Establishing the situated features associated with perceived stress

Lauren A.M. Lebois [a], Christopher Hertzog [b], George M. Slavich [c],
Lisa Feldman Barrett [d,e,f], Lawrence W. Barsalou [g,*]

[a] Division of Depression and Anxiety, McLean Hospital and Department of Psychiatry, Harvard Medical School, United States
[b] Department of Psychology, Georgia Institute of Technology, United States
[c] Cousins Center for Psychoneuroimmunology and Department of Psychiatry and Biobehavioral Sciences, University of California, Los Angeles, United States
[d] Department of Psychology, Northeastern University, United States
[e] Massachusetts General Hospital, United States
[f] Harvard Medical School, United States
[g] Institute of Neuroscience and Psychology, School of Psychology, University of Glasgow, United Kingdom

ABSTRACT

We propose that the domain general process of categorization contributes to the perception of stress. When a situation contains features associated with stressful experiences, it is categorized as stressful. From the perspective of situated cognition, the features used to categorize experiences as stressful are the features typically true of stressful situations. To test this hypothesis, we asked participants to evaluate the perceived stress of 572 imagined situations, and to also evaluate each situation for how much it possessed 19 features potentially associated with stressful situations and their processing (e.g., self-threat, familiarity, visual imagery, outcome certainty). Following variable reduction through factor analysis, a core set of 8 features associated with stressful situations—expectation violation, self-threat, coping efficacy, bodily experience, arousal, negative valence, positive valence, and perseveration—all loaded on a single Core Stress Features factor. In a multilevel model, this factor and an Imagery factor explained 88% of the variance in judgments of perceived stress, with significant random effects reflecting differences in how individual participants categorized stress. These results support the hypothesis that people categorize situations as stressful to the extent that typical features of stressful situations are present. To our knowledge, this is the first attempt to establish a comprehensive set of features that predicts perceived stress.

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1. Introduction

1.1. The importance of perceived stress

The distinction between stressful life events vs. perceived stress has played a central role in the measurement of stress (e.g. Cohen, Kessler, & Gordon, 1995; Monroe, 2008). From an environmental perspective, an individual's stress can be measured as the number of stressful life events that he or she encounters in the world, using instruments such as the Social Readjustment Rating Scale (Holmes & Rahe, 1967) and the Life Events and Difficulties Schedule (Brown & Harris, 1978). From a psychological perspective, an individual's stress can be measured as how much stress he or she perceives in their experience, using instruments such as the Perceived Stress Scale (Cohen, Kamarck, & Mermelstein, 1983) and the Perceived Stress Questionnaire (Levenstein et al., 1993). Although

both environmental and psychological measures predict the negative consequences of stress, such as illness (e.g., Cohen, Tyrrell, & Smith, 1993), we focus here on the psychological contribution.

Since the advent of appraisal theory (e.g., Lazarus & Folkman, 1984), the importance of perceived stress for mental and physical wellbeing has become well established. Depending on how the same life event is interpreted psychologically, its affective and bodily consequences can vary. Whereas one person might appraise an opportunity for public speaking as a threat, another might appraise the same event as a challenge (e.g., Blascovich, Mendes, Hunter, & Lickel, 2003). Perceived stress is associated with negative health outcomes (e.g., Cohen & Williamson, 1988), and also with various biological markers of stress, such as telomere shortening (Epel et al., 2004) and reduction in hippocampal gray matter (e.g., Gianaros et al., 2007).

The negative health consequences of neuroticism further implicate the importance of perceived stress in health. Neuroticism is typically defined as high stable levels of negative emotion, reflecting the fact that some individuals respond more negatively to negative life events than do others. As much research shows, neuroticism is associated with considerable reductions in both mental and physical wellbeing (Lahey,

2009). Importantly, for our purposes here, individuals who score high on neuroticism tend to experience classic markers of stress, being more likely to perceive threat and less likely to believe that they can cope with threat effectively (Gunthert, Cohen, & Armeli, 1999). As a result, these individuals tend to experience more stress in response to negative events (Suls, Green, & Hillis, 1998). Finally, perceived stress and neuroticism share common genetic contributions (Rietschel et al., 2014) and are closely related psychometrically (Morgan, Umberson, & Hertzog, 2014). The strong affective responses associated with individual differences in neuroticism further implicate the importance of psychological factors in the stress that an individual experiences.

1.2. Adopting a categorization perspective on stress perception

To date, research has predominantly examined perceived stress as a predictor, specifically, as a predictor of negative health outcomes (for a brief review, see Monroe, 2008). Conversely, it is important to understand the factors that predict perceived stress, with these factors potentially including cognitive, affective, and bodily processes. Once these predictive factors are established, they can inform how the perception of stress originates, and can be used to motivate interventions that decrease it.

Appraisal theory offers one account that informs the perception of stress (e.g. Lazarus, 1993; Lazarus & Folkman, 1984; Moors, Ellsworth, Scherer, & Frijda, 2013; Roseman, 2011; Scherer, 2001). When difficult life events occur, people often make certain kinds of appraisals about them (e.g., a threat is present, coping ability is low). In turn, these appraisals can cause bodily and affective responses associated with stress (e.g. McEwen, 2007; McEwen & Sapolsky, 1995). In other words, making these appraisals can cause stress responses (but see Moors, 2013; Parkinson, 1997). Once appraisals and stress responses have been produced, the perception of stress results.

We explore a related but different perspective here, drawing on categorization research in cognitive science (e.g., Barsalou, 2012; Barsalou & Hale, 1993; Murphy, 2002; Pothos & Wills, 2011). From this perspective, perceived stress is the result of categorizing the current situation as the kind of situation that has previously been experienced as stressful. Specifically, when the current situation contains features similar to the features of previous situations experienced as stressful, it is categorized as stressful, too. When it is not similar to the features of these situations, it is categorized in some other way (e.g., a boring event, a fulfilling experience). Once the current situation is categorized as a stressful experience, it becomes perceived as stressful. In the Discussion, we address the relations between stress categorization and stress perception further.

Over time, as experiences of stressful situations accumulate and become integrated in an individual's memory, a category of stressful experiences develops. The representation of this category could be a prototype, a collection of exemplars, a connectionist network, a Bayesian model, etc., or some combination of these representational structures. Although this is an important and interesting issue, the specific kinds of structures representing the category of stressful experiences do not bear on the work reported here. Instead, as described next, we simply focus on *features* of stressful situations that could be incorporated into *any* of these representational approaches.

Once an individual has established a category of stressful situations in memory, it is used to categorize new situations as stressful. Because individuals can differ significantly in the life situations they encounter, together with the resources available for coping with these situations, they are likely to differ in the stressful situations that they experience and establish in memory. As a consequence, the content and organization of stress categories varies between individuals, in turn causing variability in how they categorize future situations as stressful. Situations that one individual categorizes as stressful might not be stressful for another individual, and vice versa. From this perspective, stress perception

results from the same basic cognitive mechanisms that underlie all other kinds of categorization (cf. Sanislow et al., 2010).

1.3. Adopting a situated perspective on stress categorization

From the categorization perspective, the features associated with a category play central roles in its processing (e.g. Barsalou, 2012; Murphy, 2002). The category of birds, for example, is associated with features such as feathers, wings, flies, chirps, and nests (McRae, Cree, Seidenberg, & McNorgan, 2005; also see Wu & Barsalou, 2009; Santos, Chaigneau, Simmons, & Barsalou, 2011). During categorization, these features can be used to identify perceived entities as category members. If an entity is perceived as having feathers, wings, and flying, it might be categorized as a bird; alternatively, if it has wheels, an engine, and a trunk, it might be categorized as a car.

What features are associated with that category of stressful experiences? To the extent that we can establish these features, we can better understand how the perception of stress originates. When people perceive situations as having these features, they are likely to categorize and perceive these situations as stressful.

Certainly, the primary and secondary appraisals associated with stress offer likely features used to categorize stressful situations (e.g., Lazaraus & Folkman, 1984; Lazarus, 1993). When situations are associated with a threat (primary appraisal) and poor ability to cope with the threat (secondary appraisal), they are likely to be categorized as stressful. Because threat and poor coping ability are often associated with experiencing stress, these features become associated with the category of stressful situations. Indeed, from the perspective of appraisal theories, these are the defining features of stressful experiences.

Importantly, however, a major theme of categorization research is that the features associated with a category are not merely its defining features, but also typical features and contextual features (e.g. Hampton, 1979; Medin & Schaffer, 1978; Rosch & Mervis, 1975; Smith & Medin, 1981). Important features of birds, for example, do not simply include defining features, such as feathers, but also typical features such as small and sings, and contextual features such as live in nests (cf. Lebois, Wilson-Mendenhall, & Barsalou, 2015).

More recently, much research indicates that category knowledge is situated (e.g., Barsalou, 2003, 2008, 2009, 2016; Yeh & Barsalou, 2006). When people represent the category of hammers, for example, they don't simply represent defining features (e.g., handle, head), they also represent features of relevant background situations (e.g., woodshops, nails, boards, hammering actions). In experiments that ask people to produce the features associated with concepts, large numbers of situational features are typically produced (e.g. Barsalou & Wiemer-Hastings, 2005; McRae et al., 2005; Santos et al., 2011; Wu & Barsalou, 2009). In particular, people produce features for settings, other agents and objects present, actions and events likely to occur, and a wide variety of internal states experienced, including goals, evaluations, emotions, and interoceptions. In general, considerable evidence has existed for some time that the features associated with a category, not only represent the features of category members, but also the situations in which category members are experienced.

If we generalize this basic finding to the category of stressful experiences, it follows that situational features become associated with the category of stressful experiences, just as for any other category. As a consequence, situational features contribute to stress categorization. To the extent that a situation shares features with situations previously experienced as stressful, it too is categorized as stressful.

1.4. Establishing the features associated with stressful situations

To our knowledge, no previous work has attempted to comprehensively establish the features of situations that predict perceived stress. Thus, the study reported here attempted to do so. We adopted two heuristics for identifying features that people might typically associate with