18 Embodied Emotion, Emotional Granularity, and Mindfulness: Improved Learning in the Classroom

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Traditional Views of Embodied Emotion: Emphasis Solely on the Body

There is a rich theoretical history of how emotions engage the body, dating back to William James, who profoundly defined emotion by its experience (1884/1984). That is, an emotion occurs when a person senses the changes within the body (see W. James, 1884; Lange & James, 1922; for a critique of the James-Lange theory of emotion, see Cannon, 1927).[1] Most modern views of emotion emphasize the importance of feeling as a central aspect to emotion experience (for a detailed history of emotion theory, see Gendron & Barrett, 2009). Niedenthal proposed a theory of "embodied emotion" in which the experience, understanding, and perception of an emotion are similar (2007, 2008; Niedenthal et al., 2005). According to this view, understanding the concept of "anger" involves the activation of facial muscles associated with scowling as well as changes in the body's physiology (e.g., increasing heart rate, blood pressure, and skin conductance) and behavior (e.g., activating muscular tension).

Several studies' findings have supported bodily contributions in emotion, including facial feedback (Niedenthal, 2007; Tomkins, 1962, 1963). The facial feedback hypothesis (Buck, 1980; Tomkins, 1962, 1963) states that it is possible to experience the feeling of an emotion by moving the face in a prescribed way that is thought to be associated with a particular emotion. For example, participants who had Botox injections to the muscles associated with scowling were selectively impaired in reading sentences containing negative words and describing negative events (Havas et al., 2010). In another study, when participants were told to not move their faces, they reported a weaker emotional experience (Davis et al., 2009).

In some cases, it is even assumed that facial feedback can generate a specific emotional experience (Dimberg & Söderkvist, 2011). In one such study (Flack,

2006), participants who produced facial expressions (or bodily postures) that corresponded with specific emotions (i.e., anger, sadness, fear, and happiness) reported having higher emotional feelings for the specific emotion compared with other emotions.[2] In another study, participants who had their cheeks lifted, rated themselves as feeling happier, whereas when participants had their cheeks lowered, they rated themselves as feeling sadder (Mori & Mori, 2009). Similarly, voluntary production of facial movements associated with an emotion can produce changes in physiological parameters such as heart rate, skin conductance, finger temperature, and muscle tension associated with that emotion (Levenson et al., 1990).

Body posture is also thought to cause an embodied experience. In one study, participants who received positive feedback on a test reported feeling less proud of their accomplishments if they had been assigned to adopt a slumped-over posture (versus erect posture) (Stepper & Strack, 1993; see also Valiente et al., 2012). Finally, in an additional study that tested the congruency between valence of a stimulus and the affordances of the body, participants were slower to push a lever away from them to indicate a stimulus change that was positive compared with when it was negative (Duckworth et al., 2002). The reverse was true for participants who pulled a lever toward them. Therefore, matching the emotional reaction (e.g., *positive* and pulling toward, or *negative* and pushing away) facilitated emotional responding.[3]

Embodied Emotion from Psychological Constructionism: Emphasis on Language

Consistent with some of the most recent and influential theories of embodied or "grounded" cognition (see Macrine & Fugate, chapter 1 in this volume), constructionist perspectives of emotion suggest that emotion categories are represented as probabilistic patterns that develop from prior experience, including coordinated bodily (interoceptive and visceromotor), sensory (e.g., visual, auditory, etc.), and motor information (Barrett, 2017; Wilson-Mendenhall, 2017; Wilson-Mendenhall et al., 2011). Because emotion categories are grounded in sensorimotor experiences, they are specific to an individual; therefore, there is no clear "prototype" across individuals (Wilson-Mendenhall & Barsalou, 2016). According to these views, emotion categories (e.g., anger, fear, happiness) are better thought of as "populations" of situated, experiential patterns rather than a single prototype (Barrett, 2014). Because the situational patterns that develop for a given emotion category (e.g., anger, fear, happiness) are varied, it is often the consistent phonological form of an emotion word that anchors these patterns

to a given emotion category (see Barrett, 2006a, 2014; Betz et al., 2019; Hoemann et al., 2020; Lindquist, 2017; Lindquist et al., 2016).

In one such perspective (Barrett, 2006a, 2006b, 2014, 2017), an emotion category becomes increasingly complex as different situational instances are labeled with an emotion word. Because over time words become linked to sensorimotor patterns, an emotion word like "anger" can result in the brain simulating these experiences to determine whether oneself or someone else is "angry." Therefore, after a word is consistently yoked to a sensorimotor pattern, it serves as an anchor for simulating those patterns. As such, it "activates" embodied knowledge. Because emotion words help to activate sensorimotor patterns, they can facilitate the processing of sensory information that is consistent with the particular emotion category (Barrett, 2006b, Wilson-Mendenhall et al., 2011; see reviews by Fugate & Barrett, 2014; Lupyan & Ward, 2013).

This view is similar to Borghi's idea of "words as social tools." As one of the basic premises of her theory, Borghi states that "linguistic mediation is more crucial for abstract concepts than for the representation of concrete ones, given that the scaffolding function of the physical environment is less powerful" and that "abstract concepts (*including emotions*) and words are more affected by differences between languages than concrete ones; that is, their meaning changes more depending on the cultural and linguistic milieu in which they are learned" (Borghi & Binkofski, 2014, emphasis added).

Both these ideas bear resemblance to the idea that abstract representations are created from concrete representations by way of metaphorical extension (Gallese & Lakoff, 2005; Lakoff, 1987, 2012; Lakoff & Johnson, 1980). Lakoff extensively documented the use of metaphoric language to ground spatial, body-centric, and even emotional metaphors in concrete representations (e.g., in English, *love* is often conceptualized as a journey, a game, or a flower) (Lakoff & Johnson, 1980). Therefore, the function for such extensive use of metaphors in English as well as other languages might be to provide a tangible "grounding" to the body and to the physical world.[4]

The Development of Embodied Emotion Categories through Language

In most constructionist theories of emotion, language plays a critical role in the development of adaptive emotion categories (Barrett, 2006a, 2009, 2014; Russell & Widen, 2002; Widen, 2013; Widen & Russell, 2008; for reviews, see Hoemann et al., 2020; Shablack & Lindquist, 2019). Many developmental studies show that language (e.g., words) can serve as the *essence* that links

members of one category with others in the category (Xu et al., 2005), and that words facilitate learning new categories (Lupyan et al., 2007). Words bind together situated instances into a meaningful category representation. The result is that individual tokens are thereby linked into cohesive types (concepts) through words. In fact, infants routinely use the phonological form of words to make conceptual inferences about novel objects that share little perceptual similarity (e.g., Dewar & Xu, 2009; Xu, 2002). In one example, a shared linguistic label (even a made-up one) directed infants to group together objects that otherwise did not share strong perceptual similarities (Plunkett et al., 2008).

One way in which this might be done during development is through a child's early interaction with his/her caregivers within the context of their culture (e.g., Denham et al., 1994; Halberstadt & Lozada, 2011). Children's emotional utterances at two-to-four years old correlate with their mother's emotional word knowledge and use (Cervantes & Callanan, 1998), and children whose parents discuss emotions with them at an early age (thirty-six months) have better emotion understanding at six years (Dunn et al., 1991). Specifically, parents' explanations of internal feelings are thought to scaffold a child's own ability to identify and describe the experiences within themselves and in others (Saarni, 1999; Yehuda, 2005). Children who are more apt at recognizing and expressing their emotions worry less and show fewer signs of depression than children who struggle to convey their emotions (Rieffe et al., 2007). Similarly, children's emotional understanding is predictive of their social and emotional regulation skills and even their academic performance (Halberstadt et al., 2001, 2013).

The development of emotion categories follows a similar trajectory across cultures, with infants experiencing basic bodily sensations (e.g., negative and positive-valenced feelings) and then making more fine-grain distinctions among these more basic sensations (Hupka et al., 1999; Russell & Bullock, 1986; Shablack et al., 2019; Widen, 2013; Widen & Russell, 2008). For example, toddlers initially describe their own feelings and others' feelings with the words that reflect large differences in valence, such as *happy* versus *sad* or *mad.* By age five, however, they typically incorporate *afraid, disgust,* and *surprise* (Widen & Russell, 2003). Moreover, children by this age now recognize these emotions in others. That is, they are now able to sort *negative faces* into *angry* and *fearful* faces in perceptual sorting tasks (Widen & Russell, 2008). Emotion labels also better predict a child's ability to match emotional faces compared with different visual pictures of the same emotion (Russell & Widen, 2002), an effect known as "language superiority effect."

The Continued Importance of Language in Dissociating Embodied Concepts

Emotion words are not only important for children during development to learn emotion categories, but emotion words also continue to have an impact on the development and use of emotion categories during adolescence and across the life span. There are an increasing number of studies that show the importance of emotion words (and emotion language) and the effects that they have on embodiment (Niedenthal et al., 2009; Moseley et al., 2012). Niedenthal and colleagues (2009) used facial electromyography to measure participants' facial muscle reactions when viewing emotional (and nonemotional) words and either performing a nonembodied, perceptual task (e.g., identifying whether the word was capitalized) or an embodied task (e.g., evaluating the meaning of the word). The response of facial muscles was emotion-specific for the emotional words. In another study, Moseley et al. (2012) showed passively reading emotional words activated the parts of the brain related to processing face- and arm-related gestures associated with specific emotions. Moreover, the same areas of the brain specific to an emotion (e.g., anger) were also activated for more abstract (less embodied) emotion words, including "spite."

These findings are in line with another large body of literature that shows emotion words affect emotion perception at various levels of cognitive processing. In one study, the participants had a difficult time deciding whether two emotional faces matched when an emotion word was satiated (such that the word became meaningless) (Lindquist et al., 2006). Under similar conditions of semantic satiation, the participants also did not show repetition priming of emotional faces (Gendron et al., 2012), suggesting that the same exact face was not recognized by the visual system in the absence of emotion words.

In another study, participants were more likely to say that a distractor emotional face was a previously seen target face when primed with an emotion word (compared with when primed with a nonemotional control word) (Fugate et al., 2018, studies 1 and 2). Specifically, the participants had less sensitivity to detect differences between possible emotion category targets. This effect was later expanded upon in a study showing that emotion words both reduce *within-category* variability for emotional faces and maximize the difference *between* faces from different emotion categories (Fugate et al., 2020), which is consistent with categorical perception studies of emotion (e.g., Fugate et al., 2010; Fugate et al., 2021; Roberson & Davidoff, 2000). In these studies, the participants' abilities to detect differences between emotional faces from *different* emotion categories were enhanced when they had access to individual

emotion words or labels (for a review, see Fugate, 2013). Although the latter studies do not explore embodiment per se, they do show that the emotion words are integral to the perception and experience of discrete emotions such that they help to "anchor" affective changes.

Emotional Granularity

Emotional granularity, also known as emotion differentiation, describes the ability to make fine-grained distinctions between similarly valenced affective feelings (Barrett, 1998; Tugade et al., 2004). People who are low in emotional granularity tend to differentiate emotions only on arousal or valence, whereas those high in granularity have more fine-grained categories of emotion (Barrett, et al., 2001) and are able to distinguish among similarly valenced emotions with ease.[5] Individuals with high granularity are able to distinguish feelings of irritation from impatience, agitation, excitement, and annoyance.

Individuals who use emotion words in a granular manner are less prone to maladaptive behaviors, such as binge eating (Dixon-Gordon et al., 2014), alcohol abuse (Kashdan et al., 2010), nonsuicidal self-injury (Zaki et al., 2013), and physical aggression (Pond et al., 2012). Emotional granularity is thought to be a transdiagnostic vulnerability across a range of mental health disorders (Kashdan et al., 2015).

Individuals higher in granularity also report more flexible emotional regulation abilities (Barrett et al., 2001; Boden & Berenbaum, 2012), have a less reactive coping style (Tugade et al., 2004), and are less biased by incidental emotions when making moral decisions (Cameron et al., 2013). Barrett and colleagues (2001) showed that greater emotional granularity leads to better emotional regulation and may serve as a protective factor against more destructive emotional regulation strategies. In one recent study, adolescents' positive and negative emotions were recorded with experience sampling over a two-week period. The ability to differentiate negative emotions was related to less negative intensity and propensity, as well as increases in believing that they could change the emotion (Lennarz et al., 2018).

Others have suggested that emotional differentiation can highlight the discreteness of a feeling, which may in turn make experiences easier to regulate (Lieberman et al., 2007; Kassam & Mendes, 2013). Other studies have found low granularity might cause ineffective use (but not necessarily ineffective selection of regulation strategies), which may hinder successful emotion regulation (Kalokerinos et al., 2019).

Knowing one's own feelings may also help with understanding others' feelings (Saarni, 1997). Kashdan and Farmer (2014) proposed a model in which individuals who experience their emotions as more granular will first use

emotion words to differentiate what is felt in a given moment and then use these specific emotion words to regulate their emotions as well as to perceive emotions in other individuals.[6] Furthermore, emotional granularity is correlated with emotion perception performance (i.e., when participants are asked to judge the state of a target individual) (e.g., Israelashvili et al., 2019). This finding is suggestive that the training of emotion words in adults could improve emotion perception and sociocognitive capacities that are contingent on emotion perception.

In addition, emotion perception disorders, including autism spectrum disorders, are often mediated by language deficits, where successful intervention focuses on learning to label emotional stimuli (e.g., Baron-Cohen et al., 2009; Davis et al., chapter 17 in this volume). Indeed, emotion perception disorders for individuals on the autism spectrum are mediated by alexithymic traits (Cook et al., 2013). Alexithymia is a disorder defined by a difficulty to identify, understand, and express emotional information (Bagby et al., 1986). People with alexithymia either possess little knowledge about emotion concepts or have undifferentiated knowledge (i.e., less granularity) of emotion concepts.

Mindfulness and Emotional Granularity

The awareness practices that characterize mindfulness-based interventions are thought to improve emotion regulation by cultivating a more fine-grained awareness of what is occurring in one's mind (Hill & Updegraff, 2012; Roemer et al., 2015). Furthermore, the way in which internally oriented observation occurs in many mindfulness practices—with curiosity, openness, and a less reactive "decentered" stance—supports dismantling and defusing destructive emotions (Roemer et al., 2015).

One of the most widely used measures employed to assess trait-like individual differences in mindfulness, the Five Facet Mindfulness Questionnaire (FFMQ), includes a construct related to emotional granularity: *describing* (Baer et al., 2006). The describing facet extends beyond emotions to mental states more generally. Example items from the FFMQ describing subscale include "I'm good at finding words to describe my feelings," "I can easily put my beliefs, opinions, and expectations into words," and "It's hard for me to find the words to describe what I'm thinking" (reverse scored) (Baer et al., 2006). Higher scores on the describing facet are associated with greater self-reported attention to and clarity of emotional feelings, and fewer symptoms of alexithymia (Baer et al., 2006). The FFMQ describing facet is also associated with scenario-based measures of negative emotional granularity that draw on common life events (Boden et al., 2015) or personal experiences (Fogarty et al., 2015), providing evidence that the

two constructs are related when emotional granularity is assessed with measurement techniques other than traditional self-report.

Meta-analyses of individual differences in mindfulness show a consistent, moderate relationship between the FFMQ describing facet and mental health symptoms, in which higher scores on the describing facet are associated with fewer symptoms of anxiety, depression, and related disorders (Carpenter et al., 2019; Mattes, 2019). Better quality of life is also consistently associated with higher self-reported describing ability (Boden et al., 2015; Mattes, 2019).

Describing is distinct from, but related to, other facets of mindfulness. For example, psychometric evaluation of the FFMQ demonstrated moderate correlations between describing and other facets of mindfulness, such as acting with awareness, nonreactivity, and nonjudgment (with each facet separating in factor analysis) (Baer et al., 2006). Relative to other mindfulness facets, describing showed the strongest cross-sectional relationship with social outcomes in a recent meta-analysis (Mattes, 2019), which may speak to the role granularity plays in perceiving and communicating with others.

Evidence from intervention studies suggests that mindfulness practices may increase granularity in adults. A recent meta-analysis indicated that self-reports of the describing facet increase with mindfulness training (Quaglia et al., 2016; but see Baer et al., 2019 for evidence that this effect is diminished when active control conditions that also likely train granularity are used). Moreover, pre-post increases in describing showed moderate magnitude associations with pre-post increases in mental health (e.g., fewer symptoms of anxiety and depression; better quality of life) (Quaglia et al., 2016). In line with this evidence, a meta-analysis of the relatively few studies that examined alexithymia as an outcome (four in total) indicated that after mindfulness training the participants were better able to attend to and describe internal emotional experiences (Norman et al., 2019).

The only intervention study to examine granularity using repeated, momentary experience sampling instead of traditional self-report found that increases in the granularity of negative emotions after mindfulness training were mediated by changes in acceptance and decentering (even when controlling for changes in negative affect) (Van der Gucht et al., 2019). This result suggests that learning to observe one's internal emotional experiences with a more nonjudgmental and distanced perspective may be central to cultivating emotional granularity in this context. While this mediation analysis is suggestive, this study design did not include a control group and thus was not a randomized controlled trial.

In summary, cross-sectional evidence suggests higher granularity of emotions and mental states are related to greater trait-like mindful qualities and to beneficial outcomes. The initial results from intervention studies further suggest

that emotional granularity can improve with training, and that these changes may support better mental health.

Implications for Embodied Emotion in the Classroom

Classrooms and daycare centers should capitalize on teaching children to acquire emotion words and to improve their emotional granularity. Teaching children a variety of emotional vocabulary helps them label their own affective feelings, ultimately leading to increased emotional granularity, positive social outcomes, and school success (e.g., Hagelskamp et al., 2013). This can be done initially early in development with pairing basic emotion words with naturalistic pictures of people showing prototypic emotional "expressions" and labeling emotional behaviors when they are seen in the classroom. Situational information can later be added to help understand such "expressions" in context, and the use of situational language can then be incorporated into the category knowledge. Such activities are the basis for many emotional-intelligence packages that have been used in the classroom already.[7]

Building on evidence of the beneficial impact of mindfulness-based interventions in adults, an emerging research focus is to develop and study mindfulness-based interventions in schools. A recent meta-analysis showed consistent increases in mental health and well-being outcomes after mindfulness training in school settings, with the greatest benefit observed during late adolescence (ages fifteen to eighteen) (Carsley et al., 2018). In general, emotional granularity is lower during the adolescent period relative to childhood and young adulthood, which may indicate grappling with emotional experiences that are becoming more multifaceted (Nook et al., 2018). Because mindfulness-based programs involve observing and labeling one's internal experiences, training-related changes in emotional granularity may be one pathway to improving mental health during this time. This future research direction is consistent with recent recommendations to use more diverse outcome measurements and investigate the "active ingredients" of mindfulness-based interventions in schools (Felver et al., 2016).[8]

Beyond the classroom, many therapies focus on strategies such as cognitive restructuring to alter one's experience of emotional states. Not surprisingly, labeling is often a part of cognitive behavioral therapy to treat emotional disorders (Jamieson et al., 2012; Pennebaker & Beall, 1986). In one study, depressed individuals had less-differentiated negative emotion experiences compared with nondepressed individuals (Demiralp et al., 2012).

Mindfulness-based therapies are also used to treat emotional disturbances, stress, and anxiety (Goldberg et al., 2018). The results of a recent meta-analysis

suggest that mindfulness interventions with youth may be particularly beneficial for clinical populations (Zoogman et al., 2015). Moreover, across a broad range of subsamples and outcomes, mindfulness most robustly addressed symptoms of psychopathology (relative to other outcomes that were measured such as attention, social skills, psychophysiological outcomes).

Therefore, treatments that focus on more adaptive forms of emotion processing, including differentiating broad emotional experiences, might serve as a protective factor against emotion dysregulation and mental illness. Specifically, teaching individuals emotion words and to examine their own emotional experiences is likely to facilitate more granular emotional knowledge and allow individuals experiencing emotional difficulties to reconceptualize generalized negative feelings, which makes these individuals more likely to engage in adaptive emotion processing within themselves and also be better at emotion perception of others.

Conclusion

In this chapter we have reviewed the evidence that individual categories of emotions (that are the basis for perceiving and experiencing discrete emotions) are learned when sensorimotor and bodily affective changes are learned within a situational context and become "linked together" by the application of emotion words. Improving a person's emotional vocabulary (to increase emotional granularity) is linked to improved emotion perception of others, and improved emotion regulation and increased mental health and well-being in the self. Finally, mindfulness improves these outcomes, most likely by increasing the ability to attend to and describe embodied affective changes (thereby increasing emotional granularity).

In fact, burgeoning research suggests that improving emotional granularity might help protect individuals from a wide array of mental health disorders, especially adolescents who are disproportionately affected by certain disorders (e.g., depression, anxiety, eating disorders). Moreover, adolescence is a time when individuals experience rapid growth in the prefrontal cortex and increases in the connections between it and the temporal lobe, which support language acquisition and cognitive representations. Therefore, adolescence might be the perfect time to improve emotional vocabulary to facilitate granularity and ultimately enrich the conceptual structure of emotion categories.

Classrooms and school settings should capitalize on teaching emotion vocabulary and mindfulness to individuals to not only improve emotional interactions and regulation but also to improve attention, focus, and cognitive awareness, which all facilitate academic performance.

Notes

1. Although some of these views place the experience of the emotion as central to the emotion, most more modern models actually suggest that the feeling (subjective experience) is the reaction—not the cause—of the emotion.

2. With some overlap between anger and disgust, and fear with surprise.

3. For more cognitively mediated explanations, see Cacioppo et al. (1993), Chen and Bargh (1999), and Förster and Strack (1998).

4. See Gómez and Glenberg (chapter 5) and Kaschack and McGrew (chapter 6) in this volume.

5. Some individuals seem to be more arousal focused and some more valenced centered when describing their emotions (Barrett, 1997).

6. For a review on how this idea is related to empathy and social connectedness, see Butera and Aziz-Zadeh (chapter 16) in this volume.

7. For one such successful example, see Brackett et al. (2012) for the RULER approach: recognize, understand, label, express, and regulate.

8. Recent reviews and meta-analyses also highlight the need for more randomized controlled studies (i.e., experimental designs), use of active control comparison conditions, analyses that account for students nested in classrooms and schools, and reporting full details of student characteristics (Felver et al., 2016).

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