

## The Appraisal Basis of Anger: Specificity, Necessity, and Sufficiency of Components

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The nature of the association between anger and 5 appraisal–action tendency components—goal obstacle, other accountability, unfairness, control, and antagonism—was examined in terms of specificity, necessity, and sufficiency. In 2 studies, participants described recently experienced unpleasant situations in which 1 of the appraisal–action tendency components was present or absent and indicated which emotions they had experienced. The results showed that (a) other accountability and arrogant entitlement, as an instance of unfairness, are specific appraisals for anger; and most important, (b) none of the components is necessary or sufficient for anger. The findings suggest that the relation between emotions and appraisal–action tendency components should be conceptualized instead as a contingent association, meaning that they usually co-occur.

Over the past two decades, componential theories of emotion have gained widespread acceptance. According to these theories, emotions can be characterized and differentiated from each other on the basis of their association with a distinctive pattern of components. The componential approach to emotion is perhaps most clearly articulated within appraisal accounts of emotion, which state that the elicitation as well as the differentiation of emotions is based on a process of appraisal or evaluation of the circumstances in relation to the organism's own goals and needs (e.g., Ortony, Clore, & Collins, 1988; Roseman, 1984; Scherer, 1993; Smith & Ellsworth, 1985). The latter account results in associations between emotions and specific patterns of appraisals. Following this line of thought, researchers have argued that action tendencies should be considered as central emotion components as well in that emotions can also be characterized in terms of their association with specific action tendencies (e.g., Fischer, 1991; Frijda,

1986; Frijda, Kuipers, & ter Schure, 1989; Lazarus, 1991; Oatley & Jenkins, 1996; Skiffington, Fernandez, & McFarland, 1998). As such, every emotion is assumed to be characterized by a distinct pattern of appraisals and action tendencies.

Empirical research efforts regarding the componential approach have largely focused on the identification of specific emotion–component relations. Indeed, the high degree of convergence reached throughout different studies by various researchers regarding which components are associated with which emotions is rightfully seen as a strong indicator of the validity of this approach (for overviews, see, e.g., Omdahl, 1995; Scherer, 1997). However, in those empirical efforts, the exact nature of the association between components and emotions has largely been neglected. In general, strong and reliable associations between components and emotions are assumed (e.g., Frijda et al., 1989; Ortony et al., 1988; Scherer, 1993; Smith, Haynes, Lazarus, & Pope, 1993), but only few studies have addressed the nature of this association directly (see Parkinson, 1999). It is the latter aspect that is primarily examined in the present study in relation to the emotion of anger.

In this article, we address two main issues: First, we wish to identify specific components of anger, in view of constructing distinctive patterns of components that differentiate between anger and other negative emotions. Second and most important, we examine the nature and strength of the relation between the components and anger, more specifically, in terms of ne-

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The research reported in this article was supported by Research Fund Grant GOA/00/02 from the University of Leuven.

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cessity and sufficiency. We successively discuss each of these two research issues in more detail.

### Appraisal and Action Tendency Components of Anger

The first research question of this study concerns the specific components of anger: Which appraisal and action tendency aspects can be used to characterize anger and differentiate it from other negative emotions? We decided to include appraisals and one action tendency in our componential analysis. It is clear that the two kinds of components are of a different nature. Generally, appraisals are viewed as the cognitive prerequisites and/or contents of an emotion, whereas action tendencies are more situated along the action side of emotions (Frijda et al., 1989). However, both are considered central components of emotions and are therefore included in our analysis of anger.

For appraisal theory, it is important to attain a characterization in terms of a limited number of appraisals only. For instance, Scherer (1997) regarded parsimony with respect to the number of appraisals postulated as “a concern of paramount importance for the future development of this research area” (p. 115). In pursuit of this aim, previous research in this domain was systematically reviewed, and several components, potentially relevant to anger, were selected. The components include four appraisals—goal obstacle, other accountability, unfairness, and control—and one action tendency—antagonistic action tendency—that are discussed successively below.

#### *Goal Obstacle*

The appraisal of goal obstacle, or goal-blocking, is generally accepted as an important determinant of anger as well as of aggression. Besides its key role in the influential frustration–aggression hypothesis (Dollard, Doob, Miller, Mowrer, & Sears, 1939), it has also been adopted under various forms by numerous, more recent appraisal theorists as a major component of anger and angerlike emotions. Those forms include frustration (Averill, 1982), perceived goal obstacle (Ellsworth & Smith, 1988; Smith & Ellsworth, 1985), motivational incongruence (Smith & Lazarus, 1993), motive inconsistency (Roseman, 1984), undesirable event (Ortony et al., 1988), goal obstructiveness (Scherer, 1993), and goal blocking (Izard, 1977; Mascolo & Griffin, 1998).

#### *Other Accountability*

Next, we consider the appraisal of other accountability, or agency, which refers to somebody else be-

ing considered as the cause of what happened. This appraisal, which can be found in almost all recent appraisal theories of emotion (e.g., Fischer, 1991; Frijda, 1986; Ortony et al., 1988; Smith & Ellsworth, 1985; Wierzbicka, 1992), is considered to be important in differentiating between negative emotions such as shame and guilt on the one hand (self accountability) versus anger and contempt on the other hand (other accountability; Ellsworth, 1994; Ellsworth & Smith, 1988).

#### *Unfairness*

The relation between anger and unfairness has been documented in various studies (e.g., Ellsworth & Smith, 1988; Frijda, 1993; Frijda et al., 1989; Mikula, Scherer, & Athenstaedt, 1998; Wallbott & Scherer, 1986). Perceived unfairness is further closely related to the appraisal of illegitimacy, which is also considered as a determinant of anger (Averill, 1982; Fitness & Fletcher, 1993; Roseman, Spindel, & Jose, 1990).

#### *Control*

The appraisal of control, or power over what is happening, has been considered as a determinant of anger by several appraisal theorists (e.g., Ellsworth & Smith, 1988; Lerner & Keltner, 2001; Scherer, 1993; Smith & Lazarus, 1993), although empirical investigations of the relation between perceived control and anger have produced divergent results (e.g., Frijda et al., 1989; Roseman et al., 1990). To investigate this relation more closely, the appraisal of control is included in the present study.

#### *Antagonistic Action Tendency*

The association of specific action tendencies to specific emotions has been thoroughly examined and demonstrated by Frijda (1986, 1987; Frijda et al., 1989), and several other appraisal theories also bear references to action-related aspects of emotions (e.g., Fischer, 1991; Lazarus, 1991; Mascolo & Griffin, 1998; Smith & Lazarus, 1993; Wierzbicka, 1992). In particular, anger has been associated with the tendency to do something against an unpleasant situation, to remove an obstacle of frustration, or to blame a perceived wrongdoer (Ellsworth & Smith, 1988; Fischer, 1991; Frijda, 1986; Ortony & Turner, 1990; Skiffington et al., 1998; Wierzbicka, 1992), all of which can be summarized as an antagonistic action tendency.

The first goal of this study then was to verify which of the selected components could be considered as specific components of anger, as distinguished from

other negative emotions such as fear, shame, and sadness. Furthermore, we also sought to examine the extent to which anger differs from other negative emotions in terms of patterns of components. We expect that the selected components will yield distinctive patterns that differentiate between anger and other negative emotions because we selected all components on the basis of their association with anger.

### The Nature of Relation Between Components and Emotions

In general, componential accounts of emotions assume strong, reliable relations between emotions and their components (e.g., Ekman & Davidson, 1994; Forgas, 1993; Frijda et al., 1989; Lazarus, 1994b; Ortony et al., 1988; Scherer, 1993; Smith et al., 1993). However, the nature of the relation between emotions and their components has not been given the coverage it deserves (Parkinson, 1997, 1999). Also, it is surprising to find that only minimal research has addressed this issue directly. Indeed, one might expect that efforts would have been made to clarify or investigate the nature of this association, given its important implications for componential accounts of emotion.

Following Parkinson (1997), in the present article, we address the status of the emotion–component relation in terms of necessity and sufficiency. Theorists have made divergent (and mostly, rather implicit) statements on necessity and sufficiency aspects of the relation between emotions and their components. What follows is an overview of some positions that exist in this regard.

A strong version of appraisal theory holds that an emotion is characterized by a set of singly necessary and jointly sufficient components. Regarding joint sufficiency, most appraisal theories specify certain appraisal patterns (Frijda, 1986, 1993; Frijda et al., 1989), appraisal structures (Ortony et al., 1988; Smith & Ellsworth, 1985; Smith & Lazarus, 1993), emotion scripts (Fischer, 1991), or appraisal sequences (Scherer, 1993, 1999) to be associated with different emotions. This idea of joint sufficiency has been explicitly articulated in the theory of Smith and Lazarus (1993) in which different appraisals at a molecular level are considered to constitute a core relational theme at a molar level, which is seen as the basic elicitor of emotion. This implies that a particular appraisal or action tendency component generally is not sufficient for an emotion to occur, but rather that a combination of different components constitute the true determinant of an emotion. At present, this position seems to be shared by most appraisal theorists.

Regarding single necessity, however, there seems to be less agreement. In this respect, Smith and Lazarus (1993) stated that they “consider appraisal to be a sufficient condition of emotion, as well as a necessary one, although this latter position is clearly controversial” (p. 235; see also Lazarus, 1991, 1994a). Similarly, Clore, Ortony, Dienes, and Fujita (1993) argued “that cognitive appraisals are a necessary condition [for emotion]” and that “emotions themselves have necessary components” (p. 62). Most recently, a strong claim for single necessity was made by Roseman and Smith (2001), who stated that “appraisal theories maintain that a common pattern of appraisals is found in all the situations that evoke the same emotion” and “that there should be strong and invariant one-to-one relationships between particular appraisal combinations and particular emotions” (p. 7; see also Smith & Pope, 1992). The latter argument could be construed such that the appraisals that constitute a common pattern are assumed to be singly necessary for the occurrence of the associated emotion; for example, one cannot get angry without holding someone else accountable for what goes wrong. Regarding action tendencies, several theorists assume that different action tendencies are strongly associated with different emotions (Frijda et al., 1989; Skiffington et al., 1998; Wierzbicka, 1992) so that differentiation between emotions on the basis of action tendencies is possible. In fact, emotions themselves have been defined as felt changes in action tendency or action readiness (Arnold, 1960; Frijda, 1986; Oatley & Jenkins, 1996), implying a relation of equivalence between them (necessity plus sufficiency).

In contrast to the previous theories, other appraisal theorists seem to defend a less stringent position regarding the necessity of emotion components. For instance, contrary to Roseman and Smith (2001), Scherer (2001) stated that “appraisal theorists do not assume that the typical profile is required to produce a differentiated emotional state” (p. 373), implying that at least some components are not necessary for an emotion. After reviewing appraisal research, Parkinson (1997) suggested that “at best, the findings support a contingent connection between appraisal and emotion” (p. 72). Furthermore, other theorists have emphasized that a particular appraisal or action tendency component is a contingent concomitant of a related emotion (meaning that they usually co-occur), instead of a necessary condition (e.g., Parkinson, 2001; Reisenzein, 2000). As such, the latter position leaves room for possibly central, but not necessary components of an emotion. In any case, it is clear that

Table 1

*Instructions From Study 1 for the Description of Recalled Situations and the Number of Participants Randomly Assigned to Each Condition*

Component	Instruction “Describe three unpleasant situations in which. . .	No. of participants
Frustration		
Present	you were frustrated”	13
Absent	you were not frustrated”	12
Other accountability		
Present	someone else was accountable”	13
Absent	someone else was not accountable”	14
Arrogant entitlement		
Present	someone else arrogated something to him/herself which he/she had no right to”	15
Absent	someone else did not arrogate something to him/herself which he/she had no right to”	13
Antagonistic action tendency		
Present	you wanted to do something about the situation”	16
Absent	you did not want to do something about the situation”	14

there seems to be no consensus on this point, and that, in general, most componential accounts of emotions are underspecified in this respect.

The present article aims to shed some light on the relation between emotions and their appraisal–action tendency components in terms of specificity, necessity, and sufficiency with two empirical studies. We used a paradigm that extends a method used in previous appraisal research and that primarily relies on laypersons’ self-reports (e.g., Ellsworth & Smith, 1988; McGraw, 1987; Roseman, 1984; D. Russell & McAuley, 1986; Smith & Lazarus, 1993; Stipek, Weiner, & Li, 1989; Weiner, Amirkhan, Folkes, & Verette, 1987). In the present studies, we used specific instructions to recall past emotional experiences; the instructions were systematically manipulated with respect to the presence or absence of certain appraisals. It is the inclusion of the “absent” instruction that allows for the examination of the relation between components and emotions in terms of necessity and sufficiency.

As an aside, we note that the issue of necessity and sufficiency is addressed in logical terms only, without aiming to make causal claims with respect to the component–emotion relation. To be sure, in several theories of emotion, appraisals have been viewed as elicitors of emotions (e.g., Scherer, 1993; Smith & Lazarus, 1993). Yet, other authors such as Frijda (1993) and Solomon (1988) have called for caution in this respect, as, according to them, appraisal and action tendency could also constitute the content of an emotion instead of its prerequisites. The pres-

ent article, however, does not take a position on this issue.

### Study 1

In Study 1, we examined the relation between the target emotion of anger and four components: appraisal of frustration (pertaining to goal obstacle), other accountability, arrogant entitlement (pertaining to unfairness), and an antagonistic action tendency. The study used the paradigm outlined above.

#### *Method*

*Participants.* Participants were 119 high school seniors from three different high schools, all located in the Dutch-speaking part of Belgium. Nine students did not adhere to the instructions,<sup>1</sup> reducing the final sample size to 110 participants, of which 54 were boys and 56 were girls. The mean age of the participants was 17.5 years.

*Materials and procedure.* Eight different questionnaires were created, based on the four selected appraisal–action tendency aspects that can each be present or absent in a situation. In the study, participants were randomly assigned to one of the eight questionnaires (the number of participants that were assigned to each questionnaire type can be found in

<sup>1</sup> *Nonadherence* was defined as incompletely filled out questionnaires, situation descriptions that bore no reference to the instructions (e.g., hoax-stories) or emotion ratings that showed deliberate bias (e.g., improbable patterns of ratings such as a clear zigzag pattern).

Table 1). In particular, in each questionnaire the participants were first asked to describe three recently experienced unpleasant situations in which one of the potentially relevant appraisal–action tendency aspects was either present or absent (e.g., one questionnaire on three situations in which one was frustrated, one questionnaire on three situations in which someone else was not accountable, and so forth). The exact wording of the instructions can be found in Table 1. Because this study aims to investigate negative emotions only, the instruction to describe unpleasant situations was included to avoid descriptions of pleasant situations, which are less relevant to the assessment of negative emotions. The instructions included further guiding questions such as “describe what happened,” “describe what you were thinking,” “describe what you were doing,” “describe why the component was present/absent,” in order to collect as elaborated and complete descriptions of the situations as possible. Within each questionnaire, one of the three situations had to be sampled from the domain of work or school, one from the domain of interaction with close personal friends or family, and one from the domain of leisure time to guarantee a certain degree of variation in the recalled situations.

After having described all three situations, participants were asked to imagine as vividly as possible what they had thought, how they had felt, and what they had wanted to do in the first situation they had described. Next, they were asked to indicate the degree to which they had experienced a number of different negative emotions in this situation. These ratings were completed for all three situations, successively. The list of negative emotions was adapted from Diener, Smith, and Fujita (1995) and consists of four scales, each containing four emotion labels: (a) Fear (*fear, worry, anxiety, and nervousness*), (b) Anger (*anger, irritation, disgust, and rage*), (c) Shame (*shame, guilt, regret, and embarrassment*), and (d) Sadness (*sadness, loneliness, unhappiness, and depression*). To obtain a comparable Dutch list, the 16 emotion labels were translated and back-translated twice, once by means of an English–Dutch and Dutch–English dictionary and once by two professional bilingual translators (one of whom was a native English speaker). The 16 Dutch emotion labels that converged through both translation procedures were included in the final Dutch list. For the emotion ratings, participants had to indicate on a 4-point scale, ranging from 0 (*not*) to 3 (*very strong*), the degree to which they had experienced each emotion on the list. All participants filled out the questionnaire within the

time limit of a class hour (50 min). At the end of the session, participants were debriefed about the purpose of the study. After the omission of erroneous situation descriptions, 305 situation descriptions were collected from the 110 participants.

### Results

What follows first are descriptive statistics of the emotion scales. Second, analyses are reported that provide information about which components are associated with which emotions, and about the distinction between anger and other negative emotions (specificity). Finally, analyses addressing the issue of the status of the components (necessity and sufficiency) are presented. In each of the following subsections, the method of analysis we used is discussed, followed by a presentation of the results.

*Descriptive statistics.* First, we calculated per participant the mean score across the three situations for each emotion. Second, based on these data, we calculated mean scores for each emotion scale (averaging across the emotions composing the scale), yielding values of 0.87 for the Fear scale ( $SD = 0.57$ ), 1.28 for the Anger scale ( $SD = 0.69$ ), 0.68 for the Shame scale ( $SD = 0.53$ ), and 0.76 for the Sadness scale ( $SD = 0.56$ ).

*Differentiation between anger and other negative emotions: Specificity of components.* Because the components we studied were selected on the basis of their association with anger in previous research, we expected them to differentiate between anger and other negative emotions. In this section, we report on bivariate association indices separately for each pairwise combination of a component and an emotion to portray patterns of associations between both. Second, we present results from a multivariate analysis that takes into account possible dependencies between the variables under study.

We calculated point-biserial correlation coefficients, yielding patterns of association between each scale and the components. We calculated the coefficients between the emotion scales on the one hand and the binary variables indicating the presence or absence of each component on the other hand, across participants (note that for reasons of parsimony, we report only the results for the emotion scales instead of for all separate emotions; in general, the component pattern of each emotion scale was fairly similar to those of the constituting emotions). For each component, we calculated the coefficients across those participants who had received the “present” or absent instruction questionnaire pertaining to the respective

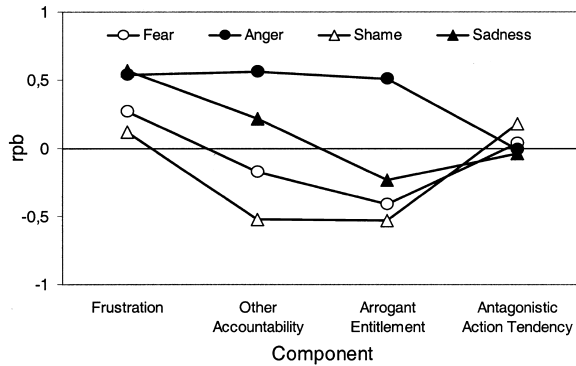


Figure 1. Point-biserial correlation coefficients (rpb) between emotion scales and components for Study 1.

component. Figure 1 represents the patterns of association between the components and the emotion scales (in Figure 1, coefficients exceeding the value of .39 are significant at  $p < .05$ ; coefficients exceeding the value of .50 are significant at  $p < .01$ ).

Next, we performed a multivariate regression analysis across all participants, taking the emotion scales as dependent variables and the binary component variables as independent variables. The results are presented in Table 2. Additionally, within the context of the specified multivariate regression model, we tested the hypotheses that the regression coefficients characterizing the different emotion scales are equal across each pairwise combination of two emotion scales. The null hypothesis was rejected in each case (with Wilks's lambda ranging from .67 to .84,  $p < .001$ ), except for the comparisons between the Fear and Shame scales and between the Fear and Sadness scales (with Wilks's lambda values of .94 and .93, respectively,  $p > .10$ ).

The results from the point-biserial correlations and the multivariate regression analysis indicated that the Anger scale was positively associated with the appraisals of frustration, other accountability, and arro-

gant entitlement. It is also the aforementioned pattern of appraisals that differentiated the Anger scale from the other emotion scales. The antagonistic action tendency, though, did not appear to be a relevant component for any of the emotions under study. Furthermore, the appraisals of other accountability and arrogant entitlement seemed to be specific features of angerlike emotions, because these appraisals were positively associated with the Anger scale only. Other single components did not seem to constitute a distinctive feature of one of the emotions under study.

*Necessity and sufficiency of components.* We further examined the association between individual components and anger in terms of necessity and sufficiency. To this end, the emotion ratings were dichotomized: 0 and 1 were scored as 0, and 2 and 3 were scored as 1, allowing for the construction of a  $2 \times 2$  contingency table for each separate emotion–component combination. Second, we aggregated, for each scale, the contingency tables of the constituting emotions, yielding a contingency table for each emotion scale–component combination. Next, we calculated two asymmetrical phi indices (Gara & Rosenberg, 1979; Loevinger, 1947) for each emotion scale–component combination. The first index captures degree of necessity, that is, the degree to which the implication holds that if the emotion occurs, then also the component occurs. More specifically, this index is defined as follows:

$$\Phi_{\text{necessity}} = \frac{P(\text{component}|\text{emotion}) - P(\text{component})}{1 - P(\text{component})} \quad (1)$$

In the numerator in the right part of Equation 1, the probability that the component occurs given that the emotion occurs is compared with the unconditional probability that the component occurs. The denominator is a common standardization factor, which implies that the maximum possible value of the index = 1. In case of necessity,  $P(\text{component}|\text{emotion}) = 1$ ,

Table 2  
Multivariate Regression Coefficients (With  $p$  Values) of the Components for Each Emotion Scale and Corresponding  $F$  and  $p$  Values for Each Emotion Scale for Study 1

Emotion scale	Component				$F$	$p$
	Frustration	Other accountability	Arrogant entitlement	Antagonistic action tendency		
Fear	-.00 (.98)	-.13 (.48)	-.29 (.08)	-.03 (.84)	0.85	.49
Anger	.39 (.04)	.59 (.00)	.91 (.00)	.20 (.26)	7.39	.00
Shame	-.16 (.29)	-.45 (.00)	-.37 (.01)	.08 (.58)	3.71	.01
Sadness	.42 (.01)	.18 (.27)	-.00 (.99)	.02 (.91)	1.76	.14

resulting in a  $\varphi_{\text{necessity}}$  value of 1; a  $\varphi_{\text{necessity}}$  value between 1 and 0 reflects a positive association, combined with lack of necessity; a value of 0 reflects a lack of association: The probabilities in the numerator of Equation 1 are equal; finally, a negative value reflects a negative association.

The second index captures degree of sufficiency, that is, the degree to which the implication holds that if the component occurs, then also the emotion occurs, and is defined as follows:

$$\varphi_{\text{sufficiency}} = \frac{P(\text{emotion}|\text{component}) - P(\text{emotion})}{1 - P(\text{emotion})} \quad (2)$$

The interpretation of Equation 2 is analogous to that of Equation 1.

The results for both asymmetrical indices for the Anger scale are shown in Figure 2. The results clearly showed that all asymmetrical phi values were considerably lower than 1. This means that none of the components can be seen as truly necessary or sufficient for the target emotion to occur (we obtained this same finding for the other negative emotions as well as for the constituting separate emotions of each emotion scale). Hence, people may become angry when they are *not* frustrated, when someone else is *not* accountable for something unpleasant, and so forth (i.e., no necessity). Conversely, sometimes people *do not* become angry when someone else arrogates something for himself or herself that he or she has no right to, when they want to do something about the unpleasant circumstances they find themselves in, and so forth (i.e., no sufficiency). For instance, one participant described being angry in the following situation in which frustration was absent: "I was at a party, and

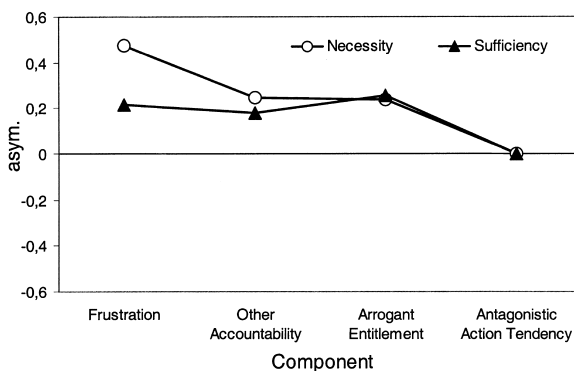


Figure 2. Degree of necessity and sufficiency of the components for the Anger scale for Study 1. asym. = asymmetrical phi.

my friends and nephews started this big quarrel with my ex-boyfriend. I got pretty angry." Another participant reported not being angry (but embarrassed) when someone else was accountable for what happened in the following way: "My best friend and I joined a sports club. Sometimes she bullies other team members. When it goes too far, I try to do something about it."

We obtained similar results when we performed the analyses for each life domain separately. Moreover, we also calculated the asymmetrical phi indices on the basis of different dichotomizations of the data (0 vs. 1, 2, and 3 and 0, 1, and 2 vs. 3). Although the degrees of necessity and sufficiency obviously are affected by such alternative dichotomizations, no component proved to be necessary or sufficient for any of the emotions under study.

### Discussion

The results regarding our first research issue largely replicated findings from prior research, suggesting that several different negative emotions are associated with different, distinctive patterns of appraisals. In particular, anger is associated with the appraisal of frustration, other accountability, and arrogant entitlement, and this pattern of appraisals clearly differentiates anger from fear, shame, and sadness, which are associated with other appraisal patterns.

Furthermore, the results suggested that the appraisals of other accountability and arrogant entitlement are specific components of anger. The ability of these appraisals to differentiate between anger and the other negative emotions is revealed in its high regression coefficients for anger in the multivariate regression analysis, as well as in the component patterns. As mentioned above, the appraisal of arrogant entitlement was included as an instance of unfairness. Unfairness, however, has been documented as being relevant to other negative emotions such as sadness (Mikula et al., 1998). As such, our present findings suggest that arrogant entitlement, as a particular case of the broader appraisal of unfairness, is specific to anger, whereas unfairness in general might not be. In contrast, the appraisal of frustration does not seem to be specific to any of the emotions under study, as appears from its positive association with several of the negative emotions.

Surprisingly, the included antagonistic action tendency appeared not to be associated with any of the negative emotions under study. A possible explanation for this finding may be that action tendencies are less accessible to self-reports in comparison with ap-

praisal components. The latter, however, is at odds with recent research results from, for example, Tiedens, Ellsworth, and Mesquita (2000). It seems more likely that the action tendency was formulated too weakly in our questionnaire instructions: Participants were asked to describe unpleasant situations in which they “wanted to do something about the situation.” Moreover, this formulation perhaps was too general or ambiguous to evoke the intended antagonistic action tendency.

Regarding our second research issue, the results suggested that no component that was included can be considered as a singly necessary or singly sufficient condition for anger. We obtained similar results for the other negative emotions, although those are not presented in this article. It could be argued that the asymmetrical indices may be attenuated because of measurement error in the emotion scale ratings (which may mask true necessity or sufficiency linkages). However, all obtained values were considerably lower than 1 (and generally did not exceed a value of .40), rendering such an assertion less probable.

It must be noted, however, that Study 1 suffers from two major weaknesses, which partly have already been alluded to. First, it can be argued that some of the formulations that we used to instruct presence or absence of the components in the recalled situations strayed too far from formulations commonly used in appraisal research. This may compromise a comparison between our findings and those from other appraisal studies. In particular, the use of the term *frustration* could be equivocal in that this term is also used to denote an emotional state in itself (e.g., Roseman et al., 1990). Moreover, arrogant entitlement, although found to be clearly relevant to anger, possibly only reflects a certain aspect of the more commonly used appraisal of unfairness. Finally, as previously mentioned above, given the bulk of research that systematically relates action tendencies to emotions, the formulation of the antagonistic action tendency in the present study should probably be considered less adequate.

Second, participants were forced to choose from a list of prespecified emotion labels to denote their emotional states. This forced-choice response format did not leave room for more subtle descriptions of one's emotional state other than the emotions included in the list. This may have altered the probability of observing instances in which a component is not necessary or sufficient for a certain emotion. For instance, in a situation in which arrogant entitlement was instructed to be absent, a participant might have

felt something *like* anger, but not exactly as described by the various labels contained in the Anger scale. Nevertheless, he or she might have checked anger because it was the best option available, compared with checking emotions such as fear or sadness, resulting in perhaps an unwarranted case of absence of necessity. Because of these weaknesses, we performed a second study in which the aforementioned limitations were addressed.

## Study 2

We included the following four appraisals and one action tendency in this study: goal obstacle, other accountability, unfairness, control, and antagonistic action tendency. The study followed a similar setup as Study 1, but some important adjustments were made. First, we carefully selected the exact formulations of the appraisal and action tendency components. For each component, we sampled a representative list of item formulations from previous studies in which exact item wordings were provided (Ellsworth & Smith, 1988; Frijda et al., 1989; Parkinson, 1999; Roseman et al., 1990; Scherer, 1993, 1997; Skiffington et al., 1998; Smith et al., 1993). We then selected one item formulation per component on the basis of the following two criteria: (a) clarity (including the absence of implicit or explicit disjunctions) and (b) the instruction for the component to be absent should have a meaningful interpretation. The item formulations that were used in the final questionnaire, as well as their reference source, can be found in Table 3.

Second, next to a forced-choice assessment of emotional state, we included an emotion question with an open-ended response format. In the questionnaires, the open-ended questions always preceded the administration of the fixed list of emotions to guarantee a valid assessment of emotional state (for a related approach with personality traits, see Claeys, De Boeck, Van Den Bosch, Biesmans, & Böhrer, 1985).

Third, we decided to include a separate rating of the recalled situations with respect to all appraisal and action tendency aspects. This not only may serve the purpose of a manipulation check but also may yield more detailed information on those variables in each situation.

## Method

*Participants.* Participants were 100 university students, of which 63 were women and 37 were men. Their mean age was 20.5 years. They were paid €5 (about \$5) for participation.



Table 3  
*Instructions From Study 2 for the Description of Recalled Situations*

Component	Instruction	Source of item
Goal obstacle		
Present	there were obstacles standing in the path between you and getting what you wanted"	Ellsworth & Smith, 1988
Absent	there were no obstacles standing in the path between you and getting what you wanted"	
Other accountability		
Present	you considered someone else responsible for what happened"	Smith et al., 1993
Absent	you did not consider someone else responsible for what happened"	
Unfairness		
Present	you considered what happened to you as unfair"	Ellsworth & Smith, 1988
Absent	you did not consider what happened to you as unfair"	
Control		
Present	you felt that you could influence what was happening"	Ellsworth & Smith, 1988
Absent	you did not feel that you could influence what was happening"	
Antagonistic action tendency		
Present	you wanted to express your opposition"	Skiffington et al., 1998
Absent	you did not want to express your opposition"	

*Materials and procedure.* Ten different questionnaires were created based on five appraisal–action tendency aspects that can each be present or absent in a situation. Each participant was randomly assigned to 1 of the 10 questionnaires. As in Study 1, in the questionnaires the participants were first asked to describe three recently experienced unpleasant situations in which one of the appraisal–action tendency aspects was either present or absent. The exact wording of the instructions can be found in Table 3. Again, the instructions included further guiding questions, and one of the three situations had to be sampled from the domain of work or school, one from the domain of interaction with close personal friends or family, and one from the domain of leisure time.

After having described all three situations, participants were instructed to imagine as vividly as possible what they had thought, how they had felt, and what they had wanted to do in the first situation that they had described. Next, they were asked to describe which emotions they had experienced in each situation by means of an open-ended question. Subsequently, they were asked to indicate for each situation (a) the degree to which they had experienced each of the negative emotions from the list from Diener et al. (1995) and (b) the degree to which they had experienced each of the components under study. The order of the latter two types of questions was counterbalanced in view of possible order effects (Schwarz, 1999). For the emotion and component ratings, participants had to indicate on a 4-point scale, ranging from 0 (*not*) to 3 (*very strong*), the extent to which they had experienced each emotion and component in the situations they had described.

Each type of questionnaire was administered to 10 participants. Hence, 300 situation descriptions were collected, with 30 situation descriptions in each condition.

## Results

*Descriptive statistics of the emotion scales and component ratings.* The mean scores for the Fear, Anger, Shame, and Sadness scale (after averaging across the ratings for the three situations each participant had provided) were 1.18 ( $SD = 0.61$ ), 1.25 ( $SD = 0.56$ ), 0.84 ( $SD = 0.61$ ), and 0.99 ( $SD = 0.52$ ), respectively. The mean scores for the component ratings were 1.77 for goal obstacle ( $SD = 0.65$ ), 1.59 for other accountability ( $SD = 0.78$ ), 1.51 for unfairness ( $SD = 0.83$ ), 1.04 for control ( $SD = 0.61$ ), and 1.48 for antagonistic action tendency ( $SD = 0.75$ ).

*Manipulation checks.* For each component, we performed independent samples *t* tests on the component ratings to examine whether the presence instruction for each component indeed yielded situations in which the respective component was present in a significantly stronger way as compared with situations that were generated under the absence instruction for that same component. The results clearly indicated that for each component, the ratings of the component that were instructed to be present were significantly higher in comparison with when the component was instructed to be absent ( $p < .001$ ), the mean difference in all cases exceeding one scale point.

*Differentiation between anger and other negative emotions: Specificity of components.* First, we calculated Pearson correlation coefficients between the emotion scales and component variables (again averaged across the three situations each participant had described) across participants. Regarding the component variables, we performed analyses both with binary variables based on the questionnaire instructions (as reported in Study 1) and with the component ratings; generally, the two yielded very similar results. We further focused on the correlations with the component ratings (which, unlike the other correlations, were calculated across the entire group of participants). The association patterns are represented in Figure 3 (in Figure 3, coefficients exceeding the value of .19 are significant at  $p < .05$ , and coefficients exceeding the value of .25 are significant at  $p < .01$ ).

Second, we performed a multivariate regression analysis using the emotion scale scores as dependent variables and the component rating scores as independent variables, across participants. The results are shown in Table 4. As in Study 1, we tested the hypotheses that the regression coefficients characterizing the different emotion scales are equal across each

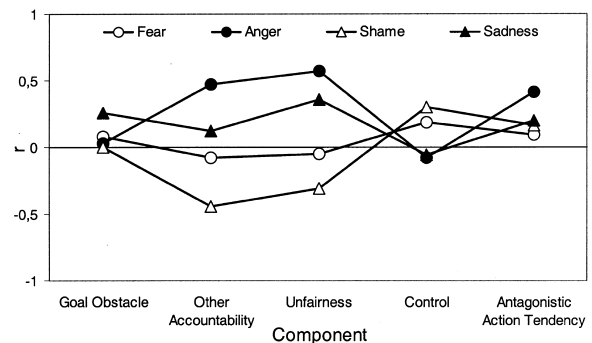


Figure 3. Pearson correlation coefficients between emotion scales and component ratings for Study 2.

Table 4  
*Multivariate Regression Coefficients (With  $p$  Values) of the Components for Each Emotion Scale and Corresponding  $F$  and  $p$  Values for Each Emotion Scale for Study 2*

Emotion scale	Component					$F$	$p$
	Goal obstacle	Other accountability	Unfairness	Control	Antagonistic action tendency		
Fear	.09 (.33)	-.09 (.33)	-.02 (.86)	.17 (.10)	.11 (.26)	1.26	.29
Anger	-.12 (.11)	.15 (.03)	.29 (.00)	.05 (.48)	.12 (.09)	12.70	.00
Shame	.12 (.17)	-.33 (.00)	-.03 (.65)	.25 (.01)	.01 (.93)	7.00	.00
Sadness	.16 (.04)	-.09 (.25)	.24 (.00)	.05 (.54)	.03 (.71)	4.02	.00

pairwise combination of two emotion scales. The null hypothesis was rejected in each case (with Wilks's lambda ranging from .47 to .87,  $p < .03$ ), suggesting that the patterns of regression coefficients were different for the four emotion scales.

The results from the correlational and multivariate regression analyses showed that the Anger scale was positively associated with the appraisals of other accountability and unfairness, and with the antagonistic action tendency (the regression weight of the latter being only marginally significant, however), whereas it was not associated with the appraisal of goal obstacle and control. Unfairness proved to be positively associated with sadness as well. All the emotions were characterized by a different pattern of components.

Third, we also calculated correlations with the answers to the open-ended emotion question. To this end, the answers provided by the participants to the open-ended question were transformed into binary variables for each of the four main emotion categories under study: "fear," "anger," "shame," and "sadness." We used a straightforward coding scheme to code presence (1) and absence (0) of an emotion: An emo-

tion was rated as present only when a participant reported that he or she had felt that exact emotion in a situation.<sup>2</sup> On average, fear was reported being experienced in 19%, anger in 55%, shame in 12%, and sadness in 22% of the total number of situations recalled by the participants. Next, we calculated point-biserial correlation coefficients between these binary emotion variables and the component ratings across all reported situations, the results of which can be found in Figure 4 (in Figure 4, coefficients exceeding the value of .11 are significant at  $p < .05$ ; coefficients exceeding the value of .15 are significant at  $p < .01$ ). We performed additional analyses on the latter variables averaged across situations as well as analyses that used the binary component variables defined on the questionnaire instructions, all yielding similar results.

The results are in line with those reported in Figure 3 and Table 4: Anger was positively associated with other accountability, unfairness, and the antagonistic action tendency, and not with control. The present results also suggested that anger was related, to a small but significant degree, to the appraisal of goal obstacle.

In general, the presented results demonstrated that anger can be clearly distinguished from the other emotions in terms of its pattern of components. Furthermore, the appraisal of other accountability seemed to be specific to anger. Conversely, unfairness was not specific to anger because it was positively associated with anger as well as with sadness. The appraisal of goal blocking yielded only moderate or no association with the emotion of anger. The appraisal of control was not related to the different emotion scales, apart from the Shame scale.

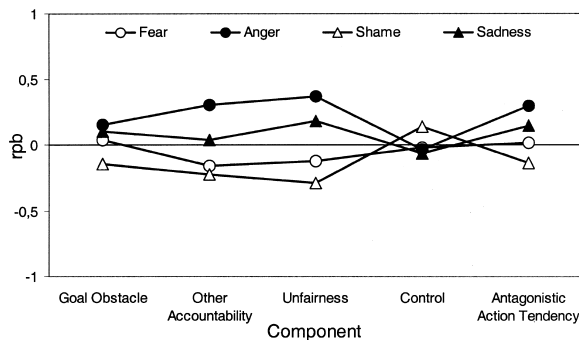


Figure 4. Point-biserial correlation (rpb) coefficients between free-response emotion reports and component ratings for Study 2.

<sup>2</sup> As a reliability check, two raters performed the coding independently. The interrater agreement (proportion of agreement) ranged from .93 to .98 for the four emotion categories separately, suggesting high interrater agreement.

*Necessity and sufficiency of components.* Again, we calculated asymmetrical phi indices to examine the degree of necessity and sufficiency of each component. We calculated several different such indices, based on either dichotomized emotion rating scores or the responses to the open-ended emotion question, and on either the manipulated component conditions or the dichotomized component ratings (with, in case of dichotomization, different thresholds). All these indices unequivocally led to the same conclusions. As an example, Figure 5 shows the results pertaining to anger, based on the degree of necessity and sufficiency of the responses to the open-ended emotion question and the dichotomized (0 and 1 vs. 2 and 3) component ratings.

The asymmetric association indices clearly reflected lack of necessity and sufficiency of each individual component in its association with anger. This means that, for each component, participants reported a nonnegligible number of situations in which a component was present, but in which they had not experienced anger, and vice versa.

### Discussion

The results of Study 2 largely replicated those of Study 1: Each of the emotions under study is associated with a distinct pattern of components, and no component proves to be a necessary or sufficient condition for anger. In this regard, the results, based on answers to the free-response emotion question, did not yield different conclusions from those based on the forced-choice emotion ratings. Although the participants freely reported slightly fewer anger instances compared with their forced-choice ratings (after dichotomization), the association indices based on both types of data are quite comparable.

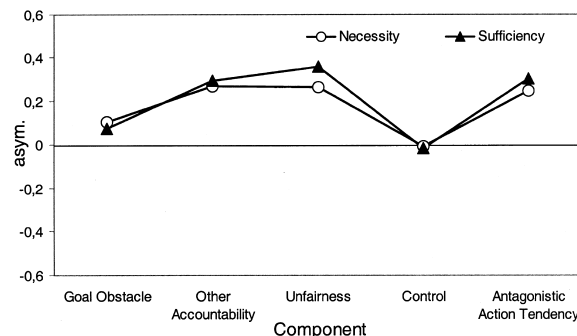


Figure 5. Degree of necessity and sufficiency of components for anger based on free-response anger reports for Study 2. asym. = asymmetrical phi.

However, there are some differences as well. First, the appraisal of goal obstacle is associated less with anger compared with the association between frustration and anger obtained in Study 1. This suggests that the “factual” situational feature of goal obstacle may not be a key determinant of anger, unlike the emotional processing of it in terms of the low-level emotional state of frustration.

Second, the results of Study 2 showed a positive association between the antagonistic action tendency and anger, whereas this was not the case in Study 1. This confirms our initial suspicion that the formulation of the antagonistic action tendency in Study 1 was too general or ambiguous, yielding no association with any of the emotions. The formulation used in Study 2 clearly referred to opposition (or antagonism) and proved to be associated with anger. As such, the results throughout the two reported studies point to the importance of carefully selecting the formulation of appraisal and action tendency components. In general, in the bulk of appraisal literature, researchers have used various formulations to denote the same component variable. It may be worthwhile to systematically examine the characteristics of different item formulations with an eye toward possibly improving the quality of the prediction of emotion variables.

In addition, Study 2 showed that the appraisal of control (which was included in this study, unlike in Study 1) is not associated with anger. As mentioned above, regarding this appraisal, previous research is the least conclusive, as both a positive as well as no association have been found between control and anger. A possible explanation may be that a distinction should be made between the feeling of having had control over what has happened before on the one hand, and the feeling that one can still change something about the situation on the other hand. Although it may sometimes be that anger can result from not having had control over what has happened before (e.g., Frijda, 1986), anger may mainly be hypothesized to include the feeling that one will be able to influence the future line of events (e.g., Scherer, 1984; Tiedens et al., 2000). In the present study, the appraisal of control was operationalized as “the feeling that one can influence what was happening” (consistent with Ellsworth & Smith, 1988). The formulation as such may have been interpreted more as control over what has happened, yielding no association with anger. In addition, this may also account for the positive association between control and shame (because of the association between shame and internal causal

attribution). Further research may be needed, however, to clarify these issues.

## General Discussion

### *Associations Between Components and Emotions*

As mentioned above, in the past two decades, a fair amount of empirical evidence has been reported in support of appraisal theories' assumptions and claims. For instance, Scherer (1997) argued that on the whole, the accumulated evidence provides substantial support for many of the theoretical claims of appraisal theorists (p. 115), and Frijda (1993) pointed to "the sizeable support for this [appraisal theory] approach, demonstrating strong relations between emotions and cognitive appraisal structures" (p. 212).

Indeed, across the two studies reported in this article, anger proved to be associated with a distinctive pattern of components, including frustration or the appraisal of goal obstacle (although results were less univocal regarding the latter), other accountability and unfairness, and an antagonistic action tendency (in terms of wanting to express opposition). The other emotions that were included in the present research proved to be consistently associated with distinct patterns of components as well.

The results of both studies suggest that other accountability is an appraisal that is specific to anger. Previous research seems to support this latter finding in that generally no specific associations between other accountability and emotions other than anger have been found (e.g., Ellsworth & Smith, 1988; Frijda et al., 1989; Roseman et al., 1990; Scherer, 1993). Furthermore, our results suggest that arrogant entitlement, as an instance of unfairness, is also a specific appraisal of anger. Unfairness in itself, however, does not seem to be specific to anger: According to the results in Study 2, unfairness was also related to sadness, which is consistent with previous research (Mikula et al., 1998).

In general, the components were associated with the different emotions we examined in a way that is not only plausible but also consistent with previous appraisal theory research. For instance, like anger, sadness is positively associated with the appraisal of goal obstacle or frustration (e.g., Ellsworth & Smith, 1988; Roseman, 1984; Scherer, 1984, 1993), but unlike anger, it is not associated with other accountability and arrogant entitlement. Apparently, feelings of sadness can occur in the case of an obstruction of one's goal, but when this obstruction is seen as caused

by someone else or accompanied by arrogance, one is more likely to get angry instead of sad. Similarly, the emotions of shame and anger are most clearly differentiated in terms of the appraisal of other accountability in that anger is positively associated with other accountability, whereas shame is negatively associated with this appraisal. The latter distinction is again in line with general appraisal theory findings (e.g., Ellsworth, 1994; Frijda, 1987; Ortony et al., 1988). Finally, only the Shame scale appeared to be positively associated with the appraisal of control, in line with previous studies (e.g., Scherer, 1993).

### *Necessity and Sufficiency of Components*

Most important, the present study addressed the issue of the association between components and emotions in terms of necessity and sufficiency. We found that none of the selected components can be considered as a truly singly necessary or singly sufficient condition for anger; for instance, one can feel angry without experiencing unfairness. Conversely, feeling antagonism is not always sufficient for getting angry. Similar conclusions hold for the other negative emotions, although those were not presented here. Whereas the finding of no single sufficiency is in line with statements from most componential theorists, the lack of single necessity is not.

One may note that part of these findings have a parallel in earlier research on aggression (see, e.g., Berkowitz, 1989, for an overview) in which it was found that, for instance, frustration and illegitimate actions by others are not always a necessary condition for aggressive behavior. Within the emotion domain, our findings are consistent with the semantic analyses presented by J. A. Russell and Fehr (1994) and the prototype approach of Shaver, Schwartz, Kirson, and O'Connor (1987) in which no necessary or sufficient features of emotions are assumed.

The implications of our findings for the componential approach to emotions are that, in general, assertions regarding the strength or universality of the relation between components–appraisals and emotions need to be specified in terms of contingent connections between both, meaning that they usually co-occur, instead of in terms of necessity (or sufficiency). Componential accounts of emotions have to consider a weaker or more complex relation between components and emotions, indeed. This echoes Reisenzein's (2000) claim, for example, about a weak probabilistic version of the coherence between different emotion components and emotional experience. A deterministic "syndrome theory" of emotions, in which different

emotion components are assumed to be strongly related to emotional experience, is no longer tenable given the moderate associations between emotions and their components (see also Parkinson, 1997).

One possible instance of a more complex relation may be that the occurrence of an emotion requires the occurrence of at least one or at least some, but not necessarily all central components of the emotion without any particular component being necessary on its own. On inspection of the data from Study 2, there is, indeed, not a single reported instance in which anger occurs when all the components under study are absent: In all the instances in which anger was reported to be present (either based on the answers to the open-ended emotion question or on the dichotomized [0 and 1 vs. 2 and 3] anger ratings), at least one of the components was reported to be present as well (based on dichotomized [0 and 1 vs. 2 and 3] component ratings). This implies that the experience of anger does require the occurrence of at least one of the components in question.

Another possibly related instance of a more complex relation may involve the existence of individual differences in the association between components and emotions. In particular, people could differ from each other with respect to which appraisals are necessary and/or sufficient for an emotion to be experienced. For instance, for Person A, someone else may need to be accountable for an unpleasant event for him or her to get angry, whereas this may not be necessary for Person B. In past work, appraisal-related individual differences in the emotion domain have been documented in terms of appraisal tendencies (e.g., hostile encoding bias; Dodge, 1993). However, such analyses are rare. Whereas these appraisal tendencies refer to individual differences in the occurrence of appraisals per se, our suggestion is that the presence of such differences may be extended to the links between components and emotions.

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Received October 21, 2002

Revision received March 24, 2003

Accepted March 26, 2003 ■

### New Editors Appointed, 2005–2010

The Publications and Communications Board of the American Psychological Association announces the appointment of two new editors for 6-year terms beginning in 2005:

- *Journal of Consulting and Clinical Psychology*: **Annette M. La Greca**, PhD, ABPP, Professor of Psychology and Pediatrics, Department of Psychology, P.O. Box 249229, University of Miami, Coral Gables, FL 33124-0751.
- *Developmental Psychology*: **Cynthia García Coll**, PhD, Brown University, 21 Manning Walk, Providence, RI 02912.

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- For *Developmental Psychology*, submit via [www.apa.org/journals/dev.html](http://www.apa.org/journals/dev.html).

Manuscript submission patterns make the precise date of completion of the 2004 volumes uncertain. Current editors, Mark B. Sobell, PhD, and James L. Dannemiller, PhD, respectively, will receive and consider manuscripts through December 31, 2003. Should 2004 volumes be completed before that date, manuscripts will be redirected to the new editors for consideration in 2005 volumes.