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Abstract

Curiosity about collective affect is undergoing a revival in many fields. This literature, tracing back to Le Bon's seminal (1897) work on crowd psychology, has established the veracity of collective affect and demonstrated its influence on a wide range of group dynamics (Mayer, Roberts, & Barsade, 2008). More recently, an interest in the *perception* of collective affect has emerged, revealing a need for a methodological approach for assessing collective emotion recognition to complement measures of individual emotion recognition. This article addresses this need by introducing the Emotional Aperture Measure (EAM). Three studies provide evidence that collective affect recognition requires a processing style distinct from individual emotion recognition and establishes the validity and reliability of the EAM. A sample of working managers further shows how the EAM provides unique insights into how individuals interact with collectives. We discuss how the EAM can advance several lines of research on collective affect.

Keywords: Group emotion, Emotion recognition, Affective tone, Global processing, Emotional intelligence, Social intelligence

Assessing Collective Affect Recognition via the EAM (Emotional Aperture Measure)

Collective affect is enjoying a resurgence of interest across disciplines. From social psychology (e.g., Mackie, Devos, & Smith, 2000) to organizational studies (e.g., Bartel & Saavedra, 2000) to behavioral economics (e.g., Shiller, 2009), there is converging evidence of the veracity of collective emotional experiences and its effect on social behavior and decision making. Indeed, these rich and diverse literatures depicting collectives as dynamic emotional arenas can be traced to Le Bon's (1897) seminal work on crowd psychology and Mackay's (1852) historic analysis of market behavior. Contemporary research continues to open new pathways on the phenomenon of collective affect, from its genesis (Barsade, 2002) to its downstream consequences (see Elfenbein, 2007; Mayer et al., 2008). Recently, scholarly attention has been aimed at how individuals recognize and make sense of collective affect (e.g., Sanchez-Burks & Huy, 2009), yet the lack of empirically validated approaches for assessing collective affect recognition has likely hampered research involving perceptions of collective affect. This article addresses this need by introducing the *Emotional Aperture Measure* (EAM).

Collective Affect

Collective affect refers to dynamic patterns of affective experiences that unfold in social groups. Converging lines of research have revealed multiple factors that foster the development of collective affect. These include exposure of group members to the same affective events, such as task demands and interdependencies with other groups (Mackie et al., 2000; Weiss & Cropanzano, 1996), adherence to mood regulation norms (Bartel & Saavedra, 2000; Rafaeli & Sutton, 1989), and social comparison and emotional contagion processes (Barsade & Gibson, 1998; Barsade, 2002; Bartel & Saavedra, 2000; Hatfield, Cacioppo, & Rapson,, 1994; Sullins, 1991; Totterdell, 2000).

Collective affect is most commonly conceptualized and measured in terms of central tendencies. The average affective experience present in a collective, sometimes referred to as *affective tone*, has been linked to a broad array of group dynamics and outcomes, including group conformity (Heerdink, Van Kleef, Homan, & Fischer, 2013), group creativity (Grawitch, Munz, & Kramer, 2003), sport team performance (Totterdell, Kellett, Teuchmann, & Briner, 1998; Totterdell, 2000), entrepreneurial team success (Perry-Smith & Coff, 2011), and collective action tendencies (van Zomeren, Spears, Fischer, & Leach, 2004). However, a closer examination of such studies where affect is measured indicates that, even when there is reasonable statistical justification for aggregating group members' affective experiences, there remains substantial variation in affective experiences within the group. Variation patterns in the distribution of moods or specific emotions, such as the relative proportion of positive and negative affective reactions, are also purported to affect group dynamics and outcomes, including collective sensemaking and action tendencies (cf., Barsade, Ward, Turner, & Sonnenfeld, 2000; Sanchez-Burks & Huy, 2009).

Perceiving Collective Affect

Complementary to research on the experience and effects of collective affect, there is a nascent interest in the *social perception* of collective affect (Coval & Shumway, 2001; Gioia & Thomas, 1996; Homan, Van Kleef, & Sanchez-Burks, 2014; Peterson & Kim, 2012; Sanchez-Burks & Huy, 2009). This relatively new line of inquiry is not surprising in light of considerable research documenting the diagnostic value of affective cues (Cosmides & Tooby, 2000; Ekman, 1992; Frijda & Mesquita, 1994). The ability to recognize other people's affective displays, even from mere facial expressions, provides a wealth of reliable information about how others are making sense of events and their likely behavioral responses to these interpretations (Frijda, 1986). Indeed, individuals have an innate capacity to communicate their own internal feeling states through nonverbal gestures as well as to ascertain other's feelings by observing various verbal and behavioral cues (Ekman & Davidson, 1994; Spoor & Kelly, 2004). For example, these cues can be manifested in facial muscle movements (Darwin, 1872; Eckman & Keltner, 1997; Ekman & Friesen, 1976; Mandler, Russell, & Fernández-Dols, 1997), distinct patterns of vocal intonation, rhythm, and pausing (Hatfield, Hsee, Costello, Weisman, & Denney, 1995; Kappas, Hess, & Scherer, 1991), and broad body movements (Duclos et al., 1989).

A 2003 incident in the city of Najaf, Iraq (Chilcote, 2003), provides a particularly vivid illustration of how collective affect recognition may be instrumental in assessing collective action tendencies and tailoring one's responses accordingly. As captured on film by an international news crew, Lieutenant Colonel Christopher Hughes, commander of a battalion known for being ruthless and feared in combat, was en route to meet with a local Imam when an apparently agitated crowd gathered, blocking the path of Hughes' battalion. It was later learned that the crowd believed Hughes and his troops were there to capture the Imam and perhaps to attack the local mosque itself. Hughes, focused on the dynamic reactions of the crowd as a whole, instructed his men to smile, kneel, and point their guns at the ground. Although this action diffused some tension, Hughes did not deem it sufficient enough, and ordered his troops to withdraw and return another day. Navigating social interactions by being attuned to collective affect may also be found in other, more everyday, situations: a singer of an indie rock band performing in a summer music festival may adjust his or her performance in real time as a function of the expressed affective reactions of the audience, rather than a single fan (cf., Pescosolido, 2002). A college professor, teaching in a large seminar, might more successfully vary the tempo of his or her lecture as a function of affective cues expressed by the class as a whole rather than those expressed by single students. Many other fruitful basic and applied research questions related to collective affect recognition can readily be generated. However, understanding such dynamics requires a method for assessing the ability of an individual—a soldier, performer, teacher, leader—to recognize patterns of collective affect.

Systematic evidence of the value of recognizing affective cues, however, has been limited to dyadic contexts. Indeed, there exists a variety of assessments that measure performance in recognizing affective cues expressed by a single individual (Matsumoto et al., 2000; Mayer, Salovey, & Caruso, 2002; Nowicki & Duke, 2001; Salovey & Grewal, 2005). Comparatively little progress has been made with regard to collective affective cues and, to our knowledge, no empirically validated approach presently exists for assessing affect recognition in collectives. Recent conceptual developments suggest that different psychological processes could underlie dyadic versus collective affect recognition abilities, and therefore shifting an individual's *emotional aperture* from focusing on individuals to collectives may yield new valuable insights (Goleman, 2013; Sanchez-Burks & Huy, 2009). That is, beyond inherent underlying similarities involved with decoding affective displays, dyadic and collective affect recognition abilities may explain unique variation and contribute to related but distinct programs of research. Building on this work, the goal of the research reported in this article was to develop a methodological approach for assessing a person's collective affect recognition ability.

Below we present the conceptual foundation for our measurement development efforts. We describe the type of perceptual processing hypothesized to underlie an individual's ability to recognize affective cues in collectives and then introduce an assessment of collective affect recognition abilities, the *Emotional Aperture Measure* (EAM), consistent with this processing style. Finally, we report evidence from three studies demonstrating that collective affect recognition entails a global, holistic processing style (Förster, 2012; Navon, 1977; Nisbett, Peng, Choi, & Norenzayan, 2001), can be measured reliably, has discriminant validity from individual affect recognition abilities, and has predictive validity above and beyond individual affect recognition.

Global Processing and Collective Affect

From the perspective of prior social perception research (Navon, 1977; Nisbett et al., 2001; Witkin, 1950), perceiving collective affect can be understood as using a global, or holistic, processing style for encoding collective affective cues. That is, perceiving collective affect entails focusing on the field (i.e., the collective) rather than on specific figures in the field (i.e., individuals). Sanchez-Burks and Huy (2009) introduced the construct *emotional aperture* (EA) to refer to this ability to shift one's focus on the affective patterns of the collective from that displayed by a single individual in the collective (also see Goleman, 2013). Emotional aperture is analogous to a camera's aperture setting that enables a photographer to bring an entire scene into focus rather than just the individual in the foreground, as well as varying the depth and width of the focus depending on the elements of the scene that the photographer wants to capture.

The ability to see the forest is distinct from the ability to see the trees. Prior studies have found that individuals typically focus either on specific local features of a scene or global, gestalt patterns, but not both at the same time (for a review see Förster, 2012). For example, a person taking a break from writing at a coffee shop may focus broadly on the general audio ambience generated by the many surrounding conversations (i.e., processing the noise globally), or narrow her attentional focus to a specific conversation (i.e., processing the audio locally). Though prior studies have demonstrated it is possible to shift attentional processing style through experimental manipulation (Förster, 2012), people tend to exhibit a relatively stable tendency to process globally or locally and these habits create individual variation in success in recognizing global patterns in a situation (Witkin & Berry, 1975).

Integrating research on global-local processing styles with research on collective affect suggests that performance in detecting patterns of collective affect reactions may not be directly inferred from performance on individual affect recognition assessments. Furthermore, taking into account the fleeting nature of affective cues, attempts to process cues displayed by individuals one by one and then simply aggregate before the cues subside naturally may be unrealistic. This further suggests that accurate recognition of collective affective reactions requires global perceptual processing. Thus, collective affect recognition performance may explain unique variation in an individual's success in liaising with collectives above and beyond his or her individual affect recognition abilities. Together, there are several promising lines of research on collective affect recognition that the EAM, introduced in this article, is intended to facilitate.

Summary and Hypotheses

We propose that emotional aperture can be understood as globally processing affective cues present in a collective of individuals. The sequence of studies reported here begin by establishing the basic construct validity of the EAM as a measure of global processing of collective affective information by comparing EAM performance of individuals primed to process information globally versus locally (Study 1). A second study examines the discriminant validity of the EAM from individual affect recognition in two ways. First, a test of the correlation between EAM performance and individual affect recognition performance shows that the two abilities are distinct. Next, we examine the relationship between performance in recognizing affective reactions of collectives of different sizes (i.e., four versus eight members) relative to performance in recognizing affective reactions of a single individual. Here we show that EAM scores in perceiving collective affect in groups of two different sizes are more closely related than either is to performance in reading individual affective cues.

A third study examines evidence for the predictive validity and utility of recognizing collective affect by focusing on a context where an individual's occupation involves leading collectives. Here, we test whether EAM performance uniquely predicts the leadership performance of managers in the eyes of their subordinates. We reasoned that abilities for decoding collective affect cues should facilitate success in responding to the collective's social-emotional needs. The findings demonstrate that EAM performance explains unique variation in leadership performance above and beyond a manager's individual affect recognition abilities.

In the next section, we describe the development of the EAM, its flexibility as a tool, and the design choices and trade-offs represented in this initial measure of collective affect recognition. We then describe three studies followed by a discussion of how the EAM and similar methodological approaches can advance multiple streams of research on collective affect.

The Emotional Aperture Measure

The primary objective of this research was to develop a valid, general assessment of individuals' ability to recognize collective affect. The Emotional Aperture Measure (EAM) reflects a series of considerations and trade-offs. In an effort to facilitate the many promising directions future research might explore, the EAM was designed to be easily adaptable to meet the unique needs of different research questions; for example, testing for differential sensitivity to specific combinations of affective reactions present in a collective. In addition, we relied on diverse stimuli (e.g., gender, culture, ethnicity) to avoid a limited focus on homogenous collectives—however, systematically varying the demographic composition of the group would be easy to accomplish within this paradigm in future research. To avoid language and cultural fluency biases common in many emotion recognition tasks (Côté & Miners, 2006; Elfenbein, 2007; Schulte, Ree, & Carretta, 2004), we limited response options to the basic dimensions of affect: the perceived prevalence of positive and negative reactions. In addition, the design of the EAM takes into account the fleeting nature of affective reactions by presenting participants with dynamic group reactions that appear only very briefly. Finally, the description of EAM below provides sufficient detail to reconstruct the EAM using alternative stimuli and to provide a basic paradigm that may be used to develop new assessments of collective affect recognition.

Stimuli

The EAM relies on facial displays as affective stimuli. Although this approach does not assess the ability to recognize affective reactions conveyed through other channels such as vocal intonation or postural gestures, the advantage of facial stimuli alone is that considerable research shows how at least a certain set of universal affective expressions map onto universal signature facial muscle movements (Darwin, 1872; Ekman & Friesen, 1976). For the EAM, we used stimuli from Beaupré and colleagues' Montreal Set of Facial Displays of Emotion (MFSDE; Beaupré, Cheung, & Hess, 2000; Beaupré & Hess, 2005). The MSFDE is a widely available set of validated facial displays from an ethnically diverse sample of men and women showing both neutral and affect-laden expressions.

To the extent social context can influence interpretations of emotional stimuli (Hess & Kleck, 1990; Russell, 1994), we focused on a single context: specifically, an office workplace. We contextualized the stimuli using Photoshop™ as follows: faces were placed on gender-matched bodies wearing professional office attire, positioned together with various office backgrounds to appear as a group of culturally diverse male and female office workers. We created groups of mixed gender and ethnicities in business attire against different office backdrops (i.e., displays of neutral, happy, anger, fear, disgust, and sadness from men and women of European, Asian and African descent). This “paper doll” technique offers an easily adaptable means of varying the group’s size, demographic composition (e.g., ethnic, gender, or cultural differences), and affective distributions (e.g., different combinations of affective expressions), as well as the context (e.g., military clothing and field background, or student attire and classroom background). The EAM also offers flexibility in using alternative validated facial displays.

To create an ecologically valid display of fleeting affective reactions, we created two-frame video clips (2000ms exposure per clip) showing various affective reactions within a four-person group. The two-frame video clip paradigm was inspired by Ekman’s Subtle Expression Training Tool and Micro-Expression Training Tool (Asla, de Paúl, & Pérez-Albéniz, 2011; Ekman, 2003; Warren, Schertler, & Bull, 2009). Each clip consisted of two frames displaying the same individuals; a first frame displaying a neutral or baseline valenced expressions followed by a second frame with a proportion of the group remaining neutral or changing to a different positive or negative expression.[1] Having some baseline expressions remain in the second frame is consistent with the reality that not every individual in a group will necessarily have or display an emotional reaction. Further, EAM stimuli are consistent with the notion that affective reactions and their expression necessarily require a change from one state to a different state (e.g., via facial movements; Parkinson, 2005; Tomkins & McCarter, 1964; Zajonc, 1998).[2] Additionally, the brevity of the two-frame video clip approach enabled us to realistically mimic affective reactions conveyed via facial muscle movements of short-lived duration (Ekman &

Friesen, 1969; Ekman, 2003). We created seventeen unique (i.e., each group was shown only once) two-frame video clips for the EAM reported here.

Instructions

The context we use consists of groups of employees working within different office environments. The assessment is presented to respondents as a measure of an individual's ability to read group emotions. Instructions state that the task involves watching short video clips of seventeen unrelated groups of employees, just prior to and just after an event happens in their organization, and reporting after each clip the proportion of positive and negative affective reactions that appeared in the group. Respondents are told to assume that the displayed affective reactions reflect employees' true feelings. Following each video clip, respondents report on the proportion of positive reactions and negative reactions seen in the group (response scale for each is: none of the group, about 25% of the group, about 50% of the group, about 75% of the group, or 100% of the group). Instructions explicitly state that not everyone will have a reaction to the event and therefore the proportions across their two responses may not add up to 100%.

The EAM focuses on positive and negative affective reactions rather than specific emotions (e.g., sadness, contempt) for two reasons. First, existing evidence documents the cultural universality of linguistic categories for "positive" and "negative" affective reactions within the lexicon of emotional descriptors (Elfenbein & Ambady, 2002; Haidt & Keltner, 1999), thereby minimizing potential language constraints in identifying affective responses. Second, reports of specific emotions have been shown to be heavily influenced by respondents' verbal intelligence and familiarity with culturally bound emotion labels (Côté & Miners, 2006; Elfenbein, 2007; Schulte et al., 2004). However, the EAM could easily be modified by researchers interested in exploring individuals' recognition abilities for discrete emotions.

(Insert Figure 1 about here)

Scoring

The correspondence between individuals' responses and the MSFDE coding for the depicted affect displays served as the criterion for accuracy. Mean accuracy was calculated by averaging accurate responses. For example, for a movie in which 25% of the group expressed positive affect and 50% of the group expressed negative affect, a respondent who estimated positive and negative affect at 25% and 75%, respectively was assigned one point for the correct answer (positive affect) and no points for the incorrect answer (negative affect). We summed the number of points across the movies (point range per movie = 0-2 points) and then transformed this score to reflect an overall percentage of correct responses (possible range = 0% to 100%). Although numerous scoring algorithms can be developed, we began with a simple one comparable to that of the widely used DANVA (Nowicki & Duke, 2001). In the discussion we identify potentially useful alternatives to address other specific research questions.

Study 1: Global Processing and the EAM

As described above, the construct of emotional aperture is hypothesized to be an instantiation of global processing of affective cues present in a collective. Thus, the EAM is proposed to test an individual's ability to focus on broad patterns of affect in a complex scene rather than on specific features within the scene (cf., Ji, Peng, & Nisbett, 2000). Thus, to the degree that people focus more on the whole, emotional aperture should improve. To test the construct validity of the EAM, we followed prior research on global processing (Förster, 2011) to examine evidence that priming global processing on an unrelated task would increase subsequent performance on the EAM.

Method

Participants and procedure. A sample of 148 European Americans (95 men, 53 women, *M*age = 29.01, *SD* = 2.34), were assigned to a global or local priming condition. After completing a baseline EAM (EAM-Time 1), participants were then presented with a series of abstract paintings (e.g., "Jackson Pollock. One: Number 31," 1950) for three minutes and instructed to try to focus on the overall painting (global prime) or specific features within the painting (local prime). Next, participants switched tasks to complete the EAM a second time (EAM-Time 2).[3]

Results

The reliability of the EAM was acceptable at Time 1 (Cronbach's $\alpha = 0.72$) and Time 2 (Cronbach's $\alpha = 0.71$). EAM-Time 1 and EAM-Time 2 performance was significantly positively correlated, $r = 0.31$, $p < 0.01$,[4] and showed an overall increase between Time 1 and Time 2 (EAM-Time 1 score: $M = 0.72$, $SD = 0.13$; EAM-Time 2: $M = 0.75$, $SD = 0.12$), $F\ (1, 146) = 4.44$, $p = 0.04$, partial $\eta^2 = .03$.

As hypothesized, a mixed design ANOVA with EAM-Time 1 and EAM-Time 2 as the repeated measure and global/local prime as between-subjects conditions showed a significant prime x time interaction, $F\ (1, 146) = 8.71$, $p < 0.01$, partial $\eta^2 = .06$. There was a significant increase in EAM scores from Time 1 ($M = 0.71$, $SD = 0.14$) to Time 2 ($M = 0.77$, $SD = 0.11$) in the global prime condition, $F\ (1, 73) = 11.71$, $p < 0.01$, partial $\eta^2 = .14$. There was no difference in EAM scores between Time 1 and 2 in the local prime condition (Time 1: $M = 0.74$, $SD = 0.12$; Time 2: $M = 0.73$, $SD = 0.13$), $F\ (1, 73) = 0.39$, $p = 0.53$. Scores at Time 1 did not differ between conditions, $F\ (1, 146) = 1.37$, $p = 0.24$, however, EAM scores were significantly higher in Time 2 in the global condition compared to the local condition, $F\ (1, 146) = 5.41$, $p = 0.02$, partial η^2 =

.04.[5]

These results provide initial support that global processing underlies the EAM and that it can be measured reliably. However, these findings do not address whether the EAM is distinct from individual affect recognition or whether these abilities generalize when perceiving larger collectives. These questions are addressed in Study 2.

Study 2: Recognizing Collective versus Individual Affective Cues

This study tests the convergent and discriminant validity of the EAM by comparing performance in recognizing patterns of affective reactions in both four-person and eight-person groups with performance in recognizing affective cues displayed by an individual. We hypothesized that accuracy in recognizing collective affective reactions across groups of different sizes would be related and more strongly correlated than either would be with performance in individual affect recognition. It was anticipated the EAM would be modestly related to individual affect recognition given underlying similarities in identifying emotional expressions. In addition, we examined evidence that EAM performance would be distinct from general intelligence.

Method

Participants, measures, and procedure. Participants were comprised of 70 university students (33 men, 37 women, *M*age = 20.19, *SD* = 1.52). Participants completed the four-person group EAM (EAM-4), an eight-person group version of the EAM (EAM-8), and the DANVA (Nowicki & Duke, 2001), a commonly used measure of individual affect recognition. Consistent with previously established indicators of general intelligence (Stanovich & West, 2008; Wood, Harms, & Vazire, 2010), participants also provided their American College Testing (ACT) (n = 36, M = 28.94, SD = 5.30, range from 1-36) and/or Scholastic Aptitude Test (SAT) scores (n =

44, $M = 1{,}945.41$, $SD = 167.49$, range from 600-2,400), as well as their current cumulative university GPA ($n = 64$, $M = 3.46$, $SD = 0.38$). Reduced sample sizes for the ACT and SAT reflect that not all students take both of these widely used standardized tests used by American colleagues to assess applicant's university readiness in English, Mathematics, and Science during the admission selection process. Additionally, participants who indicated they did not know their GPA did not report a value for that item.

Results

Consistent with our hypotheses, performance on EAM-8 ($M = 0.53$, $SD = 0.13$, Cronbach's $\alpha = 0.70$) was significantly correlated with performance on the original EAM-4 ($M = 0.67$, $SD = 0.14$, Cronbach's $\alpha = 0.70$), $r = 0.59$, $p < 0.01$. Moreover, this relationship between collective affect recognition measures was significantly stronger than the correlation between the EAM-8 and the DANVA ($M = 0.79$, $SD = 0.10$), $r = 0.33$, $p = 0.01$, Steiger's $Z = 2.07$, $p = 0.04$ and the correlation between the EAM-4 and the DANVA ($r = 0.26$, $p = 0.03$), Steiger's $Z = 2.70$, $p = 0.01$.

Further, the EAM-4 was not significantly correlated with SAT composite scores ($r = 0.10$, $p = 0.51$), ACT composite scores ($r = -0.16$, $p = 0.34$), or GPA ($r = 0.01$, $p = 0.94$), nor was the EAM-8 correlated with SAT composite scores ($r = 0.01$, $p = 0.94$), ACT composite scores ($r = -0.03$, $p = 0.85$), or cumulative GPA ($r = 0.20$, $p = 0.11$).

These patterns of correlations provide evidence that ability in recognizing patterns of collective affect generalizes from four-person groups to collectives twice that size. Moreover, the smaller and relatively modest relationships between the EAM-4 and EAM-8 on the one hand, and the DANVA on the other hand, suggest that ability in recognizing collective affective patterns is distinct from ability in recognizing individual affect. Additionally, the lack of correlation between collective affect recognition and measures of general intelligence means that, consistent with prior research on thinking styles and cognitive ability (Stanovich & West, 2008), the results suggest collective affect recognition is distinct from general intelligence.

Study 3: Recognizing Collective Affect and Interacting with Collectives

Studies 1 and 2 focused on establishing the reliability and construct validity of the EAM. In turn, Study 3 examines evidence to support the predictive validity of the EAM. That is, can an individual's ability to recognize collective affect predict productive interactions with collectives? We sought an ecologically rich context that could provide a clear criterion for effectiveness in coordinating social interactions and relationships with collectives. Given the focus of the EAM on a collective's affective reactions, we reasoned it should explain variation in a group leader's performance in terms of socially- and emotionally-attuned leadership (Bales, 1950), often referred to in organizational contexts as transformational leadership (Podsakoff, MacKenzie, & Bommer, 1996).

For a leader to be able to respond successfully to the frustrations, hopes and fears of her organization, she must first be able to read the patterns of affective cues that signal the onset and dissipation of these experiences. A leader with two organizational units, for example, that vary in their difficulties getting necessary resources but are reluctant to say so explicitly may be better able to detect this variation via the subtle affective cues present in the collective and therefore tailor her reactions to the respective units so as to appropriately address their respective needs (Elfenbein, Polzer, & Ambady, 2007; Niedenthal and Brauer, 2012). Moreover, in settings where an individual is responsible for leading large numbers of people, they may not have sufficient time to engage in dyadic, interpersonal relationships to inspire one follower at a time. Thus, the ability of leaders to decode and attend to the collective emotions, beyond individual emotions, should increase their effectiveness in leading groups of people. Specifically, we hypothesized that performance on the EAM would be a significant predictor of a leader's transformation leadership as assessed by their subordinates. Critically, we included the DANVA in this study to test the hypothesis that EAM performance predicts transformational leadership above and beyond variation explained by individual affect recognition abilities.

Method

Participants and procedure. A global sample of 91 high-ranking managers (80% male, *M*age = 32.43 years, *SD* = 6.89 years, Mean organizational tenure = 4.62 years, *SD* = 3.74 years) and their subordinates (total *n* = 858, average per participant = 9.43) participated in this study as part of a leadership development program held in Fontainebleau, France; São Paulo, Brazil; and Philadelphia, USA, hosted by a top-tier business school based in Europe.

Participants were invited to participate several weeks before the leadership program began and were provided a link that contained the study protocol. Participants completed the survey within the same one-week period. During the same period, we contacted participants' direct reports using contact information that participants provided, and requested these subordinates complete an online evaluation of their manager's leadership performance. Subordinates were assured of full anonymity in rating their manager. All participants had at least two subordinates that completed the transformational leadership evaluation. Overall, managers were rated by subordinates who had worked for them for an average of 4.46 years (*SD* = 5.03) and for the organization for an average of 10.13 years (*SD* = 9.05).

Measures and material. Participants completed the EAM (original version with 4-person groups) (Cronbach's α = .80, *M* = 0.79, *SD* = 0.08), the DANVA (Cronbach's α = 0.79; *M* = 0.82, *SD* = 0.14), and the Ten-Item Personality Inventory (TIPI) measure of extraversion (*M*

= 4.82, *SD* = 1.53; Gosling, Rentfrow, & Swann, 2003), included as a control variable given its established relation to transformational leadership found in prior studies (Ployhart, Lim, & Chan, 2001). Subordinates provided assessments of transformational leadership behavior using the widely used 22-item measure developed by Podsakoff, MacKenzie, and Bommer (1996; Cronbach's α = 0.90, *M* = 5.69, *SD* = 0.37), ICC(2) = .89, $p < .001$. We also calculated a measure of within-group agreement (rwg) among subordinates' ratings of each manager following the procedures provided by James and colleagues (James, Demaree, & Wolf, 1984). The average rwg was 0.91; we therefore aggregated subordinates' ratings for each manager in our sample.

Results

Table 1 presents complete descriptive statistics and correlations. Managers' age, gender, and organizational tenure were not significantly correlated with any variables. Nonetheless, we conducted all analyses with and without age, gender, and organizational tenure as controls. We obtained the same patterns of results regardless of whether these variables were included and thus do not discuss them further. Table 1 shows that managers' individual affect recognition ability as measured by the DANVA was modestly positively correlated with the EAM ($r = 0.28$, $p = 0.01$), replicating the pattern in Study 2. Initial analyses show the EAM was significantly positively correlated with transformational leadership behavior ($r = 0.34$, $p < 0.01$) whereas the DANVA was not ($r = 0.08$, $p = 0.48$).

(Insert Table 1 about here)

Table 2 presents regression analyses that further examine the relationship between managers' EA and their transformational leadership. After controlling for the DANVA and extraversion, the EAM was a significant positive predictor of transformational leadership behavior (Model 2: $\beta = 0.35$, $p < 0.01$); $F(3,87) = 4.00$, $p = 0.01$, change in $R^2 = 0.11$, $p < 0.01$ indicating that greater EAM performance predicted higher transformational leadership performance above and beyond individual affect recognition abilities and extraversion.

(Insert Table 2 about here)

Together, these findings reveal the importance of collective affect recognition for individuals who must effectively coordinate social interactions and relationships with collectives to achieve particular goals. Specifically, our results demonstrate the predictive validity of the EAM by showing how the ability to recognize collective affect predicts a leader's transformational leadership performance. We speculate that recognizing patterns of collective affect across subordinates provides diagnostic information about the group (e.g., feelings, beliefs, and social intentions) that can inform appropriate leader responses. Critically, our results suggest that collective affect recognition bolsters success in interacting with collectives above and beyond what is achieved solely from individual affect recognition and extraversion.

General Discussion

The findings of three studies establish the empirical validity, reliability, and utility of the EAM in assessing collective affect recognition. Study 1 establishes that performance on the EAM is enhanced when holistic processing of expressive affective cues is primed, thereby providing evidence of construct validity. Study 2 then demonstrates that performance on the EAM is comparable for collectives of varying size and is related to, but distinct from, individual affect recognition abilities and general intelligence. Finally, Study 3 provides evidence that the EAM is able to predict an individual's ability to relate successfully with collectives above and beyond his/her affect recognition ability. Together, the results from these studies provide consistent confirmatory evidence for the EAM as the first, to our knowledge, validated approach for assessing collective affect recognition abilities.

Overall, the capability to measure collective affect recognition abilities via facial expressions is an important contribution to research endeavors related to emotions in social settings. The use of diverse and validated facial stimuli in the EAM provide experimental control but also flexibility for researchers to adapt the measure to fit various specific research questions (e.g., does the gender or cultural composition of a collective influence how individuals make sense of affective cues?). In addition, incorporating neutral and expressive faces of the same individual, as available in the MSFDE database (Beaupré et al., 2000), offers an externally valid depiction of the fleeting nature of affective reactions. Similarly, the dynamic displays in the EAM account for the transient characteristics of expressions that cannot be adequately embodied by static images frequently used in emotion recognition measures (Ekman, 2003). The flexibility and ease of administration (e.g., the EAM can be completed online in less than ten minutes), provide a tool with immediate utility for research investigating myriad questions related to collective affect recognition abilities.

Limitations and Future Research

Notwithstanding the merits of the EAM, there are limitations that warrant mention. First, the EAM assesses collective affect recognition abilities based only on facial cues. Readily-available validated facial stimuli (FACS-coded faces from Beaupré et al., 2000; Beaupré & Hess, 2005) provided an independent criterion to determine recognition accuracy for the affect displayed in each video clip. Nonetheless, research has shown the utility of other non-verbal signals such as auditory (Coval & Shumway, 2001) and postural cues (Aviezer, Trope, & Todorov, 2012). For example, Coval and Shumway's (2001) examination of a Chicago futures trading pit found that an increase of the sound level in the pit was associated with subsequent increases in price volatility. Also, Aviezer and colleagues' (2012) powerful empirical findings about the importance of body movements, above and beyond facial cues, for discerning intense emotions suggest that the face may not be the only or best source for recognizing collective affect in certain situations (e.g., mobs, concert crowds, or a panel of jury members; Ekman, Friesen, O'Sullivan, & Scherer, 1980). Thus, there is an opportunity to develop complementary approaches to collective affect recognition that make use of additional channels of information. Moreover, it may be fruitful to develop stimuli that show complete transitions from one neutral or valenced display to the next expression. Although the results of Study 3 suggest the highly simplified two-frame expressions used in the EAM provide insights about individual's social functioning in real world environments, the use of movies that show the expression as it unfolds may provide a more ecologically valid set of stimuli.

A second limitation is that the EAM focuses on individuals' abilities to recognize and distinguish between positively and negatively valenced expressions rather than specific emotions. In light of prior research showing how specific emotion recognition assessments requiring participants to use specific emotion labels are highly correlated with verbal intelligence abilities and cultural familiarity (Côté & Miners, 2006; Elfenbein & Ambady, 2002; Schulte et al., 2004), the EAM focuses on simple "positive" and "negative" categories of emotion that appear within the lexicon of emotional descriptors in all cultures (Elfenbein & Ambady, 2002; Haidt & Keltner, 1999) and reduce reliance on idiosyncrasies of specific emotion labels. Of course, the EAM can be readily adapted to examine the perception of specific emotions where participant samples share a common language and are relatively equivalent in verbal intelligence. This is a likely future direction considering research that has revealed how recognizing specific emotions significantly alters how individuals react to others. For example, Van Kleef and colleagues (Van Kleef, De Dreu, & Manstead, 2006) demonstrated that negotiators who interact with "partners" (i.e., a computer manipulation) verbally expressing supplicative negative emotions (worry and disappointment) concede more than negotiators who interact with partners expressing appeasing negative emotions (guilt and regret). Future research investigating specific emotion recognition in leadership contexts might prove especially fruitful. In the workplace, for example, group leaders may more effectively coordinate their interactions with subordinates when they can more accurately recognize and distinguish between those expressing fear and those expressing anger – both negatively valenced emotions carrying distinct implications for subordinates' action tendencies at work. In this regard, the EAM may prove useful as researchers can adapt the affective stimuli to empirically assess such discrete emotions.

Finally, while we focused on overall accuracy, a complementary focus would involve exploration of errors. Individuals can make several different errors in reading collective affect, such as over- and under-estimations of different affective reactions. For example, some individuals may overestimate while others underestimate the prevalence of positive reactions. While assessing different errors was beyond the scope of this research, future research might explore the material effects of errors on relational outcomes in collectives. For instance, research emphasizing the adaptive functions of positive emotion (e.g., Fredrickson, 1998) might predict that individuals who tend to perceive more positive (or less negative) reactions in a collective than actually exists may be more upbeat and display more authentic positive emotions in their group, and this expressed positivity could inspire and energize members. However, building effective relationships in groups also requires being sensitive to others' needs and challenges. Overestimating positive reactions in a group may lead to social interactions that convey perceptions of the individual as self-centered and unconcerned with others' problems, perhaps leaving group members feeling misunderstood or marginalized. Future work is needed to unpack the interpersonal consequences of different errors and the impact on effective group functioning. The EAM could be instrumental in this regard; indeed, the scoring method is easily adaptable to go beyond overall accuracy to explore such types of errors in collective affect recognition (i.e., tendencies to over- or under-estimate positive and negative affect).

Conclusion

The emotional aperture measure introduced in this article has five noteworthy features. It (1) is adaptable to meet the needs of various research questions, (2) relies on independently validated stimuli, (3) incorporates diverse stimuli to minimize gender, culture, or other demographic biases, (4) adequately represents fleeting affective reactions likely to be observed in social interactions, and (5) minimizes constraints imposed by language-specific emotional terms. Recognizing the affective composition of a collective is, arguably, a prerequisite to productive group-based interactions with broad implications for both group leaders and members. In fact, how group leaders assess collective affect may even involve life and death consequences in certain circumstances, such as peacekeeping personnel facing hostile crowds. Many other instances involving collective affect can be highly consequential to individuals' professional careers, such as teachers facing groups of new students, political leaders communicating with groups of constituents, or corporate managers introducing major disruptive change in a large organization. Deeper insight into collective affect recognition and, critically, how this ability equips individuals to coordinate their social interactions strategically promises to generate new insights into group decision-making and performance and leadership effectiveness. The EAM offers a valuable tool for bringing such conceptual and practical inquires to fruition.

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Tables

Table 1.

Means, Standard Deviations, and Correlations

	M	*SD*	1	2	3	4	5	6
1. Gender (1 = male)	1.20	.40						
2. Age	32.43	6.89	-.10					
3. Organizational tenure (years)	4.62	3.74	-.10	.03				
4. Extraversion	4.82[a]	1.53	.04	.001	-.09			
5. Individual emotion recognition ability	.82[b]	.14	.20	.01	-.07	-.07		
6. Emotional aperture ability (EAM)	.79[b]	.08	.08	.15	-.07	.10	.28*	
7. Transformational leadership behavior	5.69[c]	.37	.09	-.05	-.03	-.06	.08	.34**

$n = 91$

*$p < .01$, **$p < .001$; [a] 1-5 response scale; [b] Scored as a proportion (range = 0 to 1.00); [c] 1-7 response scale

Table 2.

Regression Analyses Assessing Effect of Collective Emotion Recognition Ability on Transformational Leadership

Dependent variable: Transformational Leadership Behavior	Model 1	Model 2	Model 3
Independent variables:			
Extraversion	-0.05(0.03)	-0.09(0.03)	-0.15(0.03)
Individual emotion recognition ability	0.07(0.29)	-0.03(0.29)	-0.04(0.29)
Emotional aperture ability		0.35(0.47)***	0.36(0.47)***
Emotional aperture ability x Extraversion			0.12(0.30)
Emotional aperture ability x Individual emotion recognition ability			0.01(0.34)
Adjusted R^2	0.01	0.09	0.09
R^2 Change		0.11***	0.01

Values listed are standardized beta coefficients; standard errors are in parentheses.

*$p < .05$, **$p < .01$, ***$p < .001$

Footnotes

1. EAM stimuli and programming scripts are available for non-commercial research purposes at *www.tinyurl.com/emotional-aperture.*
2. Another advantage of the two-frame video clip approach includes minimizing artifactual errors in collective affect recognition that could occur when observers are not first provided with a baseline expression (e.g, neutral expression or emotional expression different from that displayed in the second frame). For example, consider a professional cricket coach who works outdoors and has developed deep vertical lines on his forehead as a consequence of squinting in the glaring sun for hours each day. Without considering a facial baseline for this particular individual, observers may mistake him for feeling negative even when he is feeling neutral or mildly pleasant (Ekman & Friesen, 1976). The first frame of the movie clips provides this critical baseline expression.
3. The authors affirm that sample size, any data exclusions, manipulations, and measures are each discussed as relevant for the studies in this research.
4. To provide a more direct assessment of the EAMs test-retest reliability, an independent sample of 72 participants (25 men, 47 women, M_{age} = 20.91, SD = 3.33) completed the EAM twice with two days between the first and second assessment. The test-retest EAM scores were significantly positively correlated, r (72) = 0.62, $p < 0.01$. A repeated measures ANOVA further showed a significant increase in EAM scores between the first assessment (M = .84, SD = 0.11) and the second assessment (M = .89, SD = 0.11) F (1,71) = 18.52, $p <$ 0.01, partial η^2 = .21.
5. In a separate study using a similar experimental design as Study 1 we examined whether individual emotion recognition would vary as a function of the global/local prime by asking

participants (n = 99) to complete the DANVA before and after completing either the global or local processing prime. A mixed design ANOVA with DANVA-Time 1 and DANVA-Time 2 as the repeated measure and global/local prime as the between-subjects condition showed a prime x time interaction, F (1, 97) = 3.98, p = 0.05. There was no evidence for a significant change in DANVA score from Time 1 to Time 2 as a result of the local prime, t (47) = 0.47, p = 0.64. However, there was a significant decrease in DANVA score from Time 1 to Time 2 as a result of the global prime, t (50) = 2.30, p = 0.03, Cohen's d = 0.25. These results further highlight the implications of a global processing style for collective (helpful) vs. individual (harmful) emotion recognition (for an insightful review of how different processing styles shape affective recognition versus facial identification see Calder, Young, Keane, & Dean, 2000, and Ellison & Massaro, 1997).

Figure Captions

Figure 1. Examples of two-frame EAM clips with four-person groups (Panel A) and eight-person groups (Panel B). Faces used with permission from the MFSDE (Beaupré, M.G, & Hess, U., 2005). Backgrounds, bodies, faces and demographic composition can be tailored to address unique research questions.

Figure 1. Examples of two-frame EAM clips with four-person groups (Panel A) and eight-person groups (Panel B). Faces used with permission from the MFSDE (Beaupré, M.G, & Hess, U., 2005). Backgrounds, bodies, faces and demographic composition can be tailored to address unique research questions.
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