# What do people think is an emotion?

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**Abstract**

In emotion research, both conceptual analyses and empirical studies commonly rely on emotion reports. But what do people mean when they say that they are angry, afraid, joyful, etc.? Building on extant theories of emotion, this paper presents three new studies (including a pre-registered replication) measuring the weight of cognitive evaluations, bodily changes, and action tendencies in people's use of emotion concepts. The results of these studies suggest that the presence or absence of cognitive evaluations has the largest impact on people's emotion attributions, and that bodily changes and action tendencies are considered to depend on cognitive evaluations. Implications for theories of emotion (concepts) and the interpretation of emotion reports are discussed.

## 1. Introduction

Everyday talk is full of references to emotions. In the spoken language section of the Corpus of Contemporary American English (COCA),[1] words such as "joy", "sadness", "fear", "anger", "disgust", and their adjectival forms appear around 49,000 times. On the other hand, words such as "sun", "rain", "storm", "cloud", "wind" and their adjectival forms appear only 27,000 times. This suggests that talking about emotions is even more frequent than talking about the weather, a ubiquitous topic of conversation. However, while we know what someone means when they say that it is sunny or rainy, this is not so clear in the case of emotion. What do people mean when they say that they are, for example, angry or joyful?

The question about people's concepts of emotions is relevant for both philosophers and psychologists. Philosophers, on the one hand, are careful that their conceptual analyses (and conceptual revisions) account for common-sense understanding of emotion (Deonna and Teroni, 2012; Scarantino, 2012). Psychologists, on the other hand, commonly rely on study participants' emotion reports to investigate emotions' physiological and behavioral correlates (Quigley et al., 2014), and these reports depend on participants' understanding of emotion (Parkinson, 1997). Furthermore, recent research suggests that emotion concepts play an important role in emotion perception (Halberstadt and Niedenthal, 2001; Gendron et al., 2014; Nook et al., 2015; Brooks and Freeman, 2018) and even emotional experience (Lindquist and Barrett, 2008; Wierzbicka, 2009).

Despite the relevance of people's understanding of emotion, there is an important gap in the current literature on emotion concepts. While some studies have investigated which features are *commonly* associated with emotion (e.g. bodily feelings, see §1.2.), no study to date has compared the *weight*[2] of these features in categorizing something as an emotion. A feature can be typical of a category but have little weight in

[1] The spoken language section of COCA consists of transcripts of unscripted conversation from more than 150 different TV and radio programs between 1990-2019.

[2] The literature on concepts offer different proposals regarding what statistical and/or salience properties determine the weight of a feature (Murphy, 2002; Machery, 2009). Here, we adopt an uncompromising notion of weight as the impact of (the presence or absence of) a feature in categorization, which remains silent regarding what determines this impact.

determining whether something falls under that category (Sloman et al., 1998). Pens, for example, are typically made of plastic. But *being made of plastic* has little impact in categorizing something as a pen. It might thus be the case that, for example, bodily feelings are typical of emotion but have little impact in categorizing something as an emotion.

Building on theoretical approaches to the nature of emotion (§1.1.) and previous research on emotion concepts (§1.2.), a series of studies measuring the weight of cognitive evaluations, bodily changes, and action tendencies in people's emotion attributions were conducted (§2-5). The design of these studies is inspired by the combination of philosophical analysis and empirical research methods (Knobe and Nichols, 2017; Machery, 2017). Their results have implications for theories of emotion (concepts) and the interpretation of emotion reports (§6).

### 1.1. What is an emotion?

Paradigmatic instances of emotions involve cognitive, physiological, and motivational elements. For example, in a clear episode of fear we evaluate the situation as dangerous, experience bodily changes such as accelerated heartbeat, and feel the urge to escape. But can we feel afraid without feeling any changes in our bodies? Without being motivated to act in any particular way? Without evaluating the situation as good or bad in any sense? All these features occur in paradigmatic episodes of fear; but some might not occur in many other cases, and thus not constitute what fear is.[3]

William James famously claimed that, in the absence of bodily feelings, "we have nothing left behind, no 'mind-stuff' out of which the emotion can be constituted" (James, 1884, p. 193). In James' view, emotions are bodily feelings. Other authors do not offer such clear-cut views about what features constitute emotions. However, different authors have stressed the importance of different features. Depending on the (set of) features they focus on, we can separate between Cognitive theories, Somatic

[3] This has been called the Problem of Parts (Prinz, 2004): The problem of determining which features are essential for emotion and which are not. Accounts that identify emotion with a combination of several features face a different problem, the Problem of Plenty, which consist of explaining how very different elements hang together to create a unitary phenomenon.

feeling theories, Motivational theories, and Componential theories (for similar taxonomies see Prinz, 2004; Goldie, 2007; Scarantino and de Sousa, 2018).

*Cognitive theories* give primacy to the cognitive aspect of emotion. Some claim that emotions are *judgments* of value (Nussbaum, 2001; Solomon, 1976). Others defend that emotions are *perceptions* of value (Roberts, 2003; Tappolet, 2016). In both accounts, emotions are constituted by representations of objects or events as having certain value (e.g. danger in fear, loss in sadness, etc.).

*Somatic feeling theories* claim that emotions are constituted by perceptions of bodily changes. Somatic feeling theories build on the seminal work of William James (1884) and Carl Lange (1922), and are defended by contemporary authors in both psychology and philosophy (Laird, 2007; Hufendiek, 2016). According to these theories, the putative "bodily symptoms" of emotion (feelings of trembling, sweating, etc.) actually constitute the emotion.

*Motivational theories* identify emotions with states of "action readiness" or "action tendencies" (Frijda, 1986). Under these accounts, emotions are essentially tendencies to act in certain adaptive ways (e.g. escape in fear, confront in anger, etc.). But many Motivational theories (and some Cognitive / Somatic theories, e.g. Prinz, 2004) stress the importance of more than one feature (Scarantino, 2014; Deonna and Teroni, 2017). Thus, they might be better characterized as *Componential* theories.

*Componential theories* posit that emotions are constituted by the combination of two or more features, including cognitive evaluations, bodily reactions, and/or action tendencies. Different componential theories hold different views about how these features come together to constitute emotions, most importantly: Via affect programs (Ekman, 1999), appraisal processes (Scherer, 2009), or psychological construction (see Gendron and Feldman Barrett, 2009).

To sum up, and roughly speaking, Cognitive theories claim that emotions are cognitive evaluations, Somatic feeling theories claim that emotions are bodily perceptions, Motivational theories claim that emotions are action tendencies, and Componential theories claim that emotions are a combination of two or more of these features. But

what do people think emotions are? The next section reviews extant work on this question.

### 1.2. What do people think is an emotion?

Much research on people's emotion concepts has focused on the role of facial expressions and situational factors in emotion categorization (Wilson-Mendenhall et al., 2011; Kayyal et al., 2015; Ong et al., 2015; Saxe and Houlihan, 2017; Anzellotti et al., 2019; Hoemann et al., 2019).

Although this research is important to understand emotion attribution to others, it does not consider the features that arguably constitute emotions: Cognitive evaluations, bodily perceptions, and action tendencies (see §1.1). A similar limitation can be found in research investigating people's classification of emotion categories, e.g. whether boredom is considered an emotion (Fehr and Russell, 1984, 1991; Russell and Fehr, 1994),[4] or work investigating people's beliefs about the value and controllability of emotions (see Ford and Gross, 2019).

Several studies to date have investigated what features are commonly associated with emotions. In these studies, participants are asked to describe the features of their (typical) experiences of joy, sadness, anger, fear, etc. Participants either free-list the features they associate with that emotion (Fehr and Russell, 1984, Study 6), report specific types of features (Scherer and Summerfield, 1983; Shaver et al., 1987) or rate the typicality of a list of features previously chosen by the researchers (Davitz, 1969; Fontaine et al., 2013). These studies provide us with a wealth of data regarding the most *typical* features of emotions.

However, a feature can be typical but not essential. Pens, for example, are typically made of plastic, but many pens are not made of plastic. A feature can thus be typical of emotion but not essential to emotion. Indeed, Fehr and Russell (1984) found that the degree to which a category (e.g. "anger") showed features considered typical of emotion (e.g. "heartrate increases") was weakly related to whether that category was

[4] An exception is Study 6 in Fehr and Russell (1984), which is further discussed in this section.

considered an emotion. Thus, typicality ratings might not tell us what people think emotions are.

Panksepp (2000) reports the results of a study asking participants to rank the *importance* of different features of emotion, instead of their typicality. Results suggest that feelings are considered the most important feature of emotion, followed by cognitive and autonomic changes. However, people's reports about the importance of different features might not reflect the importance they actually give them when categorizing emotions.

Some studies have investigated people's understanding of emotion by asking participants whether emotions would persist in the absence of some feature. Borrowing the methodology in William James' Subtraction Argument (see §1.1), Díaz (2021) asked participants to imagine a strong emotion and subtract all the accompanying feelings of bodily changes. According to James, this subtraction makes the emotion disappear, showing that emotions are bodily feelings. But in Díaz´s studies, most participants considered that their emotions would persist after the subtraction, suggesting that (in people's views) emotions are not bodily feelings.

In a similar vein, participants in Siemer (2008) were presented with scenarios in which characters are described as having certain emotions, cognitive evaluations, bodily changes, and action tendencies, and answered whether the character would still feel the emotion if some of those features were absent. Participants' responses suggest that (in people's views) cognitive evaluations are more essential than bodily changes and action tendencies. But note that this study (as well as Díaz's) does not record participants' emotion attributions, but rather their counterfactual judgments about whether the emotion would persist in the absence of some feature.

To sum up, previous studies on emotion concepts either (a) consider features that arguably do not constitute emotions, such as facial expressions, (b) study features that putatively constitute emotions, but only measure their typicality, or (c) consider the weight of putatively constitutive features, but rely on explicit importance ratings or counterfactual judgments. This paper presents a series of studies testing the weight of features putatively constitutive of emotion in people's use of emotion concepts using vignettes in which the presence of each feature was independently manipulated.

Data and materials for all studies are available at https://osf.io/d3h85/.

## 2. Study 1.

The goal of this study is to investigate the weight of cognitive evaluations (Cognition), bodily changes (Body), and action tendencies (Motivation) in people's use of emotion concepts. To do this, participants are presented with short stories depicting their reactions to an unspecified situation. This reaction consists of a combination of cognitive, bodily, and motivational aspects, which are independently manipulated to be present or absent. Participants judged whether this reaction is a case of emotion.[5]

To ensure the generalizability of the results, five different emotions were tested (anger, fear, disgust, sadness, and joy).[6] The description of each emotion's cognitive evaluations, bodily changes, and action tendencies followed emotion theorists' views,[7]

[5] Note that the question regarding which features determine emotion attribution (the one that this paper concerns) is different from the question regarding which features determine the intensity of the attributed emotion (Frijda et al., 1992).

[6] These emotions are sometimes called "basic emotions" (Ekman, 1999). Here, we do not take a stand on whether these emotions are basic or not. These emotions were selected merely because they are paradigmatic examples of emotion.

[7] The wording for *Cognition* builds on Richard Lazarus's list of the core relational themes for each particular emotion (Lazarus, 1991, p. 122). The expression "seeing as" is taken from Martha Nussbaum (2004, p. 197) and Robert Solomon, who claims "emotion is viewed as a way of seeing something as a thing of a certain sort" (Solomon, 2003, p. 63). The description of the *Body* element follows the idea that, because "emotions may each correspond to several physiological patterns […] it is best to associate emotions with body state prototypes" (Prinz, 2004, p. 72). The prototypical reaction for each emotion was taken from previous research on the topic (Scherer and Summerfield, 1983; Shaver et al., 1987; see §2). Finally, the wording for *Motivation* is based on Andrea Scarantino's list of action tendencies, which in turn builds on the work of other researchers (see Scarantino, 2014, p. 181). Note that some of these action tendencies can be interpreted as behaviors or goals. The expression "feel the urge" is taken from Nico Frijda, who claims that "Introspections produce a wealth of statements that refer to […] impulses to approach or avoid, desires to shout and sing or move, and the urge to retaliate" (Frijda, 1988, p. 351). Furthermore, I would like to thank Julien Deonna, Jesse Prinz, and Mauro Rossi for their feedback regarding the wording.

and were paired for length, level of abstraction, and semantic similarity to the emotion word (see Table 1).

| | **Cognition** ("see the situation as […]") | **Body** ("feel […]") | **Motivation** ("feel the urge to […]") |
|---|---|---|---|
| **Fear** | Dangerous (.28) | body trembling (.42) | get away (.32) |
| **Anger** | Offensive (.15) | muscles tensing up (.12) | Confront (.21) |
| **Disgust** | Foul (.28) | Queasy (.32) | avoid contact (.22) |
| **Sadness** | an irrevocable loss (.19) | body drained out of energy (.09) | withdraw from interaction (.17) |
| **Joy** | Positive (.04) | body filled with energy (.19) | engage in interaction (.07) |
| **Mean semantic similarity** | 18.8 | 22.8 | 19.8 |
| **(absent)** | "You don't see the situation as either good or bad in any sense." | "You don't feel any changes in your body." | "You don't feel the urge to act in any particular way." |

**Table 1.** Wording for each feature and emotion in Study 1 (between brackets the level of semantic similarity to the relevant emotion word).[8]

### 2.1. Method

[8] Semantic similarity coefficients were calculated using CU Boulder's Latent Semantic Analysis (LSA) tool (http://lsa.colorado.edu, topic space: General_Reading_up_to_1st_year_college). LSA builds on the idea that words that are similar in meaning appear in similar contexts, but the details are much more complex (see Landauer et al., 1998). The reported coefficients are taken as mere approximations, and they are used to flag possible differences between features in their semantic similarity to the emotion word. Results suggest that semantic similarity is not a concern, as the mean semantic similarity to the emotion word was much the same for Cognition (18.8), Body (22.8), and Motivation (19.8).

303 US participants were recruited through Amazon Mechanical Turk and completed the survey for a monetary payment. 99 participants were excluded because they did not pass one of the comprehension checks (see below and §2.3.), leaving a final sample of 204 participants (89 male, 114 female, 1 other, *Mean age* = 39.20, *Standard Deviation* = 12.97, age range 18-81). Sensitivity analyses using G*Power showed the study had enough power to detect a medium-sized[9] effect of $\eta^2$ = .086.

The study used a 2 (Cognition: Present, Absent) x 2 (Body: Present, Absent) x 2 (Motivation: Present, Absent) x 5 (Emotion: Fear, Anger, Disgust, Sadness, Joy) between-subjects design. There were eight different conditions, corresponding to all the possible combinations of Cognition (C), Body (B), and Motivation (M). Participants were randomly assigned to one of those eight conditions (CBM, CB, CM, BM, C, B, M, none) for one of the five emotions tested (fear, anger, disgust, sadness, and joy). For example, fear vignettes read as follows (between brackets the alternative text for the manipulation of C, B, and M variables):

> Today is a sunny day. You wake up in the morning, get ready, and head to work. You open the door and, right after you step outside, you notice something in the street. You see the situation as dangerous (You don't see the situation as either good or bad in any sense). You feel your body trembling (You don't feel any changes in your body). You feel the urge to escape (You don't feel the urge to act in any particular way).

Participants then answered whether they agree or disagree with the statement "You are afraid (angry, disgusted, sad, joyful)" on a scale from 1 ("strongly disagree") to 6 ("strongly agree"). From now on, I will refer to this variable as Emotion Ratings. Afterward, participants were asked to briefly justify their responses in an open text box. Finally, participants answered a series of comprehension check questions, one for each feature of emotion. In the fear case, these were "You see the situation as dangerous", "You feel your body trembling", and "You feel the urge to get away". Participants answered whether those were true or false. Participants who answered at

[9] This and the following effect size interpretations are based on Cohen's (1988) benchmarks.

least one of these questions incorrectly (their responses didn't correspond to what the story says) were excluded from the analyses (but see §2.3.).

### 2.2. Results

A one-way between subjects ANOVA was conducted to measure the effect of Cognition, Body, and Motivation on Emotion Ratings. All three variables had a significant effect. The presence or absence of Cognition explained 27% of the variance in emotion ratings, $F(1, 205) = 107.38$, $p < .001$, $\eta^2 = .271$. The presence or absence of Body explained 7% of the variance, $F(1, 205) = 34.53$, $p < .001$, $\eta^2 = .071$. Finally, the presence or absence of Motivation explained 5% of the variance in emotion ratings, $F(1, 205) = 22.10$, $p < .001$, $\eta^2 = .046$. There were no significant interactions (all $p$s > .05). Figure 1 shows mean emotion ratings for each condition.

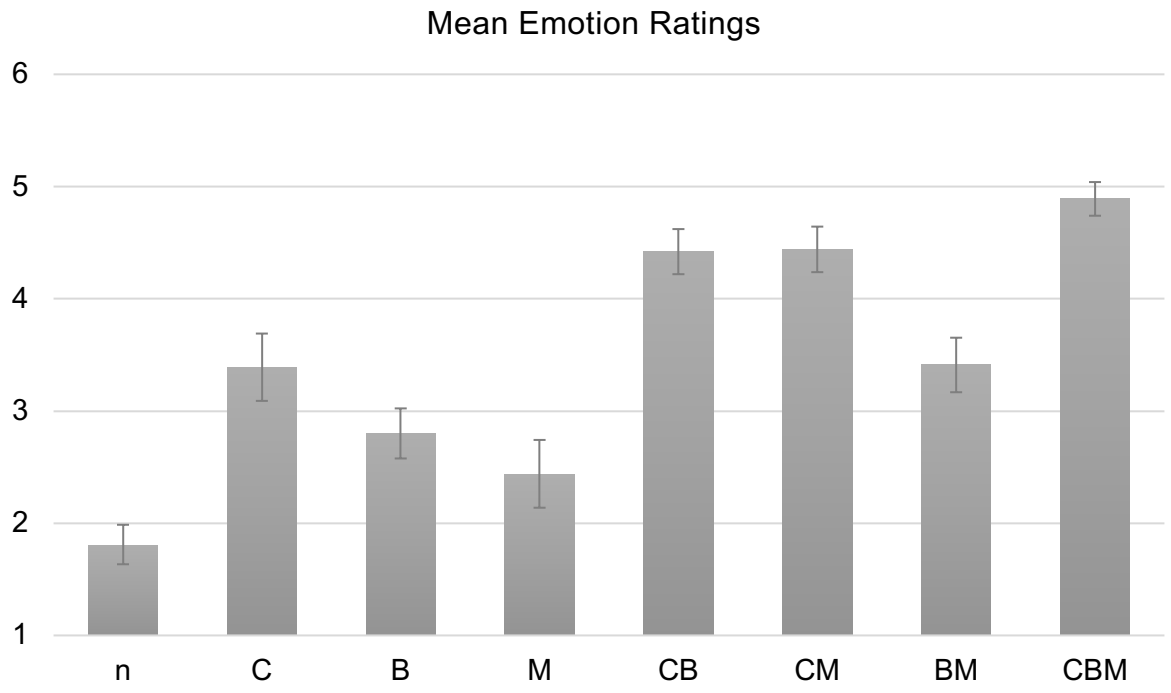


**Figure 1.** Mean emotion ratings across conditions in Study 1. Error bars represent the Standard Error of the mean.

An exploratory follow-up ANOVA analysis introducing Emotion as an additional factor revealed a significant interaction between Emotion and Motivation, $F(4, 205) = 3.56$, $p = .008$, $\eta^2 = .032$. Simple effect contrasts revealed that Motivation had a significant effect on Fear ratings, $F(1, 42) = 29.91$, $p < .001$, $\eta^2 = .293$, but not on ratings for the other four emotions (all $p$s > .05).

### 2.3. Excluded responses

Taking into account the high number of participants excluded (99 out of 303), one could question whether these participants lacked comprehension, or whether these responses are telling us something about participants' understanding of emotion.

Most participants were excluded because they judged that a feature was present when the story said otherwise. On several occasions, people answered it was true that Cognition, Body, or Motivation was present even though the story explicitly denied so. This can at first glance be surprising. However, there might be some logic to it.

Consider the following cases. If someone tells you that robins can fly, you will probably infer that robins have wings. But if someone tells you that robins have wings, you might doubt whether they can fly. This is so because flying depends on having wings, but having wings does not depend on flying. When two features of a concept stand in a dependency relation, people infer the presence of the central feature (e.g. having wings) from the presence of the dependent feature (e.g. flying), but not the other way around (Love, 1996).

It could be the case that participants in this study inferred the presence of explicitly absent features because explicitly present features depend on them. If this is the case, emotion features are either central or dependent, and participants should infer the presence of central features from the presence of dependent features more than the other way around. To test this possibility, a series of analyses of excluded participants' responses were conducted (see Table 2).

| Condition | N | Cognition FP | Body FP | Motivation FP |
|---|---|---|---|---|

| | | | | |
|---|---|---|---|---|
| **C** | 22 | - | 6 (27.3%) | 7 (31.8%) |
| **B** | 19 | 13 (68.4%) | - | 11 (57.9%) |
| **M** | 15 | 11 (73.3%) | 8 (53.3%) | - |

**Table 2.** Number of participants who ascribed emotion (Emotion Ratings > 3) responding that a feature was present when the story said otherwise (Feature false positives – FP) by condition in Study 1.

Results show that excluded participants tended to infer the presence of Cognition when bodily changes were present (B condition) more than they inferred the presence of Body when cognitive evaluations were present (C condition). 68.4% of the participants who ascribed emotion in B (Emotion Ratings > 3) inferred the presence of Cognition (despite what the story said), while only 27.3% of the participants who ascribed emotion in C inferred the presence of Body (despite what the story said), $\chi^2$ (1) = 6.94, $p$ = .008, $OR$ = 5.77.

The same asymmetry was found for Cognition and Motivation. 73.3% of the participants who ascribed emotion in M inferred the presence of Cognition (despite what the story said), while only 31.8% of the participants who ascribed emotion in C inferred the presence of Motivation (despite what the story said), $\chi^2$ (1) = 6.15, $p$ = .013, $OR$ = 5.89.

The asymmetry was not found for Body and Motivation. 57.9% of the participants who ascribed emotion in B inferred the presence of Motivation (despite what the story said), and 53.3% of the participants who ascribed emotion in M inferred the presence of Body (despite what the story said), $\chi^2$ (1) = 0.07, $p$ = .790, $OR$ = .83.

### 2.4. Discussion

The results of Study 1 suggest that the presence or absence of cognitive evaluations makes the largest difference in emotion attribution, followed by bodily changes and action tendencies. Furthermore, excluded participants inferred the presence of cognitive evaluations from the presence of bodily changes (action tendencies) more

than they inferred the presence of bodily changes (action tendencies) from the presence of cognitive evaluations. This suggests that cognitive evaluations are central, and bodily changes and action tendencies depend on them.

There are, however, some limitations to this study. First, the study tested only participants' emotion attributions to themselves. Arguably, this is what we should look at if we are interested in people's understanding of emotion, as a first-person perspective gives better access to one's own mental states. However, emotion attributions might be different in first- vs. third-person attributions in interesting and relevant ways. Second, the analyses of excluded responses were not initially planned, which increases the chances of type I errors. Finally, the stories in this study start by mentioning that "It is a sunny day". This could potentially bias participants in favor of attributing joy, and against attributing negative emotions. To account for these worries, a preregistered replication of Study 1 testing emotion attributions to oneself and others using revised vignettes was conducted.

## 3. Study 2

Study 2 is a preregistered replication and extension of Study 1. It includes a manipulation of the target of the emotion attribution (Target: Oneself, Other), and modifies the problematic passages of the stories used in Study 1 (see §2.4.). A higher number of participants were recruited, expecting a large number of exclusions. Our preregistered hypotheses were the following (see https://osf.io/bfhpq for the analysis plan):[10]

(H1) Cognition is the feature with the highest weight in emotion attribution.

(H2) Cognition is a central feature; Body, and Motivation depend on it.

(H3) Features' weight differs between emotion attribution to oneself vs. others.

[10] Tests concerning a fourth hypothesis (H2: No feature or combination of features is both necessary and sufficient for emotion attribution) can be found in footnotes 11 and 12.

### 3.1. Method

463 US participants were recruited through Prolific and completed the survey for a monetary payment. 124 participants did not pass one of the comprehension checks (see below and §3.2.3.), leaving a final sample of 339 participants (204 male, 133 female, 2 non-binary, *Mean age* = 26.64, *Standard Deviation* = 8.45, age range 18-73). Sensitivity analyses using G*Power showed that the study had enough power to detect a small-sized effect of $\eta^2$ = .053.

The study used a 2 (Cognition: Present, Absent) x 2 (Body: Present, Absent) x 2 (Motivation: Present, Absent) x 5 (Emotion: Fear, Anger, Disgust, Sadness, Joy) x 2 (Target: Oneself, Other) between-subjects design. In contrast to Study 1, the vignettes had either the participant (Target: Oneself) or a character named Tom (Target: Other) as a protagonist. For example, CBM Fear Other condition read as follows:

> It's a regular workday, and Tom is getting prepared to leave home to go to work. He walks out of his place and, right after he steps outside, Tom notices something in the street. He sees the situation as dangerous. He feels his body trembling. He feels the urge to escape.

Emotion ratings, justification questions, and comprehension checks were the same as in Study 1 (see §2.1.) but mentioned "Tom" instead of "you" in the Target: Other condition.

### 3.2. Results

#### 3.2.1. Hypothesis 1

A one-way between subjects ANOVA was conducted to measure the effect of Cognition, Body, and Motivation on Emotion Ratings. All three variables had a significant effect. The presence or absence of Cognition explained 15% of the variance in emotion ratings, $F(1, 338) = 90.62$, $p < .001$, $\eta^2 = .147$. The presence or absence of Body explained 7% of the variance, $F(1, 338) = 37.40$, $p < .001$, $\eta^2 = .072$. And the presence or absence of Motivation explained 6% of the variance in emotion ratings, $F(1, 338) = 34.96$, $p < .001$, $\eta^2 = .067$.

There was a significant interaction between Cognition and Motivation, which explained 3% of the variance in emotion ratings, $F(1, 338) = 14.43$, $p < .001$, $\eta^2 = .028$. Simple effect contrasts revealed that Motivation had a significant effect on Emotion Ratings when Cognition was absent, $F(1, 143) = 42.05$, $p < .001$, $\eta^2 = .208$, but no significant effect when Cognition was present, $F(1, 194) = 2.58$, $p = .110$. Figure 2 shows the mean emotion ratings for each condition.

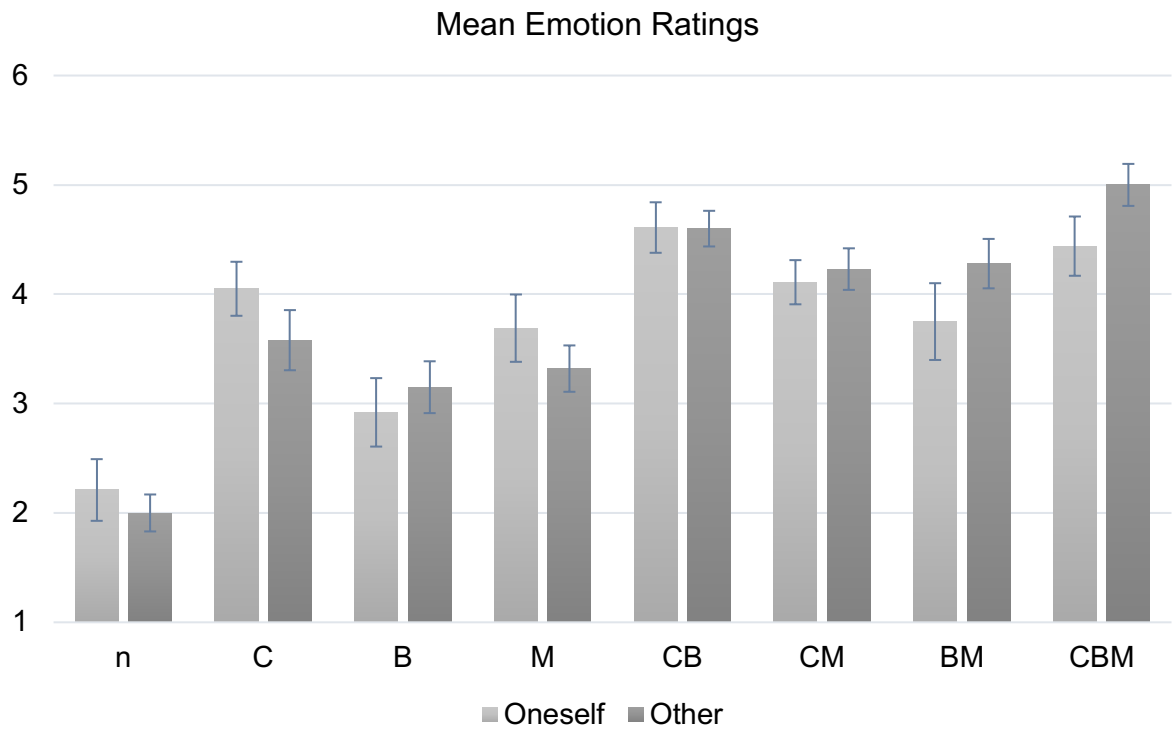


**Figure 2.** Mean emotion ratings across conditions in Study 2. Error bars represent the Standard Error of the mean.

An exploratory ANOVA analysis introducing Emotion as an additional factor showed a small significant interaction between Emotion and Motivation, $F(4, 338) = 3.27$, $p = .012$, $\eta^2 = .006$. Simple effect contrasts revealed that Motivation had a significant effect on ratings for all emotions but sadness, $F(1, 65) = .07$, $p = .785$.

### 3.2.2. Hypothesis 2

Many participants answered that it was true that Cognition (61 times), Body (47 times), or Motivation (50 times) was present even though the story explicitly denied so. Results show the same asymmetries found in Study 1 (see Table 3).

| Condition | N | Cognition FP | Body FP | Motivation FP |
|---|---|---|---|---|
| **C** | 36 | - | 7 (19.4%) | 8 (22.2%) |
| **B** | 28 | 13 (46.4%) | - | 11 (39.3%) |
| **M** | 36 | 15 (41.7%) | 13 (36.1%) | - |

**Table 3.** Number of participants who ascribed emotion (Emotion Ratings > 3) responding that a feature was present when the story said otherwise (Feature false positives - FP) by condition in Study 2.

46.4% of the participants who ascribed emotion in B (Emotion Ratings > 3) inferred the presence of Cognition (despite what the story said), while only 19.4% of the participants who ascribed emotion in C inferred the presence of Body (despite what the story said), $\chi^2$ (1) = 5.34, $p$ = .021, $OR$ = 3.59.

41.7% of the participants who ascribed emotion in M inferred the presence of Cognition (despite what the story said), while only 22.2% of the participants who ascribed emotion in C inferred the presence of Motivation (despite what the story said). Note, however, that this test did not reach statistical significance, $\chi^2$ (1) = 3.13, $p$ = .077, $OR$ = 2.50.

Once again, the asymmetry was not found between Body and Motivation. 39.3% of the participants who ascribed emotion in B inferred the presence of Motivation (despite what the story said), and 36.1% of the participants who ascribed emotion in M inferred the presence of Body (despite what the story said), $\chi^2$ (1) = 0.07, $p$ = .791, $OR$ = 1.15.

#### 3.2.3. Hypothesis 3

A one-way between subjects ANOVA was conducted to measure the effect of Cognition, Body, Motivation, and Target on Emotion Ratings. Results revealed a small significant interaction between Target and Body, $F(1, 338) = 5.15$, $p = .024$, $\eta^2 = .010$. Simple effect contrasts revealed that Body had a larger impact on emotion attributions to others, $F(1, 193) = 41.081$, $p < .001$, $\eta^2 = .127$, than in emotion attributions to oneself, $F(1, 144) = 4.283$, $p = .040$, $\eta^2 = .021$.

### 3.3. Discussion

Study 2 replicated the main finding in Study 1: (H1) Cognition is the feature with the highest weight. The results partially support that (H2) Cognition is a central feature; Body and Motivation depend on it. Finally, (H3) Body had a larger effect on emotion attributions to others than emotion attributions to oneself. This latter effect might be due to bodily changes (but not cognitive evaluations and unenacted action tendencies) being observable from a third-person perspective.

Study 2 significantly improved upon Study 1. There is, however, a remaining worry. In order to ensure experimental control, Studies 1 and 2 might have artificially separated bodily changes and action tendencies. In reality, it might be the case that action tendencies are “embodied”, and emotional bodily changes are ways of preparing action (Deonna & Teroni, 2017; Shargel & Prinz, 2017). Indeed, the results of Study 1 and 2 suggest that Body and Motivation depend on each other. Thus, a follow-up study was conducted to address this issue.

## 4. Study 3

Study 3 uses a similar design to that used in Study 2. However, instead of independently manipulating Body and Motivation, both features were merged (Bodily Motivation).

### 4.1. Method

295 US participants were recruited through Amazon Mechanical Turk and completed the survey for a monetary payment. 81 participants were excluded because they did

not pass one of the comprehension checks (see below and §4.3.), leaving a final sample of 214 participants (104 male, 109 female, *Mean age* = 38.46, *Standard Deviation* = 12.48, age range 18-73). Sensitivity analyses using G*Power showed that the study had enough power to detect a medium-sized effect of $\eta^2$ = .082.

Design was 2 (Cognition: Present, Absent) x 2 (Bodily Motivation: Present, Absent) x 2 (Target: Oneself, Other) x 5 (fear, anger, disgust, sadness, joy). Wording for fear's CBM Other condition, for example, was as follows (between brackets the wording for other emotions):

> It's a regular workday, and Tom is getting prepared to leave home to go to work. He takes his bag and walks out of his place. Right after he steps outside, Tom notices something in the street. He sees the situation as dangerous (offensive, foul, an irrevocable loss, positive). He feels the way his body is poised to get away (confront, avoid contact, withdraw from interaction, engage in interaction).

Participants then answered whether they agree or disagree with the statement "Tom is afraid" on a scale from 1 ("strongly disagree") to 6 ("strongly agree"). Afterward, they were asked to briefly justify their responses in an open text box. Finally, they were asked a series of comprehension check questions. For fear, these were "Tom sees the situation as dangerous" and "Tom feels his body poised to get away". Participants answered whether those were true or false. Participants who answered at least one of these questions incorrectly (their responses didn't correspond to what the story says) were excluded from the main analyses (but see §4.3.).

### 4.2. Results

A one-way between-subjects ANOVA was conducted to measure the effect of Cognition and Bodily Motivation on Emotion Ratings. Cognition showed a significant effect, explaining 37% of the variance in Emotion Ratings, $F(1, 213) = 169.19$, $p < .001$, $\eta^2 = .369$. Bodily Motivation also had a significant, although smaller, effect on Emotion Ratings, explaining 9% of the variance, $F(1, 213) = 41.14$, $p < .001$, $\eta^2 = .090$. Figure 3 shows the mean emotion ratings for each condition.

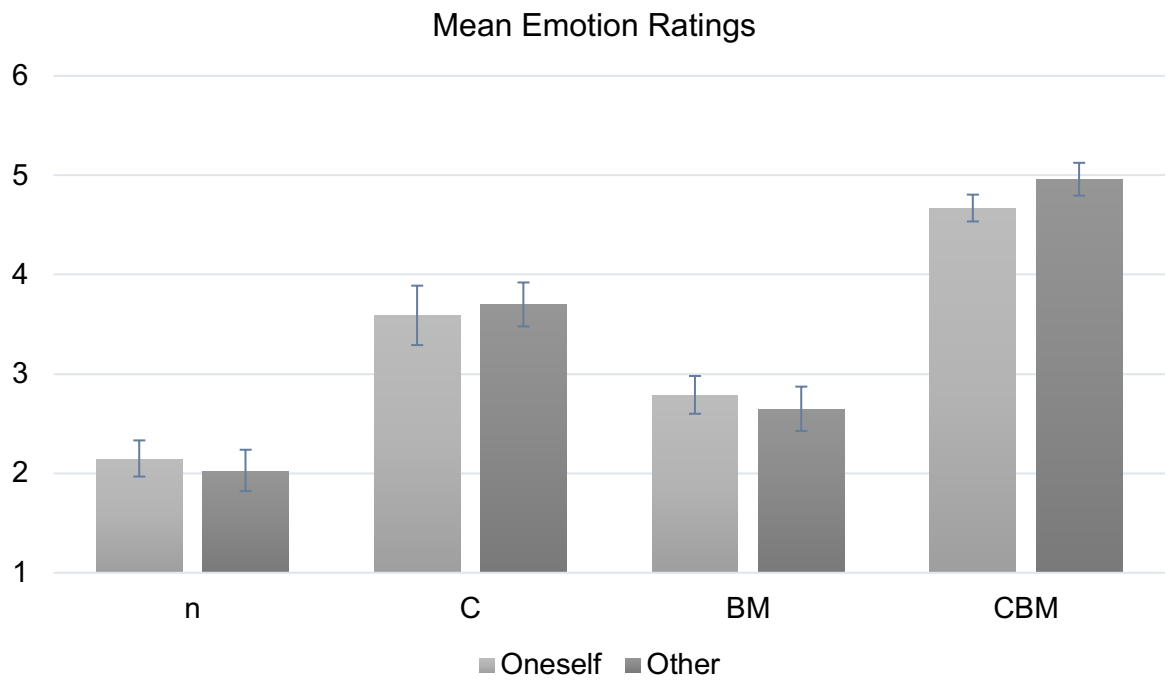


**Figure 3.** Mean emotion ratings across conditions in Study 3. Error bars represent the Standard Error of the mean.

An ANOVA introducing Target as an additional factor revealed no significant effect of Target on Emotion Ratings (all *p*s < .05).

An exploratory ANOVA analysis introducing Emotion as an additional factor revealed a small-sized significant interaction between Emotion and Bodily Motivation, $F(4, 213) = 3.07$, $p = .018$, $\eta^2 = .029$. Simple effect contrasts revealed that Bodily Motivation had a significant effect on ratings for all emotions except Sadness and Joy (*p*s < .05).

### 4.3. Excluded responses

Participants sometimes answered it was true that Cognition or Bodily Motivation was present even though the story explicitly denied it. 67.9% of the participants who ascribed emotion in BM (Emotion Ratings > 3) inferred the presence of Cognition (despite what the story said), while only 36.7% of the participants who ascribed

emotion in C inferred the presence of Bodily Motivation (despite what the story said), $\chi^2$ (1) = 8.48, $p$ = .004, $OR$ = 4.10. This suggests that embodied action tendencies depend on cognitive evaluations.

### 4.4. Discussion

As in previous studies, Cognition was the feature with the highest weight in emotion attribution, and participants' inferred the presence of Cognition from the presence of Bodily Motivation but not the other way around. In contrast to Study 2, the results of all the dependency analyses were statistically significant. This increases our confidence in the claim that emotion concepts encode dependency relations between the different features that constitute them. However, contrary to what the results of Study 2 suggest, the target of emotion attribution did not show any significant effect on emotion attribution. Participants' ratings were similar when attributing emotion to themselves and others.

It is important to note, in all the studies presented so far, the information regarding Cognition was always presented first, followed by the information regarding Body and Motivation features. A reviewer suggested that this could explain the greater impact of Cognition found in these studies. In order to test this alternative interpretation, a fourth study was conducted.

## 5. Study 4

Study 4 uses a similar design to that used in Study 3. The main difference is that the order of presentation of Cognition and Bodily Motivation features is reversed. In the vignettes used in this study, Bodily Motivation is presented first, followed by Cognition. Furthermore, the study only considers emotion attribution to others.

### 5.1. Method

302 US participants were recruited through Prolific and completed the survey for a monetary payment. 34 participants were excluded because they did not pass one of the comprehension checks (see below and §5.3.), leaving a final sample of 268

participants (67 male, 190 female, 11 non-binary, *Mean age* = 31.08, *Standard Deviation* = 11.98, age range 18-74). Sensitivity analyses using G*Power showed that the study had enough power to detect a medium-sized effect of $\eta^2$ = .066.

Design was 2 (Cognition: Present, Absent) x 2 (Bodily Motivation: Present, Absent) x 5 (fear, anger, disgust, sadness, joy). Wording for fear's BM condition, for example, was as follows (between brackets the wording for other emotions):

> It's a regular workday, and Tom is getting prepared to leave home to go to work. He takes his bag and walks out of his place. Right after he steps outside, Tom notices something in the street. He feels the way his body is poised to get away (confront, avoid contact, withdraw from interaction, engage in interaction). He doesn't see the situation as either good or bad in any sense.

Questions were the same as in Study 3's Target: Other condition (see §4.2).

### 5.2. Results

A one-way between-subjects ANOVA was conducted to measure the effect of Cognition and Bodily Motivation on Emotion Ratings. Cognition showed a significant effect, explaining 44% of the variance in Emotion Ratings, $F(1, 267) = 204.18$, $p < .001$, $\eta^2 = .436$. Bodily Motivation also had a significant, although smaller, effect on Emotion Ratings, explaining 8% of the variance, $F(1, 267) = 21.91$, $p < .001$, $\eta^2 = .077$. Figure 4 shows the mean ratings for each condition.

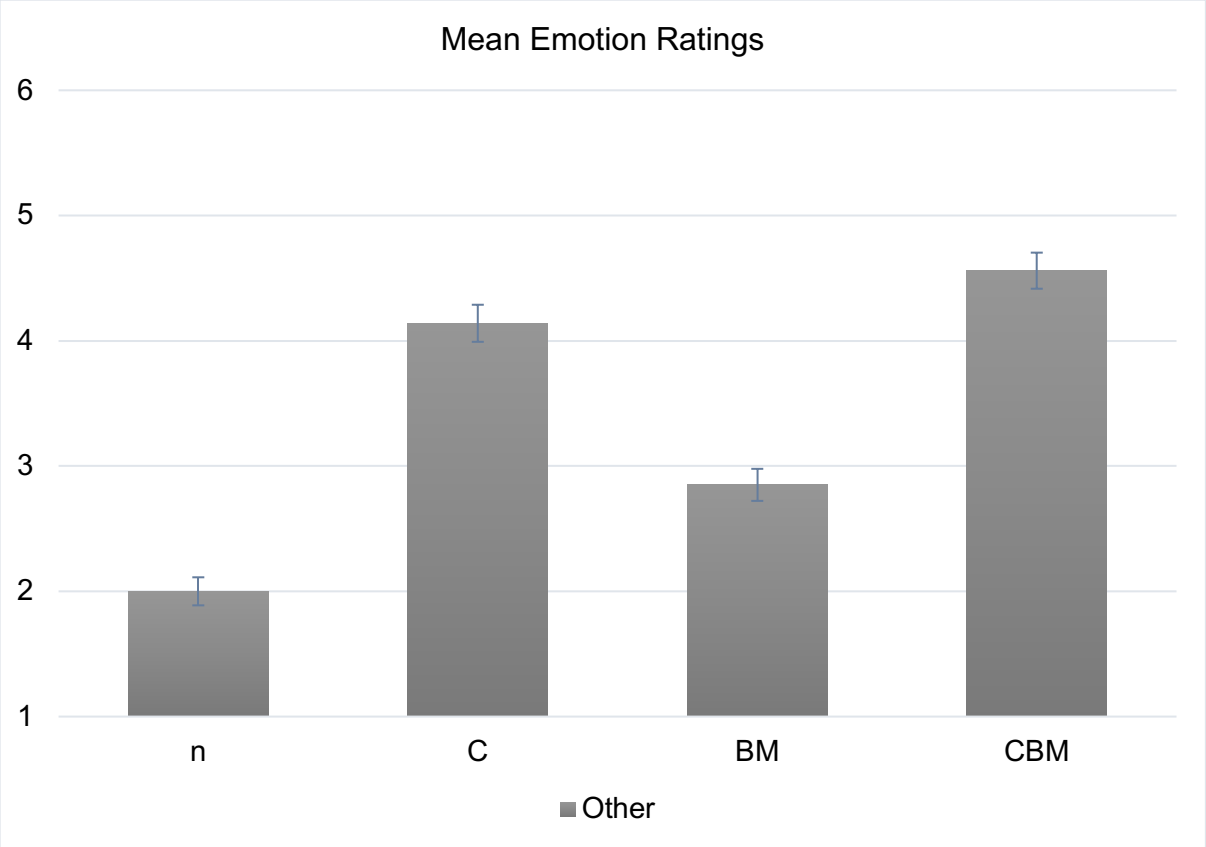


**Figure 4.** Mean emotion ratings across conditions in Study 4. Error bars represent the Standard Error of the mean.

An exploratory ANOVA analysis introducing Emotion as an additional factor revealed a small-sized significant interaction between Emotion and Cognition, $F(4, 268) = 2.82$, $p = .026$, $\eta^2 = .044$. Simple effect contrasts revealed that Cognition had a larger effect on ratings of anger, disgust, and joy ($\eta^2 = .484 – 666$) than on ratings of fear and sadness ($\eta^2 = .306 – .348$).

### 5.3. Excluded responses

Participants sometimes answered it was true that Cognition or Bodily Motivation was present even though the story explicitly denied it. 26.7% of the participants who ascribed emotion in BM (Emotion Ratings > 3) inferred the presence of Cognition (despite what the story said), while only 13.6% of the participants who ascribed emotion in C inferred the presence of Bodily Motivation (despite what the story said).

This effect, however, did not reach the standard level of statistical significance, $\chi^2$ (1) = 2.32, $p$ = .128, $OR$ = 2.32.

### 5.4. Discussion

As in previous studies, Cognition was the feature with the highest weight in emotion attribution, even though Bodily Motivation was presented first. The results of the dependency analyses showed the same asymmetry found in previous studies: People inferred Cognition from Bodily Motivation more than the other way around. However, the results were not statistically significant. A plausible explanation is the relatively low number of excluded participants in this study: 34 vs. 81 in Study 3. After all, if dependency results were driven by order of presentation, we should have found that Cognition (appearing second) depends on Bodily Motivation (appearing first). Overall, the results of Study 4 suggest that our previous results cannot be explained in terms of order effects.

## 6. General discussion

This paper presented the results of four studies testing the weight of cognitive evaluations, bodily changes, and action tendencies in people's use of emotion concepts. Across all four studies, the presence or absence of cognitive evaluations had the largest impact on participants' emotion attributions (see Table 4). Furthermore, participants tended to infer the presence of cognitive evaluations from the presence of bodily changes (or action tendencies) more than the other way around, suggesting that (in participants' understanding) bodily changes and action tendencies depend on cognitive evaluations. The following sub-sections will discuss the implications and limitations of these results.

| Study | Cognition $\eta^2$ | Body $\eta^2$ | Motivation $\eta^2$ | C/B *OR* | C/M *OR* |
|---|---|---|---|---|---|
| **1** | .271 | .071 | .046 | 5.77 | 5.89 |

| | | | | | |
|---|---|---|---|---|---|
| **2** | .147 | .072 | .067 | 3.59 | 2.50 |
| **3** | .369 | .090 | | 4.10 | |
| **4** | .436 | .077 | | 2.32 | |

**Table 4.** Effect sizes across our three studies. Showing both the impact of each feature on emotion ratings (eta squared - $\eta^2$) and the asymmetric pattern of feature false positives between features (odds ratio - *OR*).

### 6.1. Emotion concepts

The results of Study 2 showed that most participants ascribed emotion in cases where one of the features was absent (CB, CM, and BM conditions), suggesting that no feature is necessary.[11] Conversely, most participants didn't attribute emotion in cases where only one feature was present (C, B, and M conditions), suggesting that no feature is sufficient.[12] Similar results were obtained in the other studies, suggesting that emotion concepts are not defined in terms of necessary and sufficient conditions, but rather have a *prototype* structure (Fehr and Russell, 1984; Clore and Ortony, 1991; Russell, 1991). According to a Prototype view, concepts encode information about a set of *non-necessary features*, each with a certain weight in categorization (Rosch and Mervis, 1975; Hampton, 1995).

However, the results across all studies suggest that (in participants' views) bodily changes and action tendencies depend on cognitive evaluations. The existence of dependency relations between the features of a concept is usually taken as evidence for the concept having a *theory* structure. According to a Theory view, concepts

[11] The percentage of participants who *disagreed* (Emotion Ratings < 4) that BM (.27), CM (.18) and CB (.12) cases were cases of emotion was not significantly higher that .50 (all ps > .05). This is a very minimal test of necessity. Its results suggest that none of these features is necessary for emotion.

[12] The percentage of participants who *agreed* (Emotion Ratings > 3) that C (.63), B (.33) and M (.54) cases were cases of emotion was not significantly higher that .50 (all ps > .05). This is a very minimal test of sufficiency. Its results suggest that none of these features is sufficient for emotion.

encode information about causal, functional, and explanatory relations, forming a "theory" (Murphy and Medin, 1985; Rips, 1989).

Although prototypes and theories are usually considered alternative views about the nature of concepts (Margolis and Laurence, 2019), there have also been attempts to reconcile both approaches. In particular, "hybrid" views posit that concepts encode information about both features and dependency relations between them (Hampton, 2006; Keil, 2010; Vicente and Martínez Manrique, 2016). The results presented in this paper show exactly this, suggesting that emotion concepts have a *hybrid* structure.

### 6.2. Emotion theories

Whether people's understanding of emotion should inform our theories of emotion, and to which extent, is not a settled issue. Some authors use commonsense judgments about what cases count as cases of emotion to pinpoint what emotions are (see Díaz, forthcoming), but others frontally reject this method (Griffiths, 1997). Regardless of their position on this issue, authors might find interesting questions and challenges by reflecting on the overlap between theoretical and "folk" concepts of emotion.

Most would agree that it is at least desirable to have a theory of emotion that explains the things that people refer to when they say they are afraid, angry, joyful, etc. (Roberts, 2003; Scarantino, 2012). Thus, authors who believe that emotions are bodily feelings / action tendencies might wonder why people ascribe emotions in the absence of these features. Similarly, authors who believe that all cognitive evaluations, bodily changes, and action tendencies are necessary to separate emotions from non-emotions might wonder why people ascribe emotions when one of those features is absent.

Conversely, theories that stress the importance of cognitive evaluations or appraisals might do a good job at explaining the things that people refer to when they say they are afraid, angry, disgusted, sad, or joyful. Indeed, all four studies found that (1) cognitive evaluation is the feature with the largest weight in people's emotion attributions, and (2) people consider that bodily changes and action tendencies depend on cognitive evaluations.

### 6.3. Emotion reports

The results presented in this paper have implications for the interpretation of people's emotion attributions to themselves and others.

First, and of special importance for the interpretation of emotion reports, our results suggest that emotion attribution is mainly driven by people's evaluation of the situation they are in. Bodily changes or motivational urges play a smaller role in whether people consider themselves to be afraid, angry, disgusted, sad, or joyful. Thus, we should expect an imperfect correlation or even a dissociation between emotional reports and physiological measures, as some researchers have already suggested (LeDoux and Pine, 2016).

Second, and particularly relevant for understanding social cognition, people seem to readily infer cognitive evaluations based on potentially observable features such as bodily reactions and action tendencies. Thus, people may use information about others' body and behavior to infer their beliefs and concerns. This way, emotion knowledge might be crucial to navigate our highly social environment. Furthermore, the same way in which people use others' bodily and behavioral reactions to infer others' concerns, they might use their own bodily and behavioral reactions to infer their own (implicit) evaluations (Díaz and Prinz, unpublished).

### 6.4. Limitations

Before closing, some limitations of the present studies should be mentioned. First, one might wonder why participants' mean emotion ratings were not higher for conditions in which all cognitive evaluations, bodily changes, and action tendencies were present. Previous studies have shown that context significantly influences people's attributions of emotion (Carroll and Russell, 1996; Aviezer et al., 2008; Wilson-Mendenhall et al., 2011; Díaz and Reuter, 2021). Thus, a plausible explanation is that the vignettes used in the present studies did not specify the particular context in which the emotion is experienced.

Second, the participants in all studies were English speakers living in the United States, and thus Western, educated, industrialized, rich, and democratic (or WEIRD,

Halberstadt and Niedenthal, 2001). Cross-cultural work suggests that emotion concepts show universal structure but also cultural variation (Jackson et al., 2019). In particular, recent studies suggest that English speakers tend to associate emotions with bodily (vs. mental) states more than speakers of other languages (MacCormack et al., 2021). Thus, one could expect that evaluative cognitions will play even a larger role in non-English speakers' understanding of emotion.

Third, participants' attributions of emotion were constrained to one particular emotion in every condition. Participants either attributed the emotion or not, but could not ascribe a different emotion. Providing more response options or using free-labeling (Crivelli et al., 2017; Betz et al., 2019) could give valuable information about what features (cognitive evaluations, bodily feelings, or action tendencies) do a better job at *differentiating* between emotion categories (e.g. fear, anger, disgust, etc.). Although this is a different question from the one considered in this paper, it would help us get a more complete picture of people's emotion categorization.

Finally, one might worry that cognitive evaluations had the greatest impact on people's emotion attributions because cognitive evaluations are highly emotion-specific.[13] In contrast, bodily feelings and action tendencies are more variable. A reviewer suggested a test for this hypothesis. The tendencies to "get away" and "avoid contact" are associated with both fear and disgust, and are thus less emotion-specific than "confront", which is only associated with anger (Davitz, 1967). Thus, if the "variability interpretation" is right, we should expect a weaker inference to disgust from "avoid contact," (and to fear from "get away") than to anger from "confront." The data does not show this specific pattern.[14] However, future studies should test this and other hypotheses regarding perceived differences between emotions (and their features) and their influence on people's use of emotion concepts.

[13] Note, however, that a common objection against Cognitive theories of emotion states that cognitive evaluations can be made in a dispassionate way (Deigh, 1994). Thus, cognitive evaluations might not be highly specific of emotion (vs. non-emotion).

[14] In Study 1, mean emotion ratings in the motivation condition (M) were lower for anger (2.00, SD=.82) than for fear (3.43, SD=1.13) and disgust (3.14, SD=1,34). All Ns < 8. In Study 2, mean emotion ratings in the motivation condition (M) were again lower for anger (3.36, SD=.81) than for fear (4.33, SD=.98) and disgust (3.58, SD=1.00). All Ns < 13.

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