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Profound Individual Differences in Contextualized Emotion Perception

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Emotion perception is a fundamental aspect of our lives because others' emotions may provide important information about their reactions, attitudes, intentions, and behavior. Following the seminal work of Ekman, much of the research on emotion perception has focused on facial expressions. Recent evidence suggests, however, that facial expressions may be more ambiguous than previously assumed and that context also plays an important role in deciphering the emotional states of others. Here, we adopt a novel approach, breaking down the means and documenting a robust trait in emotion perception. In six experiments with 671 participants, we find evidence for striking individual differences in emotion perception, with different people presenting profound differences in weighting the face versus the extrafacial context. Importantly, these differences are stable over time, stimuli, and paradigms. Our data show that individuals are interpreting identical emotional displays as communicating different emotions. Implications of these robust differences are discussed.

Public Significance Statement
We report striking individual differences in the effects of context when perceiving emotions from faces. While some individuals rely almost exclusively on information communicated by the facial expressions ("face-centric"), others rely to the same extent on extrafacial contextual information ("context-centric"), and most are in between. These differences are highly stable across time and paradigms, indicating that individuals are interpreting identical emotional displays as communicating different emotions.

Keywords: emotion perception, individual differences, context effects, facial expressions

Supplemental materials: https://doi.org/10.1037/xge0001692.supp

As social animals, understanding the emotions of people around us may often be crucial, as these provide important information about one's feelings, attitudes, intentions, and future behavior (Chanes et al., 2018). Reflecting the centrality of emotion perception, much scientific effort has been dedicated to examining how humans understand the emotional cues and signals of others, with a strong emphasis on the role of facial expressions. Here, we develop a new approach and discover a novel characteristic that has thus far gone unacknowledged. Some of us rely more on facial expressions, whereas others rely more on the context, broadly defined. This robust tendency, we show, is highly reliable within a task, between different paradigms, and across different times. Its effects, we argue, are likely to increase Rashomons: situations in which individuals interpret the same data, events, or phenomena in different ways, creating different versions of the truth. We show that identical emotional displays are perceived as communicating entirely different emotions to different people.

While Darwin's (1872) classic treatise on the expression of emotion included descriptions of both facial and body reactions, subsequent work inspired by him focused more on the face (Tomkins, 1962), formulating the dominant *basic emotion theory* (Cowen et al., 2021; Ekman, 1992). In this highly influential account, facial expressions universally and reliably signal specific emotions, and while extrafacial contextual signals are acknowledged as informative (Keltner et al., 2019), they are not viewed as essential for recognizing specific emotions from the face (Cowen & Keltner, 2020; Ekman &

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The data are available on the Open Science Framework at https://osf.io/3np9m/?view_only=1f4ad27593b94e748b385f896e9206aa. Portions of these data were presented at the 2021 Society for Affective Science virtual meeting and the 2021 Psychologie und Gehirn annual virtual meeting.

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Friesen, 1967). This approach has recently gained support from large-scale studies of naturalistic videos demonstrating that deep neural networks find regularities across world regions in facial behavior occurring in specific situations (Cowen et al., 2021). Although exceptions exist (e.g., trunk and hand gestures have been implicated in the expression of pride), generally speaking, access to one's facial expressions alone is assumed to offer a fairly reliable proxy to felt emotions (Cowen et al., 2021). With many thousands of studies focusing on isolated face expressions from standardized sets (Ekman & Friesen, 1976; Tottenham et al., 2009; van der Schalk et al., 2011), one cannot overestimate the effect that this view has had on the science of emotion perception, on technological applications for emotion recognition (Martinez & Valstar, 2016), and on popular culture more generally (Grill & Andalibi, 2022; Karstedt, 2002; Rivera et al., 2015).

In recent decades, however, alternative accounts of *Constructed Emotion* and *Behavioral Ecology* emphasize the importance of contextual information surrounding the face (Aviezer et al., 2008; Barrett, 2022; Crivelli & Fridlund, 2018; Gendron et al., 2013). According to these accounts, real-life facial displays may lack specificity (Barrett et al., 2019) and are more diverse (Fernández-Dols & Crivelli, 2013) and ambiguous (Aviezer et al., 2012, 2015) than previously assumed. Even if humans produce some consistent facial behavior across situations (Cowen et al., 2021), the interpretation of these movements by human perceivers may be ambiguous, varying greatly across individuals and cultures (Barrett et al., 2019; Crivelli et al., 2016; Gendron et al., 2018; Jack et al., 2012). In these views, then, nonfacial contextual channels of information do not merely tweak emotion perception; rather, they serve a critical role in the process (Aviezer et al., 2017; Barrett, 2022). The debate between these two approaches has considerably advanced the field and yielded much knowledge about the cognitive (Calder & Young, 2005; Lindquist & Gendron, 2013) and neural (Fusar-Poli et al., 2009; Vytal & Hamann, 2010) mechanisms underlying emotion perception.

Here, we suggest an essential factor has been mostly disregarded in the field: when studying the group means we are in fact masking crucial individual differences. We develop a new approach examining individual differences in the tendency to rely on face versus context. For some of us, we show, emotion signals are mainly found in the context. For others, mainly in the face, and still others are in between. Thus, the significance of signals differs between individuals. Two people placed in the very same situation, at the very same time, are likely to end up with a sharply distinct understanding of the situation. Individual differences in the perception of isolated facial expressions have been studied over the years (Hamann & Canli, 2004), and such variability has recently been shown to arise from differences in the representations people maintain for each facial emotion (Binetti et al., 2022). However, humans rarely encounter isolated heads floating in space. Therefore, the possibility that humans systematically differ in the way they prioritize the face versus context may have far-reaching consequences for real-life emotion perception.

A word about terminology: Although emotional reactions comprise a multitude of signals portrayed across modalities, because of the historical dominance of the face-based view, extrafacial sources of information are often referred to as "context." For example, researchers have distinguished between sources of face contextualization that are intratarget (e.g., vocalizations and verbal narratives, body postures), extratarget (e.g., scene information, other people, as well as objects and paraphernalia), and interperceiver (e.g., mood, culture, neurological disease; Wieser & Brosch, 2012). Defining "context" is notoriously difficult, and our current conceptualization is arbitrarily crude (for a recent comprehensive review, see Barrett, 2022). Yet, for the current purposes, we adopt it and contrast face versus context-based emotion perception, where the latter includes all extrafacial signals. To emphasize our working definition, in most experiments we describe, participants were explicitly asked to respond to the face—thus highlighting that all other information (e.g., bodies, scenes, vocalizations, and paraphernalia) is the context.

In a series of six experiments with 671 participants, we showed participants contextualized facial expressions of emotion and examined whether perceivers systematically differ in their tendency to rely on different sources of information: facial expression versus context. Context was operationalized as the immediate extrafacial signals evident in the body language or surrounding information. We first explored whether individual differences in perception of stereotypical contextualized facial expressions exist and, if so, whether these are stable over time (Experiment 1). In Experiment 2, we examine one possible cause of this newly documented trait: perceptual processing style. We then tested dynamic audio–visual stimuli, broadening the scope by examining whether individual differences generalize to cross-modal contexts (Experiment 3 and 4). Importantly, after establishing these individual differences, we expanded to more ecological settings. Experiment 5 tested whether similar effects arise when presenting participants with open-ended impressions, a process arguably closer to everyday emotion perception. Finally, in Experiment 6, we depart from the well-defined instructed stereotypical expressions and test individual differences with real-life emotional displays.

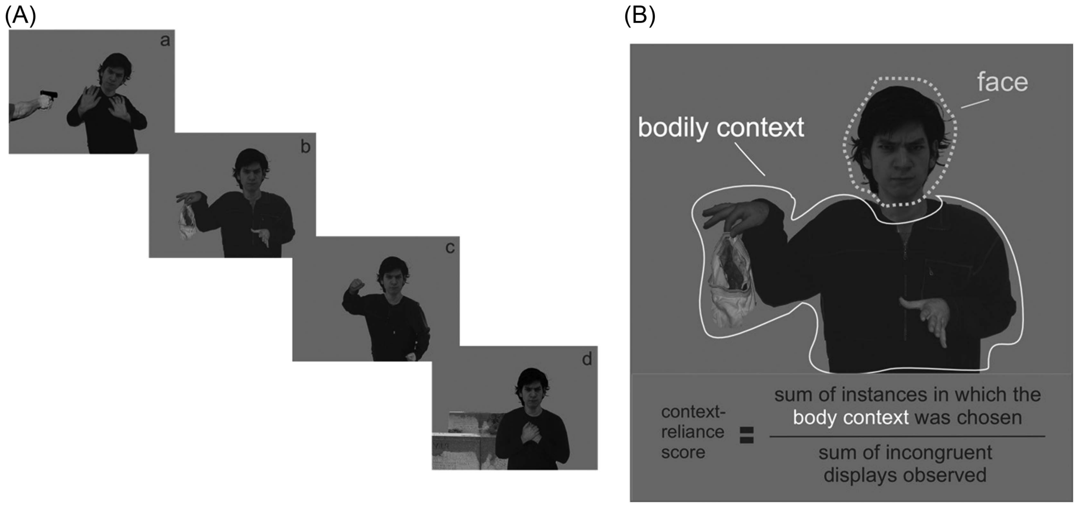
Experiment 1

Experiment 1 tested whether a face-context perceptual variation exists among different individuals and, if so, whether it is stable over time. Participants were asked to categorize stereotypical emotional facial expressions on Day 1 and then again 3–7 days later. Critically, facial expressions were combined with either emotionally congruent or incongruent bodily scene contexts (Figure 1A). Body gestures have been found to facilitate and enhance accuracy when congruent (Abramson et al., 2017; Meeren et al., 2005; Shields et al., 2012) and to shift categorizations when incongruent with the face category (Aviezer et al., 2008). The extrafacial context was made explicitly task-irrelevant by asking participants to choose the emotion that best fit the face.

Leaning on historical accounts stemming from cross-cultural research, we hypothesized that individuals portraying a context-dependent tendency in perception might be processing emotional signals in what was termed as a holistic fashion in contrast to the analytical view that could potentially characterize individuals with a face-centric tendency (Masuda & Nisbett, 2001; Nisbett & Masuda, 2003). Therefore, participants also completed the "Analysis Holism Questionnaire" (AHS), a 24-item scale measuring analytic versus holistic thinking tendency (Choi & Koo, 2007).

The protocol for this and all following experiments was approved by the Institutional Review Board of the Psychology Department of

Figure 1
(A) Examples of Stimuli (B) Context-Reliance Score Calculation Visualization



Note. (A) Examples of stimuli used in Experiment 1 and following experiments, stereotypical facial expressions on incongruent bodily contexts. Exemplars included combinations of four emotion categories (anger, fear, sadness, and disgust). The examples show an angry facial expression placed on a context conveying (a) fear, (b) disgust, (c) anger, and (d) sadness. (B) Visualization and calculation of the context-reliance score, the individual's tendency to rely on the context category. The faces are used with permission from ADFES, and the body images are used with permission from a private collection of Hillel Aviezer. ADFES = Amsterdam Dynamic Facial Expression Set.

the Hebrew University of Jerusalem. Informed consent was obtained from all participants.

Method

Transparency and Openness

Within the Method section of this and all of the following experiments, we report how we determined sample sizes, data exclusions, manipulations, and measures. All data and research materials are available on the Open Science Framework (https://osf.io/3np9m/?view_only=1f4ad27593b94e748b385f896e9206aa; Ensenberg et al., 2024). Data were analyzed using R (R Core Team, 2021).

Participants

One hundred and one English-speaking participants (61 participants reported their gender as female, 40 as male) aged 21–82 years ($M = 53$ years, $SD = 16.8$) participated in a Qualtrics survey, recruited through the software and online survey platform (Qualtrics, Provo, Utah). Participants reported their gender in a multiple-choice format question choosing between the options of female, male, or other. Participants were paid an amount of $4 and $5 for their participation in the first and second surveys, accordingly. Sample size was determined a priori when the minimal N of 67 was calculated using G*Power, based on analysis of previous data (Aviezer et al., 2017) to yield a power of over 80% for any effect size greater than Cohen's $d = 0.3$ assuming an α of .05. Due to higher dropout rates in online studies, we aimed for a larger number of participants and data collection was terminated when this number was reached. An initial pool of 198 participants participated in the first of two sessions, and 101 of them returned and participated in the second session. These composed our sample.

Materials

The contextualized facial expressions set presented to participants included 164 images (82 in each session) of actors (all men) portraying sad, fearful, angry, or disgusted facial expressions. Faces were paired with a bodily context portraying one of the above emotions. Targets were models photographed from the waist up, portraying body language and gestures alongside object manipulations matching the above emotion categories. The face–body combinations were either emotionally congruent or incongruent. Face stimuli included 10 different identities, five from Ekman and Friesen's (1978) set and five from the Amsterdam Dynamic Facial Expression Set (ADFES; van der Schalk et al., 2011). Four bodily contexts were obtained from Aviezer et al. (2008; see Figure 1A).

Participants were also presented with isolated presentations of all facial presentations and contextual bodily scenes used. Each participant completed the AHS, a 24-item scale measuring analytic versus holistic thinking tendency (Choi & Koo, 2007), and the "Balanced Emotional Empathy Scale" (BEES), a 30-item scale that is intended to measure one's tendency to feel and vicariously experience the emotional experiences of others (Mehrabian, 2000).

Procedure and Design

The experiment included two sessions, taking place 2–7 days apart. In the first session, participants were presented with 82 congruent and incongruent images from the "Faces in Context Set" described above. Participants were instructed to choose the emotion that best fits the presented face. A forced-choice response format was used with four options: fear, sadness, disgust, and anger. To ensure participants understood what was expected of them and would not be misled to intentionally answer by the context category, they were explicitly told that faces could either be congruent or incongruent with the rest of the image, but that responses were to be given based on the face alone.

In the second session, participants were presented with the other 82 images of the "Faces in Context Set" as described above. Overall, across the two sessions, each participant categorized all 164 images that were evenly divided in a semirandom order between the two sessions. Images were presented once, with no repetitions. Within each session, the images appeared in random order with no time limit. Both images and the emotion labels appeared on screen until a response was made.

After completing the above, participants were also asked to complete an emotion categorization task of all isolated facial expressions and isolated bodily contexts. Using a forced-choice manipulation, participants were asked to choose the emotion that best fits the presented face or context, accordingly. The four categories presented were as follows: fear, sadness, anger, and disgust. Last, participants completed the AHS and BEES questionnaires.

Analysis

Only participants who fully completed the two sessions were included in the analysis. Incongruent stimuli in the first and second sessions served for computing the "context-reliance score." Each participant received a score between 0 and 1, reflecting the extent to which she relied on the context category in incongruent trials (rather than the face category). The score was calculated as follows: (total number of displays in which a participant chose the contextual bodily scene category) ÷ (total number of incongruent displays observed). This score reflects individual differences in the susceptibility to contextual signals; the higher the score, the more reliant are participants' judgments on the context (Figure 1B). The score was computed twice, for each session separately, and then correlated to test for stability.

An accuracy score was computed for each participant, counting the percentage of trials in which the correct category was chosen in the isolated expressions task. These were then correlated with the mean scores of the individual's tendency to rely on context. This calculation allowed examination of the possible link between poor performance when reading emotion from facial expressions and strong reliance on the context.

Both questionnaires were scored according to their manuals; higher scores in the BEES represent higher levels of emotional empathy, while in the AHS, the higher the score, the more holistic the orientation is observed to be.

Data for this and all following studies are available at https://osf.io/3np9m/?view_only=1f4ad27593b94e748b385f896e9206aa.

Results

Context-reliance scores varied considerably, as can be seen in Figure 2A. Test–retest reliability was evidenced in a particularly strong correlation, $r = 0.84$, $p < .001$ (Figure 2B). Thus, participants demonstrated highly stable individual profiles, relying on the contextual information (or the facial expression) to a similar extent across experimental sessions. These were not found to relate to age or gender.

Attempting to characterize the individual differences, participants also completed two questionnaires. The Analysis Holism Scale (AHS; Choi & Koo, 2007) and the BEES (Mehrabian, 2000). Contrary to our hypotheses, no correlations were found ($r = 0.02$, *n.s.*; $r = 0.07$, *n.s.*).[1]

Experiment 1 revealed striking individual differences in emotion perception: We find a continuum of context-reliance. While some participants are overwhelmingly "face-centric," practically ignoring the context, others are strongly "context-centric," altering their face categorization by task-irrelevant sources of information. The remainder are located in the middle of this continuum. Critically, strong correlations were found between the performance of participants across the two sessions, suggesting this tendency is a stable characteristic. These differences were not found to relate to the basic ability of correctly categorizing emotional facial expressions, emotional empathic abilities, or tendencies for analytic or holistic thinking.

Experiment 2

To test if the robust individual differences we found are mediated by a general perceptual processing style, in Experiment 2, we adapted a global–local task. We hypothesized that "context-centric" individuals are characterized by a global processing bias, attending to the bigger picture or "seeing the forest," while "face-centric" participants are characterized by a local processing bias or "seeing the trees." Following Weinbach and Henik (2011), participants were presented with a global arrow made up of smaller local arrows and were requested to attend to one dimension and ignore the other (see Figure 3A). We tested both global/local tendencies and interference rates (i.e., the cost that the incongruent global arrow causes when asked to attend to the local arrows and vice versa) and then correlated these with the context-reliance emotion perception measure. This experiment was preregistered prior to data collection. Procedures, sample size, and exclusion criteria were specified at https://aspredicted.org/GYW_TDN.

Method

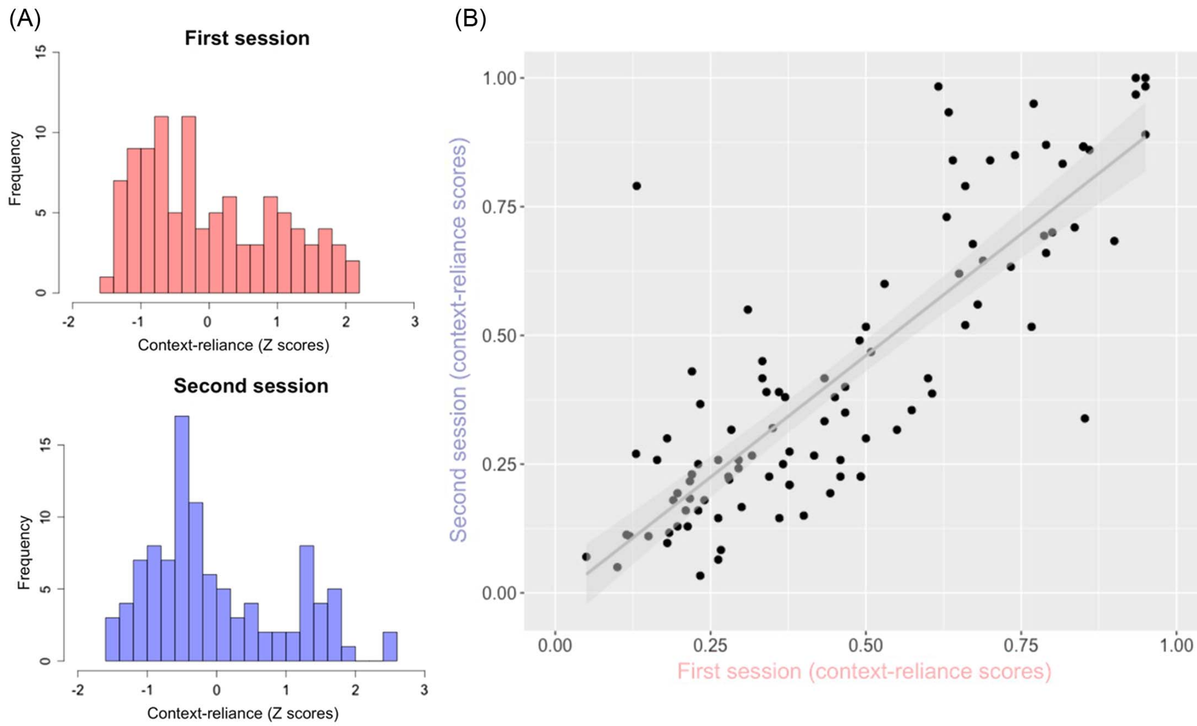
Participants

A total of 195 individuals (93 reported their gender as females, 102 as males) aged 18–60 years ($M = 35.45$ years, $SD = 12.25$) were recruited through Prolific (https://www.prolific.co). Participants reported their gender answering a multiple-choice format question choosing between male, female, and other. All reported English to be at mother tongue level. Participants gave their informed consent before beginning the experiment and were paid an amount of \$3.3 for their participation. Sample size was determined a priori; the minimal amount was calculated using G*Power to yield a power of over 80% for any effect size greater than 0.2 assuming an α of .05. Data collection was terminated once this number was reached.

[1] Participants also categorized isolated facial expressions, hypothesizing a possible relation might exist between individual context-reliance scores and accuracy levels in perception of isolated faces. No correlation was found ($r = -0.151$, *n.s.*).

Figure 2

(A) Distributions of Context-Reliance Scores (B) Consistency of Score Over Sessions



Note. (A) Distributions of the context-reliance scores in the first and second sessions in Experiment 1. (B) Consistency of context-reliance scores in the first and second sessions in Experiment 1 plotted together. See the online article for the color version of this figure.

A total of 38 participants were dropped from the analysis; see analysis for details.

Materials

The experiment was built with Gorilla Experiment Builder (https://www.gorilla.sc) to create and host the experiment (Anwyl-Irvine et al., 2018). Participants were presented with 64 images from the contextualized facial expressions set described in Experiment 1. They were then presented with a global–local processing task. In this task, inspired by Weinbach and Henik (2011), a large black arrow comprised of smaller black arrows is presented on a gray background (see Figure 3). One arrow was presented on each trial for 1,500 ms. The large arrow as well as the small arrows could point either right or left. In each trial, the large and small arrows were either congruent or incongruent. In the "Global Block," participants were presented with 100 trials, half congruent and half incongruent. They were asked to state whether the large arrow is pointing left or right, while disregarding the smaller arrows. In the "Local Block," participants were once again presented with 100 trials, half congruent and half incongruent. This time, they were asked to state whether the small arrows are pointing left or right, while disregarding the large arrow.

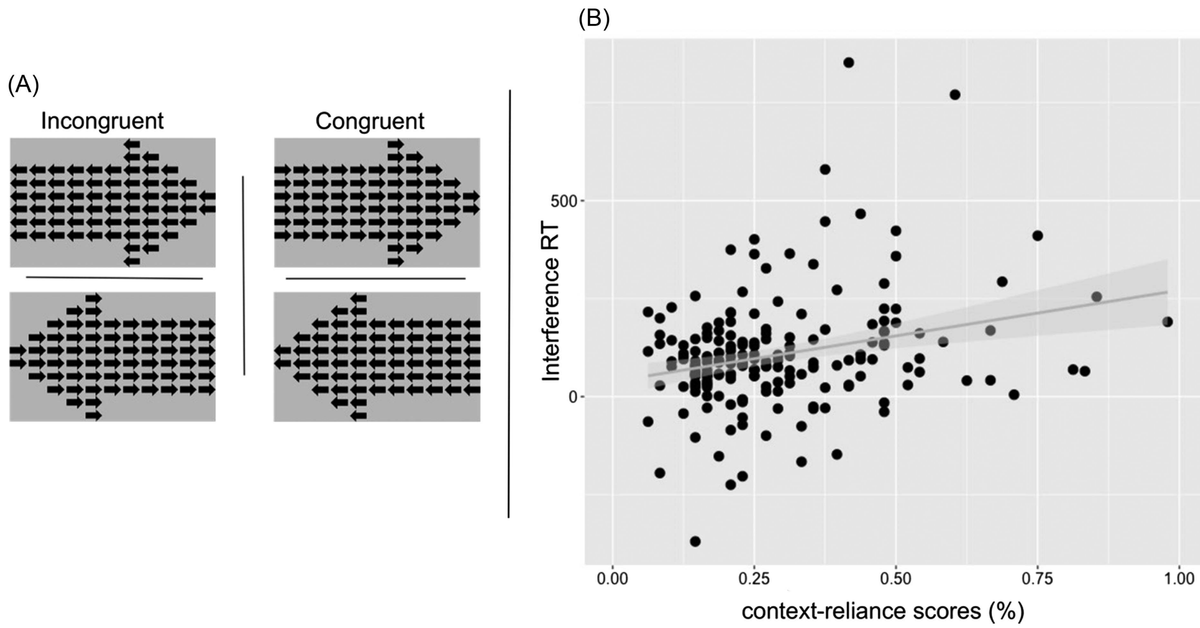
Procedure and Design

Participants completed all experimental blocks; the first presented them with 64 images of faces in context, using the forced-choice format, asking them to choose the emotion that best fits the presented face (see the methods of Experiment 1 for details). In the second block, participants were presented with the "attend global" block. Here, participants first read a thorough explanation regarding the task and underwent four practice trials in which they received feedback. Then, they were presented with 100 randomized trials of 50 congruent and 50 incongruent displays. Participants were asked to press the letter "z" on the keyboard if the large arrow is pointing left and the letter "m" on the keyboard if the large arrow is pointing right. A 2,500-ms fixation cross appeared between trials. Participants were encouraged to respond as quickly and as accurately as possible. The third block presented similar stimuli but was introduced as the "attend local block." Participants were again given a thorough explanation and underwent practice trials to which they received feedback. Then, they were presented with an identical composition of displays, except that this time they were asked to attend to the small arrows. Participants were encouraged to respond as quickly and as accurately as possible.

Analysis

In the emotion recognition task, accuracy was first calculated based on congruent instances only. The number of correct categorizations (e.g., choosing "anger" when presented with an angry face placed on an angry bodily context) composed each individual's accuracy score. Twenty-three participants were dropped from analysis due to low accuracy, scoring below 75% on congruent

Figure 3
(A) Stimuli Used (B) Correlations Between Context Reliance Scores and a Combined Measure of Global and Local Interference



Note. (A) The stimuli used in Experiment 2; in a congruent trial, the large and small arrows point to the same direction, while in an incongruent trial, the arrows point in opposite directions. (B) Plot of the correlations between the context-reliance scores and a combined measure of both global and local interference. Adapted from a paper "Phasic Alertness Can Modulate Executive Control by Enhancing Global Processing of Visual Stimuli," by N. Weinbach and A. Henik, 2011, *Cognition*, *121*(3), pp. 454–458 (https://doi.org/10.1016/j.cognition.2011.08.010). Copyright 2011 by Elsevier. Adapted with permission. RT = reaction time.

trials. Individual's context-reliance scores based on incongruent trials were then calculated in a similar manner to the previous studies described above. Looking at the global–local tasks, participants with mean reaction times (RTs) of higher or lower than 2.5 *SD*s from the mean were dropped from analysis. Similarly, subjects scoring lower than 2.5 *SD*s below the mean accuracy were also dropped from analysis. All in all, the above accumulated to 15 more participants who were not included in the following analysis.

Results

General global/local tendencies did not correlate with context-reliance scores ($r = -0.017$, *n.s.*; see Supplemental Material for the full analysis). Interestingly, interference in the global/local arrow task weakly correlated with the context-reliance tendency. Global interference was measured in the "attend local block" as mean RT in the incongruent condition minus the mean RT in the congruent condition. Local interference was calculated similarly based on the "attend global block." Context-reliance scores correlated both with the global ($r = 0.19$, $p < .01$) and local interference ($r = 0.19$, $p < .01$). As these associations were not predicted, we treat them cautiously. They may suggest that the level of susceptibility to context is weakly related to the interference itself, rather than its global–local nature (see Figure 3B). Individuals tending to rely on the context might be processing stimuli holistically and therefore are more affected by the interference.

Experiment 3

In order to broaden the scope of this novel trait-like tendency, in Experiment 3, we tested whether the observed individual differences hold when presenting participants with dynamic facial expressions contextualized in a cross-modal manner. Stemming from the Goodenough–Tinker paradigm, based on previous research (Malka et al., 2024), we composed a new set of contextualized dynamic stimuli. Dynamic emotional facial expressions from the ADFES (23) were coupled with spoken sentences conveying emotional situations of the same or different emotional category (see Figure 4A for examples). Thirty-seven participants were asked to categorize the emotion expressed by the face. As in Experiment 1, we used a forced-choice contextualized emotion categorization task to measure the individual level of the face versus context preference (see Figure 1). We hypothesized that the context-reliance measure, computed over static pictures, would correlate with subjects' performance in the audio–visual dynamic stimuli task.

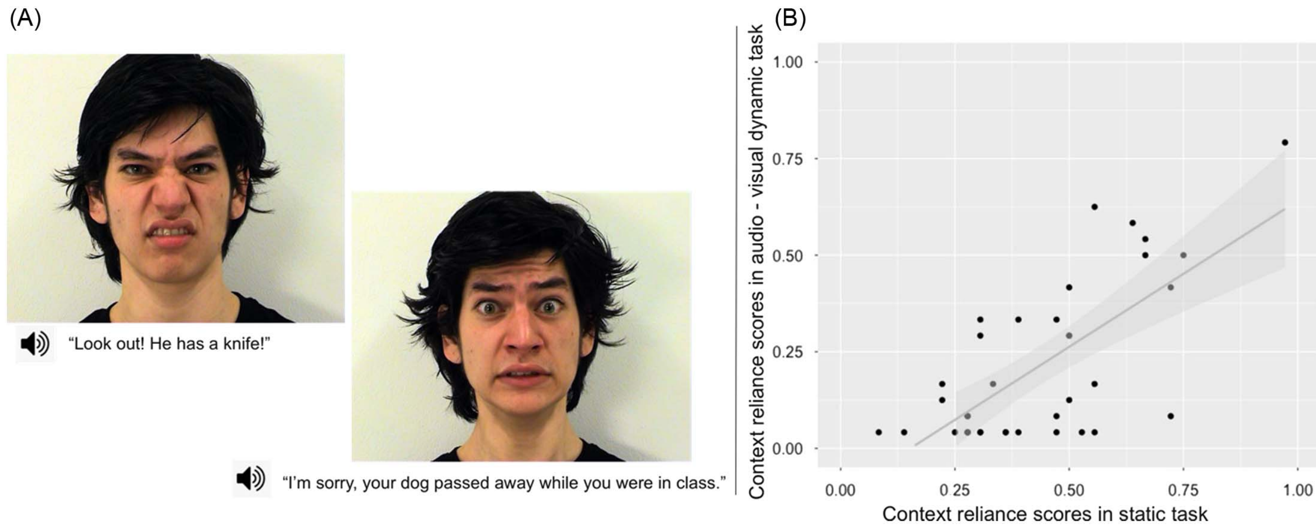
Method

Participants

Participants were 37 individuals (19 participants reported their gender as females, 18 as males) aged 18–57 years (M = 35.65 years, SD = 12.14); all reported Hebrew to be their mother

Figure 4

(A) Examples of Stimuli (B) Context Reliance Scores in the Dynamic Audio-Visual and Static Tasks



Note. (A) Examples of the incongruent stimuli presented in Experiment 3. A male fearful facial expression combined with a sentence validated to convey a sad situation and a male disgusted facial expression together with a sentence validated to convey a fear-inducing situation. (B) Context-reliance scores in the dynamic audio–visual task and the static forced-choice task plotted together. The faces are used with permission from ADFES. ADFES = Amsterdam Dynamic Facial Expression Set. See the online article for the color version of this figure.

tongue and had normal or corrected-to-normal vision and hearing. Participants reported their gender answering a multiple-choice format question choosing between male, female, and other. Participants were recruited through "Pannel4All," an Israeli online survey platform. Participants gave their informed consent before beginning the experiment and were paid an amount of $3.5 for their participation. Sample size was determined a priori based on the previous studies described above, when the minimal amount of 29 was calculated using G*Power to yield a power of over 80% for any effect size greater than 0.5 assuming an α of .05. Due to high dropout rates in online studies, we aimed for a slightly higher number of participants and data collection was terminated once this number was reached. A total of 16 participants were excluded from analysis due to failure to stand within the disqualifying criteria: either not answering enough catch questions correctly or presenting a low accuracy level. See the Analysis section for details.

Materials

The experiment was run using the Qualtrics software (Qualtrics, Provo, Utah). A new stimuli set was built for the purpose of this experiment. Participants were first presented with the 48 images from the contextualized facial expressions set described above. Next, in the second block, dynamic facial expressions from the ADFES (van der Schalk et al., 2011) were paired with sentences conveying emotional situations. Sentences describing emotion-evoking situations were composed and recorded as directed to the target seen in the video (e.g., "it smells like there is a dead animal somewhere around here, do you smell it?" conveying disgust). Both female and male voices were recorded, and all sentences were in Hebrew. These were validated separately as portraying a situation conveying one of the four emotion categories: anger, disgust, fear, and sadness (see Supplemental Material for more details). Four female and four male actors were chosen from the ADFES. Dynamic expressions conveying the above four emotions were paired with validated recorded sentences. This resulted in eight videos for each category of emotion conveyed by the facial expression. In total, there were two congruent presentations and six incongruent presentations for each emotion category. Seven memory probes were included in order to ensure participants were engaged in both visual and auditory aspects of the stimuli. These included questions about the content of the sentences, which could not be answered based on the facial expressions.

Procedure and Design

All participants completed two experimental blocks. First, they were presented with the dynamic audio–visual emotional expressions. Participants were presented with 32 videos overall, 8 congruent and 24 incongruent pairs. As participants could theoretically complete the task without actively paying attention to the heard sentences, seven "catch" questions were included as described above. Participants were informed that they will be watching short video clips and were instructed to choose the emotion conveyed in the facial expression. They were told that each video will be accompanied by a spoken sentence, which is directed at the observed individual. Moreover, they were told that the sentence could be compatible or incompatible with the observed facial expression reaction. Participants were also notified that simple memory questions will be presented throughout the task.

In the second experimental block, participants were presented with the forced-choice contextualized emotion categorization task, introduced in previous experiments. In each trial, participants were presented with a forced-choice task, asking them to choose the emotion that best fits the presented face (see the methods of previous studies for details). Participants were presented with 48 images overall, 12 congruent and 36 incongruent stimuli.

Analysis

Probe memory questions were first analyzed. Participants scoring lower than five out of seven catch trials were not included in the analysis. Congruent stimuli from the second block served as an accuracy measure for screening. The number of correct categorizations (i.e., choosing "anger" when presented with an angry face placed on an angry bodily context) composed each individual's accuracy score. Individual context-reliance scores were calculated in a similar manner to the previous studies for both blocks. The sum of instances in which the individual chose the body context in the second block and the emotion conveyed in the auditory sentence in the first block was divided by the sum of incongruent stimuli presented in that specific block. Then, the individual's context-reliance scores were correlated across the two experimental blocks.

Results

Context-reliance scores were calculated per participant for static ($M = 0.44$, $SD = 0.19$) and cross-modal dynamic stimuli ($M = 0.21$, $SD = 0.21$). These scores strongly correlated ($r = 0.697$, $p < .001$; Figure 4B).

Experiment 3 extended the contextualized emotion categorization task with dynamic faces and vocally communicated semantic context. Despite the striking differences in the nature of the stimuli presented, results clearly show that performance on one task is strongly correlated with performance on the other.

The more "face-centric" participants ignore contextual information to a similar extent even when provided nonvisually, while "context-centric" individuals adhere to their own individual tendency. Moreover, these results strongly suggest that "context-centric" tendencies cannot be explained by a generally broader visual scope, perceiving a larger diameter of any visual input, as the effect is not limited to visual signals.

Experiment 4

In all contextualized emotion categorization tasks presented thus far, participants were asked to focus specifically on the face, thus rendering the body or the semantic information as context. Are "face-centric" participants simply extremely compliant and, as such, highly motivated to ignore the surrounding information? In Experiment 4, 72 participants viewed the audio–visual dynamic stimuli presented in Experiment 3 (see Figure 4). Here, rather than categorize the emotion presented in the facial expression, participants were asked to categorize the emotion conveyed in the sentence, thereby presenting the facial information as context. Participants also completed the still-image-based individual measure of context-reliance. If the "face-centric" subjects in our previous experiments were simply more compliant, they should be able to better ignore the face in this experiment. Thus, there should be a negative correlation between our measure and task performance.

Method

Participants

Seventy-two individuals (36 participants reported their gender as females, 36 as males) aged 19–62 years ($M = 41.33$ years, $SD = 11.39$) were recruited through "Pannel4All," an Israeli online survey platform. Participants reported their gender answering a multiple-choice format question choosing between male, female, and other. All reported Hebrew to be their mother tongue and had normal or corrected-to-normal vision and hearing. Participants were paid an amount of $3.5 for their participation. Sample size was determined a priori; the minimal amount of 61 was calculated using G*Power to yield a power of over 80% for any effect size greater than 0.35 assuming an α of .05. Due to high dropout rates in online studies, we aimed for a slightly higher number of participants and data collection was terminated once this number was reached. Six participants were dropped from the analysis due to their low score on the catch trials of the dynamic stimuli block, while six other participants were dropped from the analysis due to low scores on accuracy in congruent display trials. See analysis for details.

Materials

The experiment was run using the Qualtrics software (Qualtrics, Provo, Utah). Participants were presented with 48 images from the contextualized static facial expressions set described above. The dynamic audio–visual stimulus set produced for Experiment 3 was used here once again, presenting participants with 32 dynamic facial expressions conveying different emotional categories coupled with sentences directed at the observed character. In contrast to the previous experiment, here, participants were asked to describe the emotion evoked by the semantic information conveyed verbally.

Procedure and Design

All subjects completed the two experimental blocks; in the first, they were presented with the forced-choice task, asking them to choose the emotion that best fits the presented face (see the methods of Experiment 1 for details). Then, participants were presented with the dynamic audio–visual emotional expressions. Participants were also presented with probe questions, this time regarding the faces observed. Participants were given thorough instructions as described above, directing them to categorize the emotion evoked by the sentence they heard.

Analysis

Probe memory questions were first checked. Participants scoring lower than five out of seven catch trials were not included in the analysis. Congruent stimuli from the first block served as the accuracy measure, each participant's accuracy level was calculated, and a decision regarding inclusion in analysis was made in a similar manner to that described in Experiment 3. Individual context-reliance scores were calculated in a similar manner to the previous studies for both blocks. The sum of instances in which the individual chose the body context in the first block and the emotion conveyed by the facial expression in the second block was divided by the sum of incongruent stimuli presented in that specific block. We then tested whether the individual's tendency toward context scores correlates across the two experimental blocks.

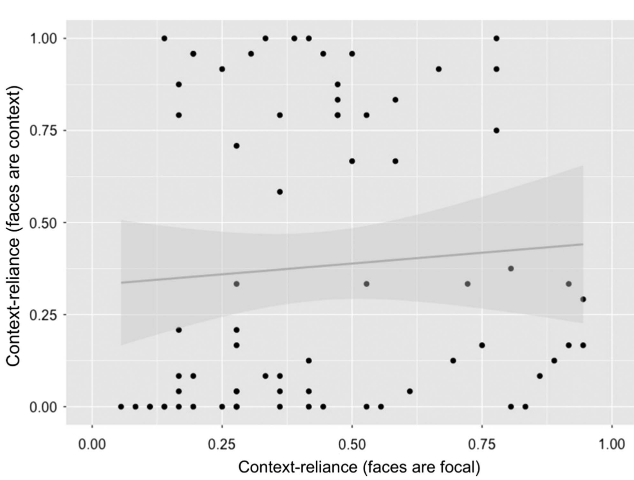
Results

Context-reliance scores were calculated for both tasks, based on the incongruent instances. Each participant received a score between 0 and 1 portraying their context-reliance tendency in the static block ($M = 0.43$, $SD = 0.25$) and in the dynamic block ($M = 0.38$, $SD = 0.39$). Importantly, in the second, the facial expression category was considered the context. Pearson's correlations revealed a nonsignificant correlation between the two scores ($r = 0.07$, $p = n.s.$; see Figure 5), suggesting that "face-centric" individuals are not simply more compliant than others.

Experiment 5

So far, our experiments revealed robust individual differences in context-reliance tendencies in tasks using instructed poses and categorization tasks. In the following experiments, we tested individual differences using more naturalistic methods. While forced-choice categorization paradigms prevail in the literature of emotion perception, they are limited as they constrain participants to specific categories (Barrett, 2022; Russell, 1994). Arguably, this is detached from the process occurring in real-life encounters. Moreover, in the current context, presenting participants with an emotionally incongruent face-context combination, participants could potentially perceive more than a single category while forced to choose only one. Therefore, in Experiment 5, 85 participants were presented with identical stimuli to the ones presented in Experiment 1 and were allowed to freely describe what they saw, using their own words. In the first block, they were asked to describe what the presented person was experiencing (with no mention of emotion), and in the second, what emotion was expressed by the face. In the final block, participants completed the forced-choice paradigm as described in Experiment 1. This allowed us to examine whether the context-reliance changed across methods. Importantly, all pictures presented within the experiment were taken from the same set, while each image was presented only once throughout.

Figure 5
Individuals' Context-Reliance Scores in Experiment 4



Note. Context-reliance scores when perceiving the still presentations against context-reliance scores calculated based on the dynamic audio–visual task (with the facial expressions defined as context).

Method

Participants

Eighty-five individuals (25 participants reported their gender as females, 60 as males) aged 21–68 years ($M = 32.76$ years, $SD = 9.18$) were recruited through Amazon Mechanical Turk and paid $6 for their participation. Participants reported their gender answering a multiple-choice format question choosing between male, female, and other. Sample size was determined a priori based on previous studies, with a minimal N of 84 calculated using G*Power to yield a power of over 80% for any effect size greater than 0.3 assuming an α of .05. Because of high dropout rates in online studies, we aimed for a higher number of 100 participants and data collection was terminated once this number was reached. A total of 15 participants were dropped from the analysis due to accuracy rates of less than 75% correct in congruent trials. See the analysis for details.

Materials

The experiment was run using the Qualtrics software (Qualtrics, Provo, Utah). Here too, the contextualized facial expressions set presented in Experiment 1 was used.

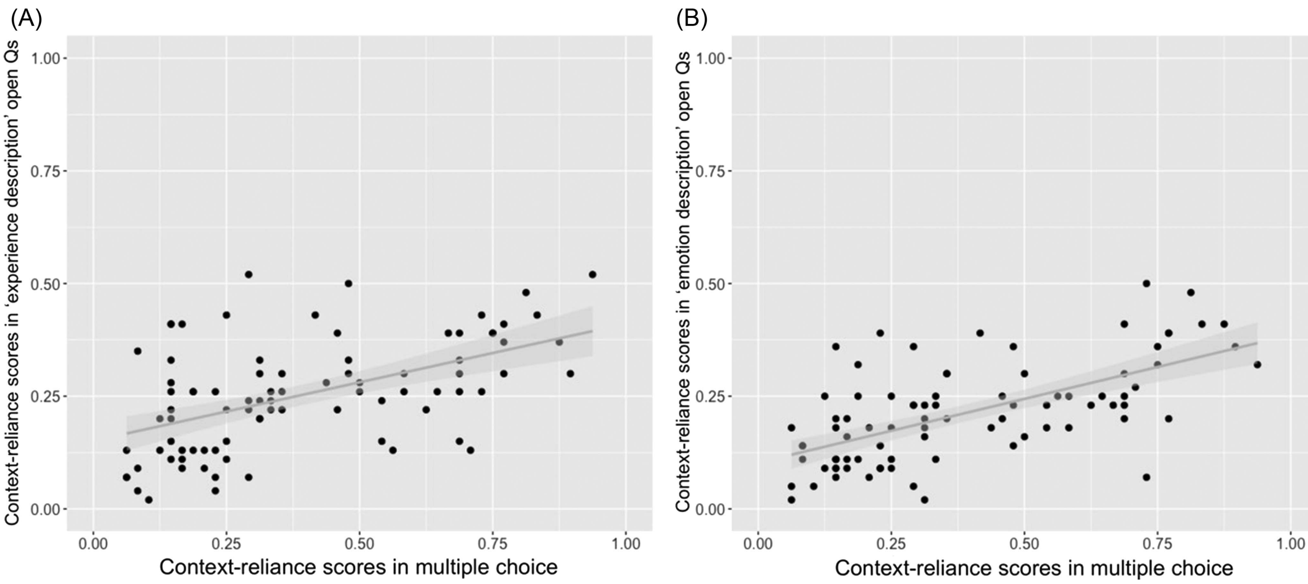
Procedure and Design

Participants completed three blocks of three tasks, all consisting of images from the stimuli set mentioned above. In the first block, participants were presented with 32 images. In each trial, the participant was asked to briefly describe what the presented person is experiencing, with no mention to the concept of emotion. In the second block, participants were again presented with an open-ended question, this time asking them to describe the emotion portrayed in the facial expression. Last, in the third block, we presented participants with a forced-choice task, asking them to choose the emotion that best fits the presented face. Participants were presented with 32, 32, and 64 images in the first, second, and final blocks, respectively. Images were presented similarly to Experiment 1, with no repetitions, random order within blocks, and no time limit.

Analysis

Congruent combinations from the third block served as the accuracy measure. See the analysis of Experiment 3 for details. Answers to the open questions were coded by two judges blind to the condition. They categorized the answers to one (or more) of five categories: anger, sadness, disgust, fearful, or other. Most categorizations were identical between judges, and disagreements were arbitrated until mutual agreement was reached. On each and every trial, each participant received a number stating whether she chose the face category, the body context category, a different category ("other"), or more than one of the above (when relating to the open-ended blocks only). A score describing each individual's tendency to rely on the contextual body was calculated in a similar manner to that described in Experiment 1 for each of the three blocks.

Figure 6
Context-Reliance Scores in Experiment 5



Note. (A) Context-reliance scores in the "experience description" open-ended questions block and the forced-choice questions block plotted together. (B) Context-reliance scores in the "emotion description" open-ended questions block and the forced-choice questions block plotted together. Qs = Questions.

Results

Answers to the open-ended questions were coded by two blind coders to describe whether responses in each trial related to one (or more) of the following categories: face, body context, or other (any other category mentioned). Cohen's kappa was calculated to assess interrater reliability (Cohen's kappa mean: $M = 0.82$, range = 0.64–1). Disagreements between judges were arbitrated until mutual agreement was reached.[2]

Next, we calculated the context-reliance score in a similar way to that described in Experiment 1 (see Figure 1B) for each of the three blocks. Critically, the individual's context-reliance was stable across the different blocks. The correlation between the calculated contextual reliance in the "experience description" block and the forced-choice block was strong and significant ($r = 0.52$, $p < .001$; Figure 6A), while the correlation between the "emotion description" block and the forced-choice block was even stronger ($r = 0.63$, $p < .001$; Figure 6B). Strong correlation between the two open measures was also evident ($r = 0.71$, $p < .001$).

These results show that even when participants are free to describe the stimuli in their own words, strong individual differences in the face-context dependency trait-like characteristic emerge. Experiment 5 provides evidence for the robustness of this tendency and suggests that it prevails in more naturalistic conditions, when participants are free to interpret the stimuli as they see fit.

Experiment 6

Thus far, all stimuli presented to participants were lab-produced by posing instructions. Such expressions are typically produced by actors specifically instructed to exactly portray each emotion based on the Facial Action Coding System (Ekman & Friesen, 1978). In Experiment 6, we presented 181 participants with real-life spontaneous expressions of emotions (Abramson et al., 2017). Images of expressors from the waist up were obtained from real-life footage of situations that elicit fearful and angry expressions (see the methods for further details). To examine our hypothesis, we had to use only those images in which the facial and body expressions were perceived to be of different categories. To test whether the face-context trait-like tendency occurs with these real-life displays, we quantified predictions from Abramson et al.'s results and computed a context-reliance score for each participant. This experiment was preregistered prior to data collection. Procedures, sample size, and exclusion criteria were specified at https://aspredicted.org/54Q_HWL.

Method

Participants

A total of 181 individuals (95 participants reported their gender as females, 86 as males) aged 18–60 years ($M = 35.22$ years, $SD = 11.06$) were recruited through Prolific (https://www.prolific.co). Participants reported their gender answering a multiple-choice format question choosing between male, female, and other. All reported English to be at mother tongue level. Participants gave their informed consent before beginning the experiment and were paid an amount of \$3.36 for their participation. Sample size was determined a priori; the minimal amount was calculated using G*Power to yield a power of over 80% for any effect size greater than 0.2 assuming an α of .05.

[2] Only 8% of responses in the first (experience description) and 6% in the second (emotion description) open-ended blocks referred to more than one emotion category. This suggests that limiting participants' responses to one category had minimal effect on our results.

Data collection was terminated once this number was reached. A total of 36 participants were excluded from analysis based on our a priori criteria; see the analysis for details.

Materials

The experiment was built using Gorilla Experiment Builder (https://www.gorilla.sc) to create and host the experiment (Anwyl-Irvine et al., 2018). Participants were presented with 43 real-life expressions of emotions taken from Google images and Google videos, which were obtained from situations expected to elicit fearful and angry expressions. Fourteen filler images were also added (stimuli were obtained from Abramson et al., 2017). Images were obtained to present people from the waist up to show their upper body and facial expression. They were then presented with 64 images from the contextualized facial expressions set described in previous studies. Last, we also measured the Big Five personality traits by asking participants to complete the 50-item International Personality Item Pool (IPIP; Goldberg et al., 2006) representation of the Goldberg markers (Goldberg, 1992) for the Big Five factor model of personality.

Procedure and Design

All participants completed all experimental blocks. The first block presented them with the real-life expressions. Participants were instructed to choose the emotion that best fits the presented expression. A forced-choice response format was used with seven options: fear, sadness, disgust, anger, happiness, surprise, and neutral. In the second block, participants were presented with the faces in context using the forced-choice format, asking them to choose the emotion that best fits the presented face (see the methods of Experiment 1 for details). In the third block, participants were asked to complete the IPIP questionnaire.

Analysis

In the real-life emotion categorization task, in order to calculate the individual's context-reliance score and the face-reliance score, we made an a priori hypothesis based on Abramson and colleagues' (Abramson et al., 2017) results. They presented participants with three different types of stimuli: the face, the body context, and the face with its body context. Relying on their results from categorizations of the face when presented alone and the body context when presented alone, we made an a priori hypothesis as to which category one should choose if they were to be making their decision based on the face alone or the body context only. Importantly, these were all naturally appearing, nonmanipulated stimuli. For each categorization in which a participant chose the category that was previously prevalent in categorizations of the context (while not prevalent in categorizations of the face), they received a point toward their individual context-reliance score. The same was done for the tendency to rely on the face. Unlike the previous experiments in which participants were instructed to categorize the emotion of the presented face, here, they were instructed to categorize the expression of the presented person. Hence, we calculated the complementary score of the individual tendency to rely on the face.

To calculate the stability of this tendency within the experiment, we computed a balanced test–retest analysis: Stimuli were divided to two balanced groups, and two scores were computed for each participant based on these. Scores were then correlated to test stability within the task. In the instructed recognition task, which was introduced in previous studies, accuracy was first calculated based on congruent instances only. Thirty-six participants were dropped from analysis due to low accuracy, scoring below 75% on congruent trials. Individual's scores of the tendency to rely on context in incongruent trials were then calculated in a similar manner to the previous studies described above. Here, we also calculated a score for the tendency to rely on the facial expression in a similar manner. Individual's scores from the real-life and the instructed expressions tasks were correlated. Scores of the IPIP scores for all five factors were calculated according to its manual.

Results

Individual differences were found as predicted (Figure 7). Moreover, a split half analysis demonstrated stability throughout the experiment ($r = 0.4$, $p < .001$).[3] Hence, we found clear evidence for the typical face-context trait-like tendency variance in the perceptions of real-life emotional expressions.

Exploratory analyses examined whether one could characterize potential personality factors underlying these individual differences. Participants completed the 50-item IPIP measure of the Big Five factor model of personality (Goldberg, 1992; Goldberg et al., 2006). Weak positive correlations were found both between the Extraversion and the Conscientiousness factors and the context-reliance scores ($r = 0.17$, $p < .05$; $r = 0.16$, $p < .05$, accordingly). More extraverted and more conscientious participants were found to rely on the context to a greater extent. Previous literature is mixed on the association between extraversion and emotion perception. For example, some studies have shown that individuals higher on extraversion perform better in tasks of facial expression recognition (Matsumoto et al., 2000; Scherer & Scherer, 2011). However, earlier research did not find support for this association (Cunningham, 1977). While speculative, the current results suggest we may benefit from broadening the definition of "emotion recognition," when seeking associations with personality traits. Future research should further explore this relation.

Together, Experiments 5 and 6 present evidence for the potentially profound effects of the individual contextual tendencies in interpretation of emotional expressions using more ecological methods and stimuli.

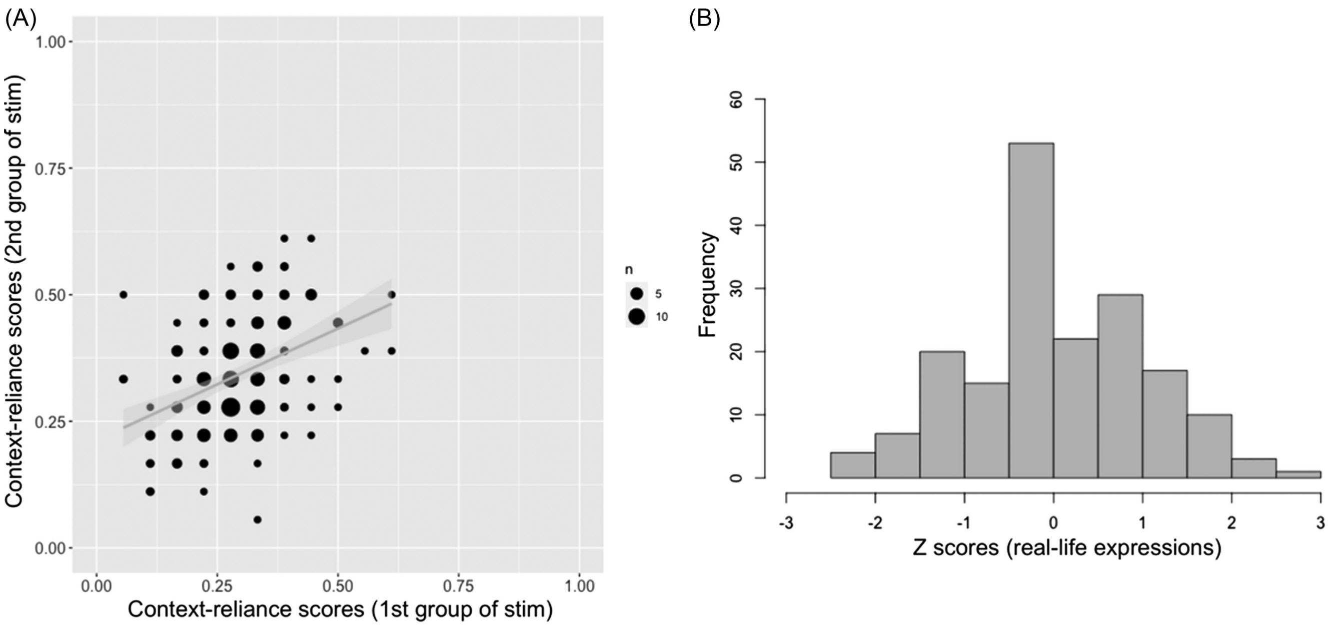
Discussion

Across six studies with 671 participants, we documented a novel, robust, trait-like characteristic in emotion perception. We discovered stable individual differences in the tendency to rely on contextual versus facial information, which are consistent across methods, stimuli, contexts, and time. They are also evident in perceptions of images captured in real life. The meaning of this

[3] Participants also completed the forced-choice instructed emotion categorization task from Experiment 1. Two scores were computed for each participant, of their context-reliance tendency but also of their face-reliance tendency. While the tasks differ in the nature of the stimuli and instructions, scores of the real-life and the instructed expressions tasks were correlated. A significant correlation was found between the face-reliance scores in both tasks ($r = 0.18$, $p < .05$).

Figure 7

(A) Consistency of Individual Scores (B) Distribution of Context-Reliance Scores



Note. (A) Consistency of individual's context-reliance scores when perceiving real-life expressions. (B) Distribution of the context-reliance scores when perceiving real-life expressions.

trait is simple: Two perceivers viewing an identical display may perceive vastly different emotional realities. Studies show that real-life facial expressions are often ambiguous and that contextual information alters emotion perception. The derivative is that the effects we illustrate here are likely not a curiosity at the fringe of emotion perception but rather a common phenomenon that may alter everyday social interactions.

With relation to recent discussions regarding the significance of contextual signals (see Keltner et al., 2019, for examples), our results show that by studying group means, we risk masking crucial variance. We show that at least in some situations, for some individuals, the contextual information is essential. In fact, our findings suggest that presenting isolated facial expressions in laboratory settings to individuals high on context-reliance imposes a highly unnatural situation for these perceivers. And just as contextual signals are essential for some, for others, the facial signals are essential.

As this article was accepted for publication, we learned of an article by Goel et al. (2024) that just came out. Among other things, they reported considerable individual differences in how perceivers process facial expressions and context. Specifically, a majority of their participants consistently based their responses on contextual cues, while others based theirs on facial cues alone, or on the integration of both contextual and facial cues. Their results also demonstrate temporal stability, such that the perceiver's tendency to rely on contextual cues or the integration of facial and contextual cues was stable over time (though facial reliance alone was less stable). While their study used meaningfully different stimuli from the tasks used here, we find the overall convergence of findings encouraging.

An intriguing question arises concerning the consequences of living in the social world and seeing it through a "face-centric" versus "context-centric" view. Our findings suggest that context-reliance tendencies indeed play a role in various situations. For example, two doctors might differ in their feeling of empathy toward a patient with minimal facial expressions if one is more focused on her face and the other on the story she is telling. Two police officers might discern very different impressions from an arrested individual if one pays more attention to her smiling face and the other to her shaking feet.

In many emotion recognition tasks used in psychological science, participants are asked to attend to isolated facial expressions, deeming the context task-irrelevant. Yet, with regard to real-life emotion perception, it seems that some level of contextualizing is crucial for better understanding of the other's emotional state (Aviezer et al., 2012). In this vein, a provocative prediction for future work would be that extreme "face-centric" individuals may have difficulties in real-life emotion recognition. On the other hand, important as context may be, we cannot rule out that "face-centric" participants specialize in reading different subtle signals that seem nonexistent to others (Aviezer et al., 2015). Thus, there may be ecological niches that are better fit for face-centric people and those that are a better fit for contextualizers. Future research may characterize both people and environments.

Furthermore, with the social world becoming increasingly more technological over time, the individual differences we present should have important implications. Most technological applications used for online social interactions are based on a limited frame, mostly capturing one's face. Future empirical studies could determine how this affects the experience and quality of interactions of individuals bearing different perceptual tendencies.

Our results are of particular interest in relation to neuropsychological populations known to exhibit difficulties with emotion perception (e.g., individuals with autism, neurodegenerative diseases, cerebral vascular accident; Kennedy & Adolphs, 2012; Penn et al., 2002; Sprengelmeyer et al., 1996). Rather than examine their impairments as isolated face perception deficits, we hypothesize that alterations in the face-context integration dynamics may be at play. Thus, following brain damage, one's individual style may shift, resulting in deficits with integrating facial expressions and their surrounding contexts.

To conclude, we report a novel and robust trait in emotion perception that significantly impacts the way humans perceive and interpret emotions in others. Our line of work sets ground for deeper understanding of the way in which individuals may differ from each other, perceiving extremely different, even opposite information, from identical emotional displays. Studying perception, one must consider not only the presented signal but also the decoder on the other end.

Constraints on Generality

Our sample included English- and Hebrew-speaking participants of a broad range of ages. We did not include any children or young adults under the age of 18 or older adults over the age of 60. People with major physiological or psychological pathologies were not included in our sample. Studies attempting to replicate the effects found should keep these criteria in mind.

Moreover, while Experiment 6 presented participants with real-life spontaneous expressions of emotions, in other experiments, participants were presented with lab-produced posed expressions. Our conclusions are thus limited in that sense. Future studies may choose to advance to dynamic real-life spontaneous expressions, possibly in real-life scenarios, outside of the lab.

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