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# Implicit Theories About Interrelations of Anger Components in 25 Countries

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We were interested in the cross-cultural comparison of implicit theories of the interrelations of eight anger components (antecedents, body sensations, cognitive reactions, verbal expressions, nonverbal expressions, interpersonal responses, and primary and secondary self-control). Self-report scales of each of these components were administered to a total of 5,006 college students in 25 countries. Equivalence of the scales was supported in that scales showed acceptable congruence coefficients in almost all comparisons. A multigroup confirmatory factor model with three latent variables (labeled internal processes, behavioral outcomes, and self-control mechanisms) could well account for the interrelations of the eight observed variables; measurement and structural weights were invariant. Behavioral outcomes and self-control mechanisms were only associated through their common dependence on internal processes. Verbal expressions and cognitive reactions showed the largest cross-cultural differences in means, whereas self-control mechanisms scales showed the smallest differences. Yet, cultural differences between the countries were small. It is concluded that anger, as measured by these scales, shows more pronounced cross-cultural similarities than differences in terms of both interrelations and mean score levels.

*Keywords:* emotion components, anger, coherence, construct equivalence, cross-cultural

Cross-cultural studies of emotions help us to understand how people from different cultures are alike and different from each other in experiencing, expressing, and regulating their emotions. When studying emotions cross-culturally, one could choose either to examine a wide range of elements that cover

different emotions or to take a more focused approach in which a single emotion is studied more in-depth. The first approach is more common (e.g., Matsumoto, Nezlek, & Koopmann, 2007; Scherer & Wallbott, 1994). We adopted the second approach by focusing on anger. There were two reasons for choosing anger. First, it is a universal emotion that regulates social and interpersonal behaviors (Izard & Kobak, 1991; Lewis, Sullivan, Ramsay, & Alessandri, 1992; Saarni, Campos, Camras, & Witherington, 2006; Wallbott & Scherer, 1986); inappropriate regulation and expression of anger has important implications, both social (Eisenberg, Fabes, Nyman, Bernzweig, & Pinuelas, 1994; Murphy, Shepard, Eisenberg, & Fabes, 2004) and clinical (Barefoot, Dodge, Peterson, Dahlstrom, & Williams, 1989; Casey & Schlosser, 1994; Cole, Teti, & Zahn-Waxler, 2003; Suinn, 2001). Second, anger shows important cultural variability; for example, there are indications that its expression is more tolerated in individualistic countries than in collectivist countries (Niedenthal, Krauth-Gruber, & Ric, 2006). We developed an instrument purported to measure mental models or prototypical knowledge of anger components. Our study was aimed to examine the cross-cultural equivalence of the scales (do the scales measure the same anger components across cultures?), the interrelations of the scales (how are these anger components related? Are there cross-cultural variations in these interrela-

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tions?), and cross-cultural differences in mean score levels (are there cross-cultural differences in anger components, and if so, what is their patterning?).

### Coherence Among Emotion Components

The componential approach (e.g., Frijda, 1986) views emotions as comprising separate, yet interrelated components that may vary across situations. What has not been clarified yet is to what extent those components constitute the entire emotion. How these components are interrelated is a crucial question in emotion psychology. Several authors have claimed that there must be relations between appraisals, physiological or body responses, subjective experience, and expressive behaviors of an emotion (e.g., Ekman, 1984; Lazarus, 1991; Matsumoto, Nezlek, & Koopmann, 2007; Mesquita, Frijda, & Scherer, 1997; Roseman, 1984, 1991; Scherer, 1999). Such coherence has been observed (e.g., Frijda, Kuipers, & ter Schure, 1989; Matsumoto, Kasri, & Kooiken, 1999; Matsumoto, Nezlek, & Koopmann, 2007; Mauss, Levenson, McCarter, Wilhelm, & Gross, 2005; Rosenberg & Ekman, 1994; Ruch, 1995); however, the support was not consistent. Weak and even zero correlations between the expressive and experienced components have been reported, specifically when trying to link happiness and smiling (e.g., Fernandez-Dols & Ruiz-Belda, 1995; Ruiz-Belda, Fernandez-Dols, Carrera, & Barchard, 2003; Schneider & Josephs, 1991).

### Anger Components and Their Interrelations

There are no theories of coherence of emotion components (or anger components, for that matter). However, extant models imply coherence, which usually amounts to a positive correlation of components. We review here two models that were used as starting points in our search for coherence: a structural model and a process model.

It is often assumed that emotions are entities with jointly operating components (for a review, see Barrett, 2006a). The basic idea is that an event triggers a certain emotion, which is conceptualized as a series of interrelated repertoires (physiological changes, affective reactions, cognitive reactions, verbal and nonverbal responses, other behavioral actions, and self-control mechanisms). Barrett argued that this hypothetical relation between the components and the emotion as an existing entity has been never tested before. She suggests that the relations of the emotion components would be similar to those between the items of a unidimensional scale. The emotion, anger in the present study, is then a latent variable that drives the correlations between the components. The underlying one-factor construct is labeled here the *structure-oriented* model (see Figure 1).

An alternative model to account for interrelations of anger components is the *process-oriented* model that is based on work by Frijda (1986, 2007). An emotion is viewed as a process in which components unfold over time. The eliciting event would be followed by the individual's appraisal. The physiological arousal and experienced affect would then stem from the appraisal. Appraisal is a continuous process that does not disappear once the subsequent emotion components lead to external manifestations such as observable behaviors. Self-control mechanisms can be activated

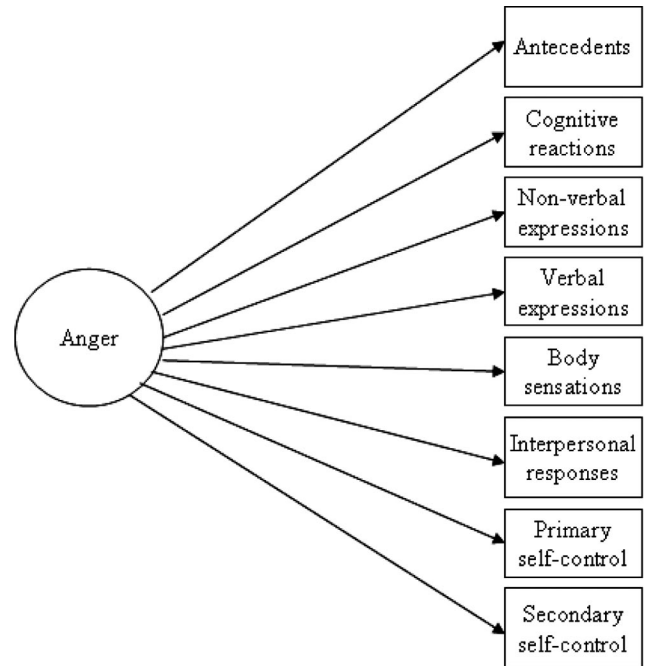


Figure 1. Structure-oriented model of the interrelations of anger components.

and exert influence on the other components. A graphical display of this model can be seen in Figure 2.

### Cultural Variability of Anger Components

Compatible with a notion of universality as the guiding principle to understand the phenomenology and general functioning of emotions, there is also widespread conviction that culture exerts some kind of modulating effect over them (e.g., Matsumoto, Nezlek, & Koopmann, 2007; Matsumoto, Yoo, & Chung, 2007; Scherer & Wallbott, 1994; Scherer, 1999). Mesquita and Frijda (1992) noted that differences in one emotion component did not directly bring similar differences in another component, and therefore, these should be studied in more detail. Emotions in general and anger in particular are susceptible to cultural influence, but we do not know whether anger components are related in the same way across cultures, nor do we know in which components culture exerts a bigger influence.

Scherer and Wallbott's (1994) study assessed cross-cultural variability in a number of anger components: physiological measures, verbal, and nonverbal expression—along with some other subjective dimensions, such as duration, intensity, and control attempts. Their study involved 37 countries. Cross-cultural differences were larger for verbal expression than for nonverbal expression and physiological reactions. In a recent reanalysis using statistically more sophisticated procedures, Matsumoto, Nezlek, and Koopmann (2007) found that differences in anger components that were attributable to country ranged between 2% and 7%, with higher percentages for verbal expression and the lower for the physiological measures (temperature). They found moderate correlations between participants' angry facial expression and appraisal of injustice (.35) and self-reported feelings of anger (.44).

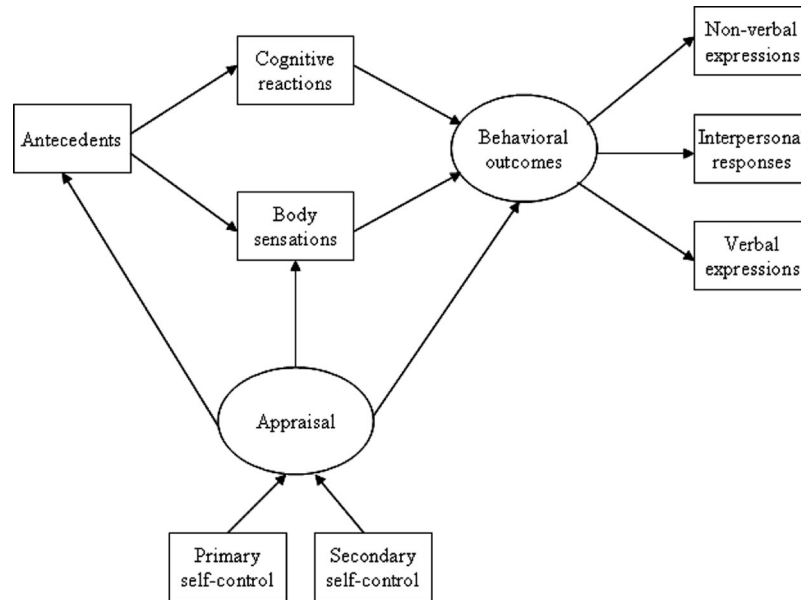


Figure 2. Process-oriented model of the interrelations of anger components.

The authors also reported coherence among verbal expression, nonverbal expression, and physiological measures of anger. This pioneering study did not examine anger in sufficient detail for our purposes; more specifically, beyond the physiological responses, there was no assessment of some other internal aspects of anger of cognitive nature, such as antecedents and cognitive reactions and self-control mechanisms.

Ekman and Friesen (1969) coined the term “display rules” to refer to the implicit norms embedded in a particular culture that guide individuals’ behavior as when, to whom, and how expressing emotions is considered acceptable. A related concept is “feeling rules” (Hochschild, 1979) that specify how we accommodate our emotions to cultural norms about appropriate feelings in a situation. From this perspective, norms would not only influence external manifestation of the emotion but also the internal experience of it (Mesquita & Frijda, 1992). If “cultural calibration” of biologically based emotions (Matsumoto, Yoo, & Chung, 2007) happens because behaviors need to be managed to maintain the social order, then the processes of anger that are more internal are presumably subject to less cultural variability as compared to (the more norm-regulated) behavioral outcomes. This hypothesis has not yet been tested.

Similarly, control mechanisms and emotional regulation have not received their deserved cross-cultural attention in such an interpersonal emotion as anger. Scherer, Matsumoto, Wallbott, and Kudoh’s (1988) study is among the few studies investigating this issue. In a sample of students from Japan, the U.S., and Europe, these authors examined the efforts individuals were compelled to make to control their verbal expression, nonverbal expression, and physiological responses. They found that, compared to the other basic emotions under study, anger showed more regulatory control in all countries (more so in Japan and the U.S. than Europe); control efforts were particularly strong for verbal expression (also observed in Scherer, Wallbott, & Summerfield, 1986). Control mechanisms in anger are, there-

fore, expected to show considerable cultural variability (Mesquita & Frijda, 1992).

Borrowing the terminology adopted by Rothbaum, Weisz, and Snyder (1982), we could distinguish two strategies to deal with emotions: primary control—with a focus on bringing environmental or situational issues into one’s wishes—and secondary control—with a focus on adapting oneself to environmental forces. The former reflects a more active coping with the emotion arousal, whereas the latter involves strategies of passive and withdrawal behavior. Yamaguchi (2001) has shown that inhabitants from East Asian countries show a higher tendency to use strategies of secondary control and are less likely to use primary control.

### Present Study and Hypotheses

We assume that implicit views on interrelations of anger components are derived from generalized (personal- or vicarious-based) experiences with these components, although a perfect match between folk conceptions and actual experiences cannot be claimed (see Russell, 2009). In line with a tradition of empiricism, Russell (2009) has provided some examples of how our perceptions of objects in our external field of vision may lead us to incorrect conclusion of the positioning or movement of those objects, warning us about the real risks of taking the so-called folk theories as proven scientific theories. Nevertheless, when it comes to analyze processes that take place inside the individual, we think that some sort of “knowledge” should be implied to her/him. Therefore, without claiming that the implicit views that an individual holds based on his or her past experiences are synonym of what emotions are, we still believe that the underlying dynamics of the interrelations among emotion components may be derived from individuals’ prototypical views on them, while necessarily complemented with empirical assessments of those components of emotion that are observable.

Therefore, these interrelations may bear some resemblance to actually observed contingencies. We expect that all components of anger—that is, antecedents,<sup>1</sup> cognitive reactions, body responses, verbal expressions, nonverbal expressions, interpersonal responses, primary self-control, and secondary self-control—are relevant elements of the emotion, and hence, they should be positively linked. We tested the construct equivalence in the following hypothesis:

*Hypothesis 1:* Scales of anger components are positively related in each country.

Based on the stability of interrelations of components across the countries investigated, we can determine the generalizability of the hypothesized model and the universality of anger components. Therefore, the second hypothesis tests the cross-cultural similarity of construct equivalence:

*Hypothesis 2:* Associations of the scales can be modeled in a factor model with invariant loadings across cultures.

Finally, we were interested in the relative size of cross-cultural differences in the anger components. Based on previous findings (e.g., Scherer & Wallbott, 1994; Matsumoto, Nezlek, & Koopmann, 2007), we expect the cultural variability to be small, though patterned. Antecedents, perceived body sensations, and the two types of nonverbal expressions (motor expression and interpersonal responses) are expected to show less cross-cultural variability than cognitive reactions, verbal expressions, and control mechanisms (Mesquita & Frijda, 1992). We tested the following hypothesis:

*Hypothesis 3:* Compared to the other anger components, verbal expression and self-control mechanisms show the largest cross-cultural differences.

## Methods

### Participants

A total of 5,006 students of 25 different countries took part in the study (2,858 women, 2,142 men, 6 unknown). They were recruited from Psychology and Social Sciences colleges on campus by local collaborators in each country. The mean age was 21.70 year ( $SD = 4.06$ ). Descriptive information for each country regarding age, gender percentage, and participant numbers is provided in Table 1. The countries included in the study were located in different geographical locations of the world: North, Central, and South America (Argentina, Bolivia, Brazil, Chile, Colombia, El Salvador, Mexico, Panama, Peru, U.S.A., and Venezuela), Mediterranean (Greece, Italy, Portugal, Spain, and Turkey), the rest of Europe (Belgium, France, Germany, Russia, and Switzerland), and the Middle and Far East (China, Iran, Lebanon, and Singapore). Previous research on anger and other emotions has acknowledged their association with country variables, such as individualism versus collectivism, power distance, and affluence (e.g., Basabe et al., 2000; van Hemert, Poortinga, & van de Vijver, 2007). Therefore, an effort was made to include countries that differ in these three variables (e.g., individualist and hierarchical, collectivist and hierarchical, highly developed and individualist,

Table 1  
*Sample Size, Gender Distribution, Age, and Language of the Countries*

Country	N	Female percentage	Age $M (SD)$	Language of the scales
Argentina	221	59.3	24.2 (6.36)	Spanish
Belgium	87	81.6	20.9 (2.95)	French
Bolivia	108	50.9	20.0 (4.19)	Spanish
Brazil	491	52.3	22.0 (4.13)	Portuguese
Chile	137	56.9	22.9 (3.32)	Spanish
China	119	50.4	21.3 (1.16)	Mandarin
Colombia	117	52.1	21.1 (4.51)	Spanish
El Salvador	117	83.8	19.5 (1.83)	Spanish
France	188	52.1	23.5 (4.74)	French
Germany	109	62.4	22.6 (3.08)	German
Greece	113	81.4	20.5 (3.96)	Greek
Iran	87	60.9	22.4 (3.70)	Farsi
Italy	111	50.5	21.8 (2.51)	Italian
Lebanon	120	49.2	22.1 (2.51)	French
Mexico	164	50.0	21.7 (3.78)	Spanish
Panama	78	75.6	22.4 (3.81)	Spanish
Peru	119	50.4	22.0 (2.33)	Spanish
Portugal	262	59.2	20.9 (3.08)	Portuguese
Russia	265	50.9	19.6 (1.97)	Russian
Singapore	119	48.7	20.2 (1.77)	English
Spain	1,270	54.8	21.4 (3.19)	Spanish
Switzerland	175	81.1	21.0 (3.49)	French
Turkey	105	63.8	21.2 (1.82)	Turkish
USA	101	42.6	21.3 (2.53)	English
Venezuela	223	57.4	26.8 (7.79)	Spanish
Total	5,006	57.2	21.8 (4.06)	

highly developed and collectivist). Finally, East Asian countries were included because of the special status of this region on self-control mechanisms (Yamaguchi, 2001).

### Instruments

**Anger scales.** For the assessment of relevant dimensions of mental models of anger, eight scales were developed based on the descriptions derived from studies by Shaver, Schwartz, Kirson, and O'Connor (1987), and Scherer, Rimé, and Chipp (1989). The scales were named as follows: Antecedents (6 items), Cognitive Reactions (5 items), Body Sensations (5 items), Verbal Expressions (4 items), Non-Verbal Expressions (5 items), Interpersonal Responses (5 items), Primary Self-Control (3 items), and Secondary Self-Control (4 items); items are given in Table 2). The items were preceded by the instruction that asked the participants to rate each item's prototypicality for anger. Items were answered using a four-point Likert response format, with item options ranging from 1 (*Not at all typical*) to 4 (*Very typical*).

The different language versions were obtained following recommendations for test adaptation (van de Vijver & Hambleton, 1996; van de Vijver & Leung, 1997). Translators and specialists in emotion collaborated in the participating countries during the back-translation process. For that purpose, and stemming from an English version, a bilingual collaborator in each country created a

<sup>1</sup> By antecedents, we do not refer to an objective eliciting event but rather to the interpretation made by the individual of a situation as being one motive of anger (Mesquita et al., 1997).



Table 2  
Factor Loadings of the Items of All Anger Scales in the Pooled Within-Group

Item	Factor loading
Antecedents (eigenvalue = 2.03, variance explained = 33.9%, alpha = .61)	
Predisposition towards feeling anger	.54
Sudden loss of power, status, respect	.60
When things do not go as planned	.67
Interruption of an activity	.62
Real or threatened physical or mental pain	.54
Judging that the situation is wrong	.52
Cognitive reactions (eigenvalue = 2.18, variance explained = 43.6%, alpha = .69)	
Imagining one attacks or hams the cause of anger	.59
Nervousness, anxiety, disconformities, oppression	.66
Thinking that one is right and that everything else is wrong	.70
Focusing attention on the anger situation without paying attention to any other thing	.74
Powerless, feeling one is not able to control or solve the situation	.62
Body sensations (eigenvalue = 2.33, variance explained = 46.6%, alpha = .71)	
Agitated, rigid movement; tension in the body	.67
Blushing	.59
Feeling hot	.71
Fast heart beat	.75
Feeling muscular symptoms	.69
Verbal expressions (eigenvalue = 2.31, variance explained = 57.8%, alpha = .78)	
Verbally attacking the cause of anger	.75
Screaming, raising one's voice	.82
Discussion, confrontation—talking about how bad things are—	.73
Cursing, obscenities	.74
Non-verbal expressions (eigenvalue = 2.53, variance explained = 50.6%, alpha = .76)	
Clenching one's fists	.76
Threatening, aggressive gestures	.78
Not smiling, frowning	.54
Heavy walk, stomping	.72
Grinding one's teeth	.73
Interpersonal responses (eigenvalue = 2.39, variance explained = 47.8%, alpha = .76)	
Physically attacking the cause of anger	.68
Physically attacking another object which is not the cause of anger	.76
Being out of control, strong emotional behaviors	.77
Not verbally communicating one's disapproval with the cause of anger, one's disagreement	.68
Abandoning social contact	.53
Primary self-control (eigenvalue = 1.83, variance explained = 61.1%, alpha = .67)	
Redefining the situation or trying to see it under a different light so that the anger reaction is not the most appropriate one	.74
Finding solutions for the conflictive situation	.82
Searching for explanations; this must be done actively, not only in thought	.78
Secondary self-control (eigenvalue = 1.62, variance explained = 40.6%, alpha = .50)	
Trying not to express or show anger	.65
Self-comforting oneself, telling oneself that the problem is not that important, closing one's eyes	.74
Leaving or ignoring the situation	.59
Staying put, enduring	.56

version in the target language that was then back-translated to English independently by another bilingual collaborator. The Spanish version was created taken into account all possible linguistic and idiomatic variations, as suggested by colleagues from different countries. The objective of the translation process was to preserve the conceptual meaning of the original form.

## Procedure

Collaborators in the participating countries were university lecturers and researchers. They explained the study to students; participation was voluntary. Data collection took place in the classrooms.

## Results

First, we address the construct equivalence analyses for the anger scales across countries. Second, the interrelations of anger components (taken as mental models) are analyzed using structural equation modeling (Arbuckle, 2008). Finally, we present the analyses conducted to examine country differences for all anger components.

## Construct Equivalence of Scales Across Countries

The issue of equivalence of psychological meaning has been addressed by van de Vijver and Leung (1997) as a precondition to compare the constructs in cross-cultural research. Thus, we conducted equivalence analyses of the anger component scales to ensure that comparability. In a first step, the dimensionality of each scale was calculated on the basis of the pooled data; country differences in items were removed so that the factor analysis on these data would not be influenced by confounding country-level differences in item means. All scales showed a one-dimensional structure; this single factor explained between 34.2% (Antecedents scale) and 60.8% (Primary Self-Control scale). Internal consistencies were also calculated; acceptable Cronbach's alpha coefficients of .69 and higher were obtained for all scales, except for the Antecedents scale ( $\alpha = .61$ ) and Secondary Self-Control ( $\alpha = .50$ ). Both the total variance explained (from the pooled-within solution) and internal consistency coefficients for all scales can be found in Table 2.

Construct equivalence was analyzed by examining the similarity of the factor in the pooled data to the factors in each country; a separate analysis was conducted for each scale. Tucker's phi coefficients were calculated for each country and each scale. This congruence coefficient measures factorial identity; values lower than 0.90 are usually taken as indication of differences in underlying factors. The congruence coefficients, shown in Table 3, showed impressive evidence that the anger components were equivalent across the countries examined in the present study; only 2 out of the 225 calculated coefficients showed a subthreshold value. This was the case of Secondary Self-Control scale in China (.39) and the Antecedents scale in Colombia (.34). A Chinese native speaker and a Spanish native speaker—emotion experts not present in the previous team of the back-translation procedure—reviewed the content of items to check possible deviations from the intended meaning. The Chinese expert suggested that subtle changes might have been introduced in the wording of items of Secondary Self-Control, which may have led to different answers

Table 3  
*Congruence Coefficients (Tucker's Phi) of the Anger Scales for All Countries*

Country	Antecedents	Cognitive reactions	Body sensations	Interpersonal responses	Non-verbal behavior	Verbal behavior	Primary self-control	Second. self-control
Argentina	1.00	1.00	.99	1.00	1.00	1.00	1.00	1.00
Belgium	.95	.92	1.00	.99	.99	.99	1.00	.98
Bolivia	.96	1.00	1.00	.99	1.00	1.00	1.00	.98
Brazil	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Chile	.98	1.00	.99	1.00	1.00	1.00	1.00	.99
China	.94	.99	.95	.98	.91	1.00	1.00	.39
Colombia	.34	1.00	1.00	.94	1.00	.99	1.00	1.00
El Salvador	1.00	1.00	1.00	.99	.99	1.00	1.00	.99
France	1.00	1.00	1.00	1.00	1.00	1.00	1.00	.99
Germany	.98	.97	.97	1.00	.98	.98	.99	.91
Greece	.98	.99	1.00	.99	.99	1.00	1.00	1.00
Iran	.90	.99	1.00	.99	1.00	1.00	1.00	.99
Italy	.99	.99	1.00	.99	.99	.99	1.00	1.00
Lebanon	.99	.99	1.00	.99	.98	.98	1.00	.99
Mexico	.99	1.00	1.00	.98	1.00	1.00	1.00	1.00
Panama	.99	.99	1.00	1.00	1.00	1.00	1.00	.95
Peru	1.00	.98	1.00	1.00	.99	1.00	1.00	.98
Portugal	.98	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Russia	.98	.99	.95	1.00	.99	1.00	1.00	.97
Singapore	.98	1.00	.98	1.00	.97	.93	1.00	.99
Spain	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Switzerland	.97	.98	1.00	1.00	1.00	1.00	1.00	.99
Turkey	.99	1.00	1.00	.99	.99	1.00	1.00	.98
USA	.99	.99	.94	1.00	1.00	.97	1.00	.98
Venezuela	1.00	1.00	1.00	1.00	1.00	1.00	1.00	.99

Note. Coefficients below .90 are shown in italics.

from Chinese respondents. The reason for the problem with the Colombian data was unclear; the translation did not show any flaw. Removing China and Colombia from the analyses did not change the conclusions of the study; therefore, we decided to retain the problematic scales in these two countries.

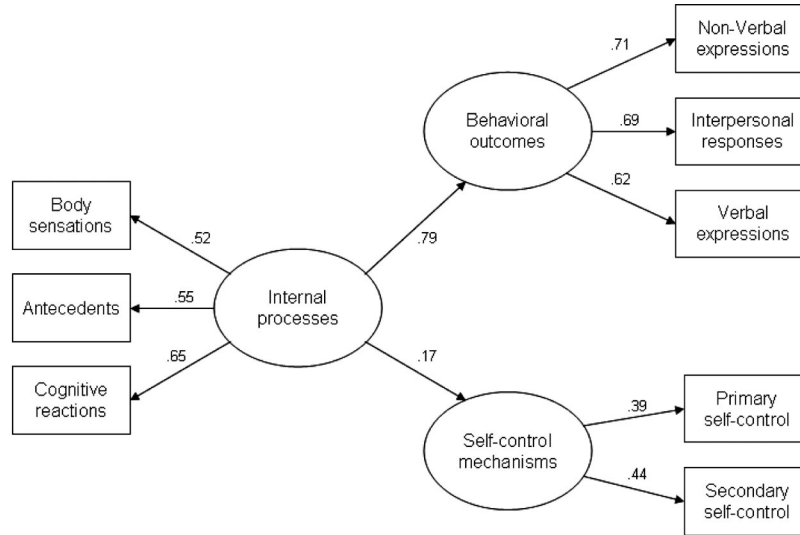
### Coherence and Interrelations of Anger Components

All eight variables were positively related within each of the countries, which confirmed the first and second hypothesis dealing with the expected coherence among anger components. Coherence was further examined by testing the fit of the structure- and process-oriented models of Figure 1 and 2. Both models were tested in multiple-group structural equation models (using maximum likelihood estimates). The baseline was an unconstrained model in which all parameters were allowed to vary, and subsequent analyses constrained parameters to be cross-culturally invariant in the search for the most parsimonious model that still showed an acceptable fit.

Since the sample size was large and the conventional chi-square statistic is sensitive to sample size (Schumacker & Lomax, 2004), various additional indexes were used to test the goodness of fit of the models. The relative or normed chi-square is the chi-square fit index divided by its degrees of freedom ( $\chi^2/df$ ); values of three or less are seen as pointing to a good fit (Kline, 1998). The Adjusted Goodness of Fit Index (AGFI) is a related measure of fit that corrects for model complexity; the lower threshold level for a good fit is .90. The Tucker-Lewis Index (TLI; also called Non-Normed Fit Index, NNFI) compares the fit of a target model to fit of a null model and penalizes for model complexity; values above .90 point

to a good fit. As for the Root Mean Square Error of Approximation (RMSEA), another parsimony-adjusted measure, a value less than .05 would indicate good fit. In our study, the Akaike Information Criterion (AIC) was used to select the most parsimonious model, indicated by the lowest value between the competing models when the models are not nested, which is the case in the comparison of the structure- and process-oriented models.

Both the structure- and process-oriented model showed fit measures that were not entirely acceptable; notably the AGFI and TLI values suggested that the models required further modifications. Some further explorations with these models revealed that only the structure-oriented model could be improved significantly while maintaining a theoretically meaningful pattern. This new model, called *the hierarchical structure-oriented model*, is displayed in Figure 3 and its fit values are given in Table 4. Overall, the fit statistics of this model were well acceptable; more specifically, the structural weights model showed the most favorable fit statistics. This finding indicates that the parameter estimates, drawn in Figure 3, were invariant across all countries and that the additional parameters (i.e., the error variances of the scales and factors) varied across countries. Clearly, the cross-cultural equivalence of the coherence of anger components is strongly supported. The model was best described with three latent variables (Internal Processes, Behavioral Outcomes, and Self-Control Mechanisms) to account for the covariation among the eight observed variables. The most important component of the model is Internal Processes. In our model, anger-related processes constitute the core of anger that drives, directly or indirectly, all the associations between the anger components. Two additional latent variables, Behavioral



Note. Standardized coefficients.

All  $p < .05$

Figure 3. Predictive model for the interrelations of anger components across countries.

Outcomes and Self-Control Mechanisms, had to be introduced to deal with the relatively high correlations of the scales they constitute. Internal Processes were strongly related to Behavioral Outcomes (standardized  $\beta = .79$ ) but only weakly related to Self-Control Mechanisms (standardized  $\beta = .17$ ). The association between Behavioral Outcomes and Self-Control Mechanisms is not very strong and entirely due to their common dependence on Internal Processes, whereas the associations between the scales of a single dimension are much stronger.

### Countries Differences in Anger Components

In order to examine which anger component showed a greater variance across countries and with the aim of controlling possible gender differences in anger components, a MANOVA was conducted. Using Wilks's  $\Lambda$ , there was a significant effect of country on the scores of anger components,  $\Lambda = 0.72, F(192, 37,721) = 8.61, p < .001$ . In general, the country effect was small, yet meaningful as shown later; the partial eta square values of the

Table 4  
Invariance Analysis of Models for the Interrelations of Anger Components Across Countries

Model no.	Model description	$\chi^2$	df	$\chi^2/df$	AGFI	TLI	RMSEA	AIC	Nested models	$\Delta\chi^2$	$\Delta df$	Significance level
Structure-oriented model												
1	Unconstrained	1669.9	500	3.34	.862	.850	.022	2469.9				
2	Measurement weights	1931.0	668	2.89	.882	.879	.019	2394.9	2-1	261.0	168	.000
3	Structural covariances	2099.0	692	3.03	.875	.870	.020	2515.0	3-2	168.1	24	.009
4	Measurement residuals	2659.9	884	3.01	.872	.871	.020	2691.9	4-3	560.9	192	.000
Process-oriented model												
1	Unconstrained	2038.8	475	4.29	.830	.789	.026	2888.8				
2	Measurement weights	2197.7	571	3.85	.847	.818	.024	2855.7	2-1	159.0	96	.000
3	Structural weights	2410.6	691	3.49	.860	.841	.022	2828.6	3-2	213.0	120	.000
4	Structural residuals	2599.6	739	3.52	.858	.839	.022	2921.6	4-3	189.0	48	.000
5	Measurement residuals	3121.3	883	3.54	.852	.838	.023	3155.3	5-4	521.7	144	.000
Hierarchical structure-oriented model												
1	Unconstrained	1267.0	525	2.42	.899	.909	.017	2020.0				
2	Measurement weights	1413.2	621	2.28	.906	.918	.016	1971.2	2-1	143.2	96	.001
3	Structural weights	1518.0	693	2.19	.910	.924	.015	1932.0	3-2	104.9	72	.007
4	Structural residuals	1773.1	741	2.39	.900	.911	.017	2091.1	4-3	255.1	48	.000
5	Measurement residuals	2250.0	885	2.54	.891	.901	.018	2280.0	5-4	476.8	144	.000



anger components ranged from 1% to 11%. There was also a statistically significant effect of gender,  $\Lambda = 0.99$ ,  $F(8, 4,949) = 8.69$ ,  $p < .001$ , and of the interaction of gender and country,  $\Lambda = 0.95$ ,  $F(192, 37,721) = 1.26$ ,  $p < .01$ . However, the effect size was very small in all cases (smaller than .005). These findings suggest that gender did not play any role of importance in anger components.

In line with our predictions, verbal expressions ( $\eta_p^2 = .11$ ) was the component with the largest variability; cognitive reactions ( $\eta_p^2 = .08$ ) also showed a relatively large variability. Nonverbal expressions ( $\eta_p^2 = .07$ ), body sensations ( $\eta_p^2 = .07$ ), interpersonal responses ( $\eta_p^2 = .06$ ), and antecedents ( $\eta_p^2 = .04$ ) showed less cross-cultural variation as expected, although the difference with cognitive reactions was small. All means and standard deviations are shown in Table 5. Finally, contrary to our expectations, the means of self-control did not vary much across countries (primary self-control,  $\eta_p^2 = .01$ , and secondary self-control,  $\eta_p^2 = .03$ ). No differences were observed in primary self-control,  $t(5004) = -0.76$ ,  $p = .940$ , between the combined mean of East Asian countries ( $M = 8.69$ ,  $SD = 1.92$ ) and the mean of the other group of countries ( $M = 8.70$ ,  $SD = 2.01$ ). Moreover, as expected, a statistically significant difference was found for secondary self-control,  $t(4885) = 3.85$ ,  $p < .001$ , Cohen's  $d = .37$ , East Asian countries scoring higher ( $M = 10.35$ ,  $SD = 2.22$ ) than the other group of countries ( $M = 9.50$ ,  $SD = 2.39$ )<sup>2</sup>. Therefore, overall the cultural differences were small but in most cases as predicted, with the exception of control mechanisms that appeared to show less cross-cultural variation than expected.

## Discussion

We were interested in cross-cultural differences and similarities in eight anger components as individuals' implicit theories: antecedents, body sensations, cognitive reactions, verbal expressions, nonverbal expressions, interpersonal responses, and primary and secondary self-control. Unique features of the present study were the focus on a single emotion, anger, and the inclusion of more emotion components than typically examined in previous studies. Scales measuring implicit views on anger components were administered to 5,006 students from 25 countries. Equivalence of the (in all cases unifactorial) scales was supported. A multigroup confirmatory factor model with three latent variables was tested. The three factors, labeled internal processes, behavioral outcomes, and self-control mechanisms, showed a good fit; measurement and structural weights were invariant. The frequent theoretical distinction made by emotion researchers between internal processes and external behaviors, has shown to be also reflected in implicit views. This finding is in line with our assumption that implicit views are based on generalizations of observed contingencies of these components. The presence of a central component of the model, internal processes, confirmed the expected coherence of the anger components. Verbal Expressions and Cognitive reactions showed the largest cross-cultural differences, and Self-Control Mechanisms scales the smallest. It was concluded that the anger components showed more pronounced cross-cultural similarities than differences, both in terms of interrelations and mean score levels.

Support for the theoretically expected coherence of emotion components has not yet been entirely conclusive (e.g., Bonanno & Keltner, 2004; Matsumoto, Nezlek, & Koopmann, 2007; Ortony & Turner, 1990; Russell, 2003). Our study provides strong evidence

for the coherence of implicit views on anger components, as all anger components were positively linked to each other in a higher-order confirmatory factor model with sizable positive loadings in all countries. The magnitude of the interrelations among anger components is larger than typically reported in other studies in the literature of emotions. At least, three possible reasons could be mentioned. First, we focused on a single emotion, whereas in previous studies several emotions had been studied concurrently, addressing fewer aspects of each emotion (e.g., Matsumoto, Nezlek, & Koopmann, 2007). The interrelations within a single emotion may be stronger because the elements chosen for the assessment of components tend to be more precise. Second, the more the item asks about an emotion in a concrete situation is, the more interference with other emotions or personality aspects can be expected. Our data relied on prototypical rather than on recalled experiences of anger (e.g., Matsumoto, Nezlek, & Koopmann, 2007) or episodes while the emotion is unfolding (e.g., Bonanno & Keltner, 2004). Conscious representations of anger episodes as studied here are based on declarative knowledge and may show a higher consistence. The third possible explanation is related to the methods of our study: we used self-reports to assess all components, whereas some other studies dealt with different response modes (e.g., Bonanno & Keltner, 2004). The use of multiple methods to assess components may lead to lower correlations.<sup>3</sup>

The positive evidence in favor of coherence that was found in the present study suggests that the question may not be whether there is coherence among components or not but rather under which conditions we would find a weaker or stronger pattern of interrelations among the components. Combining our observations with those from previous studies, we would argue that coherence of emotion components is more likely to emerge (a) when a single emotion is studied (as compared to a study of multiple emotions); (b) when all responses are collected in the same response mode (notably self-reports); (c) when the outcome variables are not so heavily regulated by cultural rules that individual differences are curtailed; and (d) when the influence of confounding emotions in the same emotional sequence is avoided by assessing prototypical instead of more specific situations. This last aspect has special importance because, as other authors have underlined (e.g., Carrera & Oceja, 2007; Clore & Ortony, 2000; Ellsworth & Scherer, 2003; Frijda, 2007), emotions are dynamic per se. Quite often the episodes affectively charged do not involve a single emotion but a sequence or mixture of emotions; the emotional decomposition of such a mixed emotional situation may be difficult to disentangle for individuals.

Another aim of this comparative study was to analyze the cross-cultural similarities and differences in anger components. The structure of anger, as measured by the eight components under study, was universal in our study. This finding is not surprising, given the status of anger as one of the basic emotions that would

<sup>2</sup> Since the Tucker's Phi coefficient was not adequate for Secondary Self-Control scale in China, the mean of East Asian countries in that case was reported from the scores of the Singapore sample. Including the Chinese data did not lead to a different conclusion:  $M = 10.12$ ,  $SD = 2.12$ ;  $t(5004) = 4.39$ ,  $p < .001$ , Cohen's  $d = .27$ .

<sup>3</sup> It may be thought that the source of coherence is due to common method bias, but the lower interrelations with the self-control mechanisms, also using self-reports, rule out this possibility.

Table 5  
*Mean Scores (and Standard Deviations) for All Anger Scales*

Country	Antecedents	Cognitive reactions	Body sensations	Interpersonal responses	Non-verbal behavior	Verbal behavior	Primary self-control	Secondary self-control
Argentina	17.08 (2.94)	14.78 (3.17)	14.02 (3.38)	12.35 (3.56)	11.96 (3.48)	12.31 (2.71)	8.90 (1.90)	8.84 (2.30)
Belgium	17.43 (2.98)	15.30 (2.65)	15.80 (2.63)	13.63 (3.39)	14.91 (3.38)	13.26 (3.39)	8.63 (2.11)	9.14 (2.25)
Bolivia	16.38 (2.70)	13.86 (2.83)	12.01 (3.30)	13.19 (3.31)	12.34 (3.61)	11.51 (3.03)	8.65 (1.82)	9.88 (2.32)
Brazil	16.32 (3.48)	13.35 (3.22)	13.80 (3.61)	12.20 (3.62)	12.13 (3.84)	11.08 (3.30)	8.48 (2.13)	9.61 (2.34)
Chile	16.96 (2.78)	14.96 (2.81)	15.40 (3.14)	13.53 (2.99)	13.84 (3.45)	12.63 (2.52)	8.54 (2.16)	9.07 (2.36)
China	14.92 (3.00)	12.97 (2.97)	13.19 (2.96)	12.33 (3.15)	10.49 (3.03)	10.50 (3.34)	8.75 (2.04)	9.89 (2.00)
Colombia	18.02 (2.29)	15.16 (2.97)	16.41 (3.10)	14.32 (3.34)	13.38 (3.75)	12.32 (2.89)	8.75 (2.07)	9.80 (2.15)
El Salvador	15.75 (4.17)	12.79 (3.78)	12.78 (4.53)	12.08 (4.07)	11.39 (4.43)	10.19 (3.77)	8.79 (2.33)	10.00 (2.83)
France	17.21 (2.97)	14.64 (2.90)	15.15 (3.06)	14.08 (3.31)	13.86 (3.18)	13.28 (2.61)	8.75 (2.10)	9.37 (2.59)
Germany	16.83 (3.00)	14.06 (2.72)	13.41 (3.21)	13.33 (3.31)	11.76 (3.20)	12.82 (2.19)	8.36 (1.75)	9.10 (2.11)
Greece	17.17 (2.74)	14.40 (2.88)	14.78 (2.95)	14.42 (2.94)	14.36 (3.55)	13.12 (2.72)	8.64 (1.90)	9.16 (2.58)
Iran	16.15 (2.55)	13.99 (2.73)	14.07 (2.80)	12.77 (2.71)	12.86 (3.46)	11.63 (2.64)	7.92 (1.81)	9.18 (2.41)
Italy	16.69 (3.40)	13.65 (3.02)	13.15 (3.06)	12.85 (3.31)	10.71 (3.47)	11.78 (2.72)	8.91 (1.90)	8.95 (2.82)
Lebanon	16.23 (3.69)	12.46 (2.93)	13.00 (3.72)	12.45 (3.24)	11.82 (2.96)	11.14 (2.87)	8.99 (2.19)	9.61 (2.49)
Mexico	16.64 (3.51)	14.00 (3.47)	14.23 (3.65)	13.73 (3.67)	13.56 (3.63)	12.18 (2.99)	8.88 (2.05)	9.40 (2.42)
Panama	16.31 (4.05)	13.45 (3.69)	13.19 (4.03)	12.79 (3.96)	12.72 (4.29)	11.64 (3.64)	9.01 (2.12)	9.87 (2.50)
Peru	16.87 (3.40)	13.34 (3.41)	13.26 (3.46)	11.59 (4.00)	11.95 (3.68)	10.48 (3.43)	8.80 (2.10)	10.16 (2.52)
Portugal	17.21 (2.77)	14.98 (2.82)	14.88 (3.15)	14.44 (3.14)	13.39 (3.48)	12.72 (2.67)	8.57 (1.88)	9.66 (2.41)
Russia	16.83 (2.98)	14.16 (2.81)	13.18 (3.05)	13.40 (3.15)	13.13 (3.43)	12.14 (2.66)	8.61 (2.02)	9.37 (2.29)
Singapore	18.13 (2.61)	14.53 (2.57)	14.07 (2.68)	15.20 (2.88)	14.87 (2.64)	12.77 (2.13)	8.64 (1.80)	10.35 (2.22)
Spain	17.29 (2.63)	15.35 (2.71)	14.72 (2.95)	14.03 (3.24)	13.46 (3.29)	13.35 (2.37)	8.69 (1.92)	9.55 (2.24)
Switzerland	17.47 (2.96)	15.52 (2.43)	14.46 (3.24)	14.06 (3.05)	13.15 (3.08)	13.42 (2.41)	9.05 (1.98)	9.02 (2.48)
Turkey	18.30 (2.87)	14.90 (2.85)	15.29 (3.04)	13.18 (3.08)	13.47 (3.20)	12.56 (2.50)	8.64 (2.10)	8.76 (2.33)
USA	17.96 (3.18)	14.02 (3.23)	14.02 (3.23)	13.58 (3.42)	14.23 (3.69)	12.15 (2.64)	8.79 (2.02)	10.88 (2.33)
Venezuela	16.24 (3.42)	13.43 (3.19)	13.94 (3.30)	11.79 (3.97)	12.31 (4.06)	10.54 (3.29)	9.06 (2.10)	9.90 (2.43)

have a universal configuration with presumably strong biological roots (Poortinga, 1992). Yet, there may be cross-cultural differences in conditions that trigger anger and in cultural norms that moderate the manifestation of anger. These differences were not studied here.

Country similarities in means of anger components seemed to prevail over differences and individual differences are more salient, as in other studies of this type (Matsumoto, Nezlek, & Koopmann, 2007; Scherer & Wallbott, 1994). Coherence was found even though the components did not all show the same pattern of cross-cultural differences in mean scores. Our study is more in line with a view that anger is an experiential category that is well recognized in a wide variety of cultures. This recognition supports the notion of an implicit theory of anger as a unitary emotion, as measured in the self-report domain. Barrett (2006b) questions the view that basic emotions like anger "are given to us by nature" (p. 28). Cross-cultural studies could present evidence in favor of Barrett's viewpoint if relations of components would show little or no coherence across cultures. Our data do not support Barrett's view, at least on the domain of prototypical experiences of emotional categories. However, it should be noted that Barrett was referring to the actual experience of emotion, and our study deals with the implicit views (or semantic knowledge) of the anger emotion. One step forward would be to see to what extent those implicit views are confirmed with actual experience of anger, for which other empirical methods should be used (i.e., observation in the behavioral domain).

Our study examined prototypical theories of anger and highlighted the influence of culture for prototype theories. The question can be asked whether these theories are linked to actual behavior. Relationships between implicit views and actual behavior have

been established in the domain of developmental expectations (e.g., Dieterich, Hebert, Landry, Swank, Smith, 2004; Goodnow, 1985). Similar studies are still to be conducted in order to examine the existence of such a link in the domain of emotions. The link would be expected in both the structure and process model. Yet, the underlying mechanisms remain elusive. Concepts like display rules (Ekman & Friesen, 1969) and feeling rules (Hochschild, 1979) have been proposed to explain the link by pointing to the relevance cultural norms in the expression of emotion. These norms may affect both expectancies (prototypical models can be seen as influenced by these norms and the observed co-occurrences of particular emotional aspects) and actual expressions. The present study established that implicit views are associated to various emotion components; future studies are needed to establish the mechanisms behind the associations.

Country differences were found in the mean scores of some components, notably verbal expression, which was also the case in Matsumoto, Nezlek, and Koopmann's (2007) study. This is not surprising because verbal expression is the most characteristic mode of communication of human beings, through which cultural information is transmitted in the social context; as a consequence, cross-cultural differences in display rules may play a role here. In the search for an interpretation of these small but meaningful differences, there is a growing body of evidence in cross-cultural psychology that points to the relevance of the individualism/collectivism dimension in explaining diverse psychological phenomena, including emotions (see Oyserman, Coon, & Kimmelmeier, 2002). The scores of Hofstede's (2001) cultural values have been widely used as valid indicators to analyze the effect of the individualism/collectivism construct, as it was also the case for anger and other emotions in Matsumoto, Nezlek, and Koopmann's

(2007) study. Nevertheless, the ongoing debate on culture acknowledges the multiple ways of unfolding the effect of culture and, hence, its units of analysis. Thus, country is not but another way in which commonly shared values can be examined, and the effect of culture may go beyond it. For instance, how individuals display different values of individualism/collectivism within the same country has recently been studied for sadness (Fernandez, Carrera, Paez, & Sanchez, 2008), acknowledging the salience of individualism/collectivism at individual-level. Therefore, it remains for future research to examine how culture may intertwine with individuals' values of individualism/collectivism to produce the differences in anger that we have observed in the present study.

On the other hand, it must be mentioned that cross-cultural similarities were much more salient than differences in the present study. Cross-cultural similarities prevailed, primarily in the patterning of the components, but also in mean scores, in particular the low cultural variability of self-control mechanisms. These similarities could mean that the anger components are not strongly influenced by cultural factors. Given the potentially disruptive nature of anger expressions, it is likely that these are controlled by cultural norms and that cultural norms about the expression of anger do not show large cross-cultural differences. Moreover, emotions may be influenced by cross-culturally fairly invariant feeling rules that affect our inner and intimate experience of anger.

Some limitations of the present study should be mentioned. First, we cannot exclude the possibility that the list of anger-eliciting events might have been more appropriate for some cultures than for others; yet, we do not think that differential appropriateness is a major challenge to our findings, since events were chosen with the viewpoint of having universal adequacy. We may have missed culture-specific triggers of anger. However, it is unclear to what extent these events are accompanied by a different coherence of the components. A second limitation refers to the absence of action tendencies of anger. Future studies should incorporate this component to ensure a more complete model of the interrelations of anger components. A final limitation involves the use of self-reports. Interrelations among components may be lower when self-reports are complemented or replaced by observational procedures or neuroimaging techniques. Yet, we think that for the purposes of our study (i.e., documenting cross-cultural differences and similarities in prototypical theories of anger), self-reported assessment is valid, apart from the only available method for the more subjective components (Matsumoto, Nezlek, & Koopmann, 2007; Scherer, 1986). Both in the structural and process models of emotions, the constituting elements are imperfectly linked and we need to gain insight in all these components and their antecedents. A combination of methodologies (i.e., self-report and observation) and of approaches (implicit views and emotion experiences) is necessary for the advancement of our knowledge of emotions. Our study examined prototypical theories of anger and highlighted the influence of culture for these theories. Such theories can be best assessed by self-reports, as also found in the study of implicit views on intelligence (e.g., Sternberg, 2000) and developmental expectations (e.g., Goodnow, 1985).

In conclusion, not only have the findings of our study contributed to the debate of universality-cultural relativity about emotions,

but they have also shed light on the comprehension of anger, an emotion hitherto insufficiently studied and understood. Cross-culturally validated anger scales will pave the way for future studies.

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