included the action tendency of antagonism, which is the central action tendency associated with anger and is even considered to lie at the core of what it means to experience anger (Frijda, 1986). Study 2 further used different scenarios than Study 1, which were selected in a systematic way from a large pool of descriptions of unpleasant situations. Finally, the participants of Study 2 consisted of a large number of last year high school students, which is a much more representative and diverse sample than the sample of psychology students in Study 1.

[2]Kuppens et al. (2008) only used the appraisals of frustration, other accountability, and unfairness.

Method

Participants

Participants were 832 high school students from eight different high schools in the Dutch-speaking part of Belgium. Participants who did not answer one or more rating questions in the directed imagery task were excluded from the sample. This was the case for 154 participants, leaving us with a final sample of 678 participants, of which 442 were girls and 227 were boys (nine participants did not report their sex), with an average age of 17.1 years.

Materials

Scenarios. Twenty-four scenarios were selected from a pool of 443 descriptions of unpleasant situations from three different life domains (work or school, interpersonal contact, leisure), which were collected by Kuppens, Van Mechelen, Smits, and De Boeck (2003) from 161 high school students. Each of these 443 situations was characterized by either the presence or the absence of one of the following six features: frustration, other accountability, arrogant entitlement, antagonistic action tendency, anger or irritation. The selection of the 24 situations for the present study was based on the following criteria: (i) equal representation of the presence/absence of the six aforementioned anger-related features, (ii) equal representation of the three domains of life and (iii) equal representation of the sex of the participants who generated the situations. As such, the selected situation descriptions varied broadly with respect to the six anger-related features and were relevant for the high school participants in the present study. Summary descriptions of the situations can be found in Table 3.

Appraisal, action tendency and anger experience items. Four items were included to measure the four appraisal contents under study: to what degree 'are you frustrated in this situation?' (frustration); 'do you feel that someone else is deliberately accountable for what has happened?' (other accountability); 'do you feel treated in an unfair way?' (unfairness); and 'do you feel threatened in your self-esteem?' (threat to self-esteem). Note that these four item formulations were carefully selected by means of a pilot study performed to find reliable and valid anger-relevant appraisal formulations (for details, see Kuppens et al., 2007). On the basis of this pilot study, the following item was selected to assess the presence of an antagonistic action tendency: 'to what degree do you want to express your dissatisfaction?'. Finally, participants rated their subjective anger experience by means of the following item: 'to what degree do you feel angry in this situation?'.

Trait anger. Trait anger was measured by means of the Dutch adaptation of the Spielberger Trait Anger Scale (van der Ploeg et al., 1982).

Copyright © 2011 John Wiley & Sons, Ltd.

DOI: 10.1002/per

Table 3. Summary of situation descriptions used in Study 2, grouped according to the situation typology of the CLASSI solution of rank (5,3,4,2)

Summary situation description	Fit percentage
Situation type 1	
Your sibling wakes up with a high fever in the morning.	96.9
You are alone at home and you are bored.	88.7
A swimming appointment is cancelled because one of your friends falls ill.	88.6
You fail on a test, on which the average score is 3/10.	87.9
Your sports team loses from a much higher ranked team.	85.7
The waiter does not show up when you are sitting in a café.	82.8
You rip your pants during sports.	82.0
Situation type 2	
You and a friend are both in love with the same person.	79.3
Your sibling is nearly run over by a car when he or she runs into the street.	79.1
You drop a plate of glasses at a party, and everyone is looking at you.	75.6
You are in love with someone, but he or she is not interested in you.	75.3
No one lets an old man sit down on a crowded bus.	75.3
Situation type 3	
A floppy disc holding an important school assignment is destroyed by your computer.	77.7
Your friend is in a coma after an accident.	74.6
It is hard to study when the neighbours make a lot of noise, and it is a hot day.	73.0
Situation type 4	
You are blamed for someone else's failures after a sports match.	80.7
You hear that a friend is spreading gossip about you.	80.4
Your sibling sneaks out when you both have to clean up the house.	79.5
At a party, someone tells you that your bike has been smashed outside.	78.1
A fellow student fails to return your notes the day before an exam.	77.9
Being a job working student yourself, an employee makes you do all his or her chores.	76.3
Situation type 5	
A friend lets you down on an appointment to go out with his or her friend.	74.6
After working hard on an assignment, your teacher says it is still not better than your previous work.	73.5
A fellow student loses your notes, causing you to fail the exam.	73.4

The study was conducted in small groups of up to 30 participants each. They were encouraged to read each scenario attentively and imagine how they would feel, what they would think and what they would do in such a situation. After each scenario, they were presented the anger and appraisal items, which were to be rated on a 4-point scale (ranging from 0 = *not* to 3 = *very strong*). Following the directed imagery task, the participants completed the trait anger questionnaire.

Results and discussion

Model selection

The 0 to 3 ratings were dichotomized by replacing 0 and 1 ratings by a 0 value, and 2 and 3 ratings by a 1 value. Like in Study 1, this implies that we focus on at least moderately intense emotion components and experience. CLASSI models of different complexities were fitted, after which a (5,3,4,2) CLASSI solution was selected that included five situation types, three appraisal/action tendency types, four person types for the first process of anger elicitation and two person types for the second. Figure 3 shows a graphical representation of the selected CLASSI model, which reconstructed 79.9% of the data correctly.

Situation typology

Summary descriptions, type memberships and fit percentages of the 24 considered situations are presented in Table 3. Like in Study 1, the differences among the five situation types seem to refer to increasing negativity for the protagonist from type 1 to type 5, with type 3 being an exception. This interpretation was empirically validated by asking eight experts to rate the situations (on the same 0 up to 3 scale as previously mentioned) in terms of how negative the situation is to the protagonist. This negativity rating of the situations [averaged over the experts, where the average negativity rating for type 1 up to type 5 amounts to .95 ($SD = 0.24$), 1.43 ($SD = 0.67$), 2.42 ($SD = 0.47$), 2 ($SD = 0.40$) and 2.29 ($SD = 0.51$), respectively] was strongly positively correlated to the ordering of the situation types ($r = .69$, $p = .0006$).

Appraisal and action tendency typology

Table 4 reports the appraisal and action tendency typology and the associated fit percentages. A first type consists of *frustration and antagonism*. Other accountability and unfairness make up the second type, which is labelled *other-blame*. Finally, *threat to self-esteem* is the sole element of the third type.

Individual differences in the appraisals and action tendencies that are activated by the situations

The four person types for the first process of anger elicitation, labelled as person types I.1 up to I.4, consisted of 89 (13.1%), 239 (35.3%), 150 (22.1%) and 200 (29.5%) participants, respectively. An inspection of the situation–appraisal/action tendency profiles of these person types, as displayed in the upper grid in Figure 3, reveals about the same pattern

Copyright © 2011 John Wiley & Sons, Ltd.

DOI: 10.1002/per

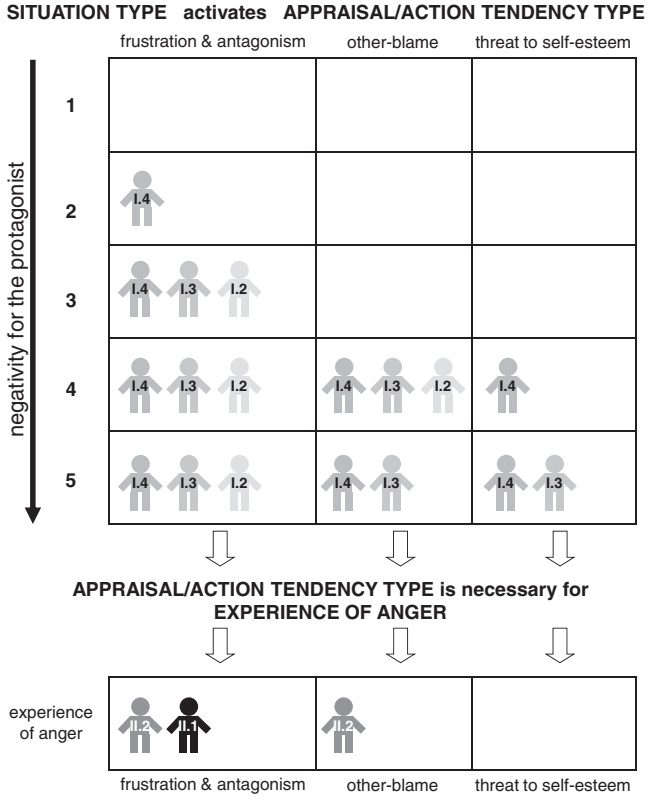

Figure 3. CLASSI solution for Study 2. The upper grid displays individual differences in situation/emotion component relations: person types I.1 ($n = 89$), I.2 ($n = 239$), I.3 ($n = 150$) and I.4 ($n = 200$) experience an appraisal/action tendency type (column) in a situation type (row) if the associated manikin shows up in the corresponding cell of the grid. The lower grid displays individual differences in emotion component/emotional experience relations: an appraisal/action tendency type is necessary to become angry for Person types II.1 ($n = 403$) and/or II.2 ($n = 186$) if the corresponding cell of the grid contains the associated manikin. Note that darker colours are used for person types that experience more appraisals or more anger.

of findings as obtained in Study 1: the four person types can be rank ordered in terms of the amount of appraisal/action tendency types that are experienced to an at least moderate degree in increasingly negative anger situations. Note that person type I.1 never experiences any of the appraisal/action tendency types; therefore, for this type, no manikin shows up in the upper grid of Figure 3. As was the case in Study 1, these individual differences are related to trait anger in that participants that experience more appraisal/action tendency types in the different situations have higher trait anger scores ($r = .29$, $p < .0001$).

Individual differences in the necessity of specific appraisals and action tendencies for the experience of anger

The two person types for the second anger-eliciting process, labelled person types II.1 and II.2, contain 403 (59.4%) and 186 (27.4%) participants, respectively (the other 89 participants can be assigned to either one of the types, without altering the fit of the model). This person typology is unrelated to that for the first process of anger elicitation (correlation between both typologies: $r = -.07$, n.s.). From the lower part of Figure 3, it can be read that the difference between the two person types again resides in the role of other-blame: whereas person type II.1 experiences anger whenever frustration and antagonism is activated, person type II.2 only feels anger when other-blame is also present. As in Study 2, these individual differences reflect differences in thresholds, with person type II.1 having a lower (frustration and associated antagonism) and person type II.2 having a higher threshold (additionally requiring blame). Like in Study 1, the mean trait anger score of person type II.1 is significantly higher than that of person type II.2 ($t = 4.73$, $p < .0001$, $r_{pb} = -.22$). Moreover, a multiple regression analysis showed that both processes independently contribute to trait anger (first process: $\beta = .18$, $t = 3.99$, $p < .0001$; second process: $\beta = -.20$, $t = -4.26$, $p < .0001$).

General discussion

The aim of this paper was to obtain a comprehensive picture of how anger experience is simultaneously determined by emotion components, context and individual differences. This was achieved by re-analysing data from two directed imagery tasks with CLASSI, a data analytic tool that was tailor-made to answer this research question. Although based on different participant samples, scenarios and appraisal item wordings, Studies 1 and 2 reveal a very consistent picture of the structure of contextual individual differences in anger. Both studies show that individual differences in the subjective situation-specific experience of anger are the result of individual differences in the two considered processes of anger elicitation: (i) individual differences in which emotion components are activated by situations and (ii) individual differences in the specific patterns of components that are necessary for a person to experience anger.

Table 4. Appraisals and action tendency used in Study 2, grouped according to the appraisal/action tendency typology of the CLASSI solution of rank (5,3,4,2)

Appraisal/action tendency	Fit percentage
Appraisal/action tendency type 1: frustration and antagonism	
To what degree do you want to express your dissatisfaction?	76.8
To what degree are you frustrated in this situation?	75.8
Appraisal/action tendency type 2: other-blame	
To what degree do you feel that someone else is deliberately accountable for what has happened?	83.7
To what degree do you feel treated in an unfair way?	83.5
Appraisal/action tendency type 3: threat to self-esteem	
To what degree do you feel threatened in your self-esteem?	78.7

Copyright © 2011 John Wiley & Sons, Ltd.

DOI: 10.1002/per

Individual differences in the emotion components activated by situations

With respect to the first considered process of anger elicitation—situations activating emotion components—it was found that the situations mainly differed in terms of the extent to which they negatively affect the participants. This negativity of the situations strongly determined the amount of appraisals (Studies 1 and 2) and action tendencies (Study 2): the more negative a situation, the more appraisals and action tendencies it elicits. Given that all studied appraisals and action tendencies are considered relevant for anger, this general psychological result implies that more negative situations will more frequently result in the experience of anger than less negative situations. As such, this finding is in line with theories that state that the aversiveness of an event is a crucial determinant of anger (Berkowitz & Harmon-Jones, 2004), and theories that claim that an event must imply ego-involvement (Lazarus, 1991), or be personally significant (Frijda, 1993) for anger to occur.

The general finding that more negative situations activate more emotion components is subject to individual differences, however. This confirms the generally accepted notion that appraisals occur as a result of the interaction between situation and person characteristics (e.g. Griner & Smith, 2000; Kuppens & Van Mechelen, 2007; Smith & Pope, 1992). Specifically, people differ in how easily increasingly negative situations elicit anger-relevant appraisals and action tendencies. As such, these individual differences can be summarized by means of an underlying dimension that may be interpreted as an anger appraisal tendency. Such a disposition seems to be part of a general anger proneness, moreover, given its observed relationship with trait-anger. In other words, across more and more negative events, people with high trait anger have lower thresholds to appraise these events in anger-eliciting ways. As such, these results provide a first process basis of trait anger.

Individual differences in the associations between emotion components and subjective anger experience

Regarding the second process of anger elicitation—emotion components being associated with the subjective experience of anger—our results yield insight into how people differ with respect to the emotion components that are required to become angry. Specifically, our results showed that frustration is universally necessary to experience anger. Yet, whereas for some, lower threshold individuals the experience of at least moderate frustration is sufficient for feeling angry, other, higher threshold individuals additionally require the appraisal of other-blame. Moreover, this difference in threshold was found to be consistently related to trait anger, with, in both studies, trait anger being higher for individuals that needed less conditions to be met to experience anger. Thus, next to the lowered thresholds for anger-relevant components, high trait anger also seems to involve a lower threshold for anger once an event has been appraised.

In light of the ongoing debate about which emotion components constitute the core of anger, these results seem to indicate that both the theory of Berkowitz and Harmon-Jones (2004)—aversive, frustrating circumstances constitute the central elicitor of anger—and appraisal theories that consider other-blame as the core component of anger (e.g. Ortony, Clore, & Collins, 1988; Smith & Lazarus, 1993) are correct, albeit for different subsets of individuals. As such, this finding is an important contribution to the debate about the core components of different emotions in that it suggests that the solution to this controversy does not lie in examining which of the different theories correctly describes and predicts the emotional experiences of all individuals. Instead, one theory seems to hold for one subset of individuals, whereas another theory fits another subset of individuals better. Hence, a major challenge for future research consists of the detailed investigation of individual differences in the associations between patterns of emotion components and subjective emotion experience (Ellsworth & Tong, 2006; Kuppens et al., 2007; Kuppens & Tong, 2010; Tong, 2010a, 2010b; Van Mechelen & Hennes, 2009). Moreover, with the development of CLASSI, a tailor-made data analytic method is available to assist researchers in this challenge.

Finally, the finding that the appraisal types of 'hostile threat' and 'threat to self-esteem' are not necessary to become angry does not imply that these appraisals are not relevant for anger. Indeed, according to our results, activation of these appraisal types implies that the appraisals of frustration and other-blame are also activated, which themselves are necessary for anger to be experienced; therefore, people will always become angry when they experience 'hostile threat' or 'threat to self-esteem'.

Understanding of trait anger

Our findings yield a double-shot account of the processes that govern individual differences in trait anger. Certain people are more prone to anger than others because, first, they require less negative situational input to experience anger-relevant appraisals and action tendencies and, second, because they need less of these anger-relevant appraisals and action tendencies to become angry. These findings resonate with research that relates emotional traits to emotion-congruent appraisal biases (e.g. Hazebroek, Howells, & Day, 2001) and with studies that demonstrate an inverse relationship between trait anger and frustration tolerance (e.g. Kassinove & Eckhardt, 1994; Muran et al., 1989).

Mechanisms behind individual differences in situation–emotion component relations and emotion component–experience relations: Some hypotheses

Identifying and summarizing individual differences in situation–emotion component relations and emotion component–experience relations is an important accomplishment. Understanding the mechanisms behind these differences is another challenge and important direction for future research. With respect to the emotion component–experience relations, Kuppens and Tong (2010) discuss the potential impact of attentional biases and affect-related traits (e.g. for neurotic people, less emotion components have to be present to experience negative emotions). In addition, some hypotheses can be formulated on the basis of the Computational Belief–Desire Theory of Emotion (CBDTE; Reisenzein, 2009). According to the CBDTE, emotions are the result of a match or a mismatch between (newly acquired) beliefs and a pre-existing desire. Negative emotions, for instance, are

Copyright © 2011 John Wiley & Sons, Ltd.

DOI: 10.1002/per

postulated to occur, if a mismatch between the belief and the desire is detected. Applying these principles to the present findings leads one to assume individual differences in the comparison processes between beliefs and desires. More specifically, for certain individuals (type II.1), felt anger is only associated to a mismatch between one belief (frustration) and one desire (not being blocked), whereas for other individuals (type II.2), there has to be an additional mismatch between the belief that someone else is to blame and a desire that this should not happen (e.g. because one wants to be treated with respect) for them to become angry.

Limitations

An obvious limitation of the findings is that the analysed data consist of responses to hypothetical situations. Despite possible disadvantages of the use of hypothetical situations (e.g. ecological validity, response biases), no other method is readily available for gathering data on individual differences in a sufficiently large set of standardized contexts, which is needed to address these questions. The data were collected with these disadvantages in mind, however, and care was taken to ensure that participants vividly imagined the presented vignettes and that they were able to provide responses in anonymity. Research has shown that cued recall can indeed be useful and informative for theory construction in the emotion domain (Robinson & Clore, 2001).

Second, the research questions and discussion focused on how this study contributes to understanding (individual differences in) the subjective experience of anger. However, as the data rely on self-report, they also at least partially reflect how people label their experiences and how people may differ in the extent that they use the label of 'anger' to describe their feelings across different contexts. Although these two may not necessarily always converge (e.g. Frijda, 2009), it should be acknowledged that the current data do not allow to disentangle the two.

Conclusion

The present paper reveals how individual differences in the experience of anger can be understood as a function of dispositional differences, context and emotion components. Individual differences in how people appraise specific circumstances and in the patterns of appraisal that are necessary to experience anger both contributed to what makes one person experience anger in a particular situation, and another not. These two types of individual differences take the form of two distinct, quantitative dimensions on which people take different positions. The dimension for the first process can be interpreted in terms of the ease with which different people experience emotion components in increasingly negative situations; thus, this dimension is related to the amount of negative situational input that a person needs to become angry. The dimension for the second process captures individual differences in the amount of emotion components that are necessary for feeling angry, in other words, individual differences in the amount of throughput that a person needs to subjectively experience anger.

ACKNOWLEDGEMENT

This paper was partially supported by the Research Council of K. U. Leuven (GOA/10/02 and OT/11/31).

REFERENCES

Berkowitz, L., & Harmon-Jones, E. (2004). Toward an understanding of the determinants of anger. *Emotion*, *4*, 107–130.

Ceulemans, E., & Kiers, H. A. L. (2006). Selecting among three-mode principal component models of different types and complexities: A numerical convex hull based method. *British Journal of Mathematical and Statistical Psychology*, *59*, 133–150.

Ceulemans, E., & Kiers, H. A. L. (2009). Discriminating between strong and weak structures in three-mode principal component analysis. *British Journal of Mathematical and Statistical Psychology*, *62*, 601–620.

Ceulemans, E., & Van Mechelen, I. (2008). CLASSI: A classification model for the study of sequential processes and individual differences therein. *Psychometrika*, *73*, 107–124.

Ceulemans, E., Van Mechelen, I., & Leenen, I. (2003). Tucker3 hierarchical classes analysis. *Psychometrika*, *68*, 413–433.

De Sarbo, W. S., Oliver, R. L., & Rangaswamy, A. (1989). A simulated annealing methodology for clusterwise linear regression. *Psychometrika*, *54*, 707–736.

Ellsworth, P. C., & Smith, C. A. (1988). From appraisal to emotion: Differences among unpleasant feelings. *Motivation and Emotion*, *12*, 271–303.

Ellsworth, P. C., & Tong, E. M. W. (2006). What does it mean to be angry at yourself? Categories, appraisals, and the problem of language. *Emotion*, *6*, 572–586.

Frijda, N. H. (1986). *The emotions*. Cambridge: Cambridge University Press.

Frijda, N. H. (1993). The place of appraisal in emotion. *Cognition and Emotion*, *7*, 357–387.

Frijda, N. H. (2009). Emotion experience and its varieties. *Emotion Review*, *1*, 264–271.

Griner, L. A., & Smith, C. A. (2000). Contributions of motivational orientation to appraisal and emotion. *Personality and Social Psychology Bulletin*, *26*, 727–740.

Gross, J. J. (1999). Emotion and emotion regulation. In L. A. Pervin, & O. P. John (Eds.), *Handbook of personality: Theory and research* (2nd edn) (pp. 525–552). New York: Guilford Press.

Hazebroek, J. F., Howells, K., & Day, A. (2001). Cognitive appraisals associated with high trait anger. *Personality and Individual Differences*, *30*, 31–45.

Kassinove, H., & Eckhardt, C. I. (1994). Self-reported affect and irrational beliefs in Russia and America. *Personality and Individual Differences*, *16*, 133–142.

Kroonenberg, P. M. (2008). *Applied multiway data analysis*. Hoboken NJ: Wiley.

Kuppens, P., & Tong, E. M. W. (2010). An appraisal account of individual differences in emotional experiences. *Social and Personality Psychology Compass*, *4*, 1138–1150.

Kuppens, P., & Van Mechelen, I. (2007). Interactional appraisal models for the anger appraisals of threatened self-esteem, other-blame, and frustration. *Cognition & Emotion*, *21*, 56–77.

Kuppens, P., Van Mechelen, I., & Rijmen, F. (2008). Towards disentangling sources of individual differences in the experience of anger. *Journal of Personality*, *76*, 969–1000.

Kuppens, P., Van Mechelen, I., Smits, D. J. M., & De Boeck, P. (2003). The appraisal basis of anger: Specificity, necessity and sufficiency of components. *Emotion*, *3*, 254–269.

Kuppens, P., Van Mechelen, I., Smits, D. J. M., De Boeck, P., & Ceulemans, E. (2007). Individual differences in patterns of appraisal and anger experience. *Cognition & Emotion*, *21*, 689–713.

Lazarus, R. S. (1991). *Emotion and adaptation*. Oxford: Oxford University Press.

Copyright © 2011 John Wiley & Sons, Ltd.

DOI: 10.1002/per

Lazarus, R. S. (1994). Individual differences in emotion. In P. Ekman, & R. J. Davidson (Eds.), *The nature of emotion: Fundamental questions* (pp. 332–336). New York: Oxford University Press.

Lerner, J. S., & Keltner, D. (2000). Beyond valence: Toward a model of emotion-specific influences on judgment and choice. *Cognition and Emotion*, *14*, 473–493.

Lerner, J. S., & Keltner, D. (2001). Fear, anger, and risk. *Journal of Personality and Social Psychology*, *81*, 146–159.

Lerner, J. S., & Tiedens, L. Z. (2006). Portrait of the angry decision maker: How appraisal tendencies shape anger's influence on cognition. *Journal of Behavioral Decision Making*, *19*, 115–137.

Muran, J. C., Kassinove, H., Ross, S., & Muran, E. (1989). Irrational thinking and negative emotionality in college students and applicants for mental health services. *Journal of Clinical Psychology*, *45*, 188–193.

Ortony, A., Clore, G. L., & Collins, A. (1988). *The cognitive structure of emotions*. New York: Cambridge University Press.

van der Ploeg, H. M., Defares, P. B., & Spielberger, C. D. (1982). *Zelf-analyse vragenlijst* [Trait Anger Scale]. Lisse, The Netherlands: Swets & Zeitlinger.

Reisenzein, R. (2000). Exploring the strength of association between the components of emotion syndromes: The case of surprise. *Cognition and Emotion*, *14*, 1–38.

Reisenzein, R. (2009). Emotional experience in the Computational Belief–Desire Theory of Emotion. *Emotion Review*, *1*, 214–222.

Robinson, M. D., & Clore, G. L. (2001). Simulation, scenarios, and emotional appraisal: Testing the convergence of real and imagined reactions to emotional stimuli. *Personality and Social Psychology Bulletin*, *27*, 1520–1532.

Roseman, I. J., & Smith, C. A. (2001). Appraisal theory: Overview, assumptions, varieties, controversies. In K. R. Scherer, A. Schorr, & T. Johnstone (Eds.), *Appraisal processes in emotion: Theory, methods, research* (pp. 3–19). New York, NY: Oxford University Press.

Schepers, J., Van Mechelen, I., & Ceulemans, E. (2006). Three-mode partitioning. *Computational Statistics & Data Analysis*, *51*, 1623–1642.

Scherer, K. R. (1993). Studying the emotion-antecedent appraisal process: An expert system approach. *Cognition and Emotion*, *7*, 325–355.

Scherer, K. R., Schorr, A., & Johnstone, T. (2001). *Appraisal processes in emotion: Theory, methods, research*. New York: Oxford University Press.

Silvia, P. J. (2005). Cognitive appraisals and interest in visual art: Exploring an appraisal theory of aesthetic emotions. *Empirical Studies of the Arts*, *23*, 119–133.

Silvia, P. J., Henson, R. A., & Templin J. L. (2009). Are the sources of interest the same for everyone? Using multilevel mixture models to explore individual differences in appraisal structures. *Cognition and Emotion*, *23*, 1389–1406.

Smith, C. A., & Lazarus, R. S. (1993). Appraisal components, core relational themes, and the emotions. *Cognition and Emotion*, *7*, 233–269.

Smith, C. A., & Pope, L. K. (1992). Appraisal and emotion: The interactional contributions of dispositional and situational factors. In M. S. Clark (Ed.), *Review of personality and social psychology, volume 14: Emotion and social behavior* (pp. 32–62). Newbury Park, CA: Sage.

Solomon, R. C. (1988). On emotions as judgments. *AmericanPhilosophical Quarterly*, *25*, 183–191.

Tong, E. M. W. (2010a). The sufficiency and necessity of appraisals for negative emotions. *Cognition and Emotion*, *24*, 692–701.

Tong, E. M. W. (2010b). Personality influences in appraisal–emotion relationships: The role of Neuroticism. *Journal of Personality*, *78*, 393–417.

Van Mechelen, I., & Hennes, K. (2009). The appraisal basis of anger occurrence and intensity revisited. *Cognition & Emotion*, *23*, 1373–1388.

Vande Gaer, E., Ceulemans, E., Van Mechelen, I., & Kuppens, P. (in press). The CLASSI-N model for the study of sequential processes. *Psychometrika*.

Vansteelandt, K., & Van Mechelen, I. (2006). Individual differences in anger and sadness: In pursuit of active situational features and psychological processes. *Journal of Personality*, *74*, 871–909.

Copyright © 2011 John Wiley & Sons, Ltd.

DOI: 10.1002/per