

Perceptions of Variability in Facial Emotion Influence Beliefs About the Stability of Psychological Characteristics

Max Weisbuch
University of Denver

Rebecca L. Grunberg
Massachusetts Institute of Technology

Michael L. Slepian
Columbia Business School

Nalini Ambady
Stanford University

Beliefs about the malleability versus stability of traits (incremental vs. entity lay theories) have a profound impact on social cognition and self-regulation, shaping phenomena that range from the fundamental attribution error and group-based stereotyping to academic motivation and achievement. Less is known about the causes than the effects of these lay theories, and in the current work the authors examine the perception of facial emotion as a causal influence on lay theories. Specifically, they hypothesized that (a) within-person variability in facial emotion signals within-person variability in traits and (b) social environments replete with within-person variability in facial emotion encourage perceivers to endorse incremental lay theories. Consistent with Hypothesis 1, Study 1 participants were more likely to attribute dynamic (vs. stable) traits to a person who exhibited several different facial emotions than to a person who exhibited a single facial emotion across multiple images. Hypothesis 2 suggests that social environments support incremental lay theories to the extent that they include many people who exhibit within-person variability in facial emotion. Consistent with Hypothesis 2, participants in Studies 2–4 were more likely to endorse incremental theories of personality, intelligence, and morality after exposure to multiple individuals exhibiting within-person variability in facial emotion than after exposure to multiple individuals exhibiting a single emotion several times. Perceptions of within-person variability in facial emotion—rather than perceptions of simple diversity in facial emotion—were responsible for these effects. Discussion focuses on how social ecologies shape lay theories.

Keywords: facial expressions, lay theories, emotion perception, social perception

People differ widely in the degree to which they believe that personality, intellect and other psychological characteristics are stable versus dynamic. Considerable empirical evidence now suggests that such lay beliefs play an important role in social cognition and even personal achievement. *Entity* (as opposed to *incremental*) lay theories reflect the belief that psychological traits do not change, and entity theorists are more likely than incremental theorists to make the fundamental attribution error, to stereotype more, and to respond poorly to failure (Dweck & Leggett, 1988; Levy, Plaks, Hong, Chiu, & Dweck, 2001). Research supports the idea that these beliefs can derive from explicit verbal statements, such as when children hear that they succeeded or failed because of a stable disposition (e.g., Mueller & Dweck, 1998; see also Rattan, Good, & Dweck, 2012)

or when people read that human traits are stable (e.g., Chiu, Hong, & Dweck, 1997).

A discrete statement may influence beliefs about trait stability but it seems likely that people also derive such beliefs simply by observing others' behavior. For example, a person whose social environment includes individuals whose behavior is relatively stable over time may begin to think that human traits are relatively stable, and thereby endorse an entity theory. Among the behaviors from which people may learn about the stability or instability of psychological dispositions, facial expressions may be especially informative: Social encounters are filled with facial expressions, perceivers rapidly and effortlessly process the social meaning of facial expressions, and attribute personality traits, moral traits, and intelligence to individuals on the basis of those individuals' facial emotions (Knutson, 1996; Montepare & Dobish, 2003; Rozin, Lowery, Imada, & Haidt, 1999; Said, Sebe, & Todorov, 2009; Tiedens, 2001). We extend this work by examining how variability in facial emotion shapes trait attributions and lay theories. Specifically, we propose that variability versus stability in others' facial expressions provides a context for perceivers to learn about the variability or stability of human traits. Specifically, we tested the idea that exposure to emotional variability *within* facial identities causes perceivers to believe that those individuals (Study 1) and people in general (Studies 2–4) can change. Put differently, we

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Max Weisbuch, Department of Psychology, University of Denver; Rebecca L. Grunberg, Sloan School of Management, Massachusetts Institute of Technology; Michael L. Slepian, Department of Management, Columbia Business School; Nalini Ambady, Department of Psychology, Stanford University.

Correspondence concerning this article should be addressed to Max Weisbuch, Psychology Department, University of Denver, 2155 Race Street, Denver, CO, 80210. E-mail: max.weisbuch@du.edu

identify exposure to facial emotion variability as an ecological influence on lay person theories.

Facial Emotions as Signals of Individual Variability

Aside from cartoonish caricatures of emotion, such as those painted on clown faces, facial expressions of emotion do not represent permanent properties of a face but rather temporary properties that perceivers interpret with respect to emotions, intentions, and other mental states (cf. Adams, Ambady, Macrae, & Kleck, 2006; Fridlund, 1994; Keltner, Ekman, Gonzaga, & Beer, 2003; Matsumoto, 2006; Russell, 1994). Indeed, people process facial emotion quickly and without using considerable cognitive resources, reliably identifying facial emotion after as few as 30 ms of unmasked exposure to a face (e.g., McAndrew, 1986) and extracting the positive or negative meaning of a facial expression without consciously attending to a face (Murphy & Zajonc, 1993; Weisbuch & Ambady, 2008). The speedy processing of facial expressions is consequential, as perceivers form specific trait attributions on the basis of specific facial emotions, such that angry and happy facial expressions, for example, are thought to belong to people with dominant and affiliative personalities, respectively (Knutson, 1996; Montepare & Dobish, 2003; Said, Sebe, & Todorov, 2009). Indeed, perceivers infer some traits after only a few milliseconds of exposure to a person's facial appearance (Bar, Neta, & Linz, 2006).

Perceivers draw different trait inferences from different facial expressions, yet nearly all people exhibit some variability in facial emotion, such that they exhibit different facial emotions at different times. Perceivers may thus draw different trait impressions of the same person at different times, to the extent that that person exhibits different facial expressions. Indeed, recent work demonstrates that subtle differences in the facial appearance of a target person can lead perceivers to draw quite different trait inferences of that person (Todorov & Porter, 2014). All of this variability might be tracked by perceivers, who could then draw broader inferences about the extent to which a given person has a stable or variable personality. Indeed, people maintain visual representations of an individual's facial expressions over time (e.g., Ellamil, Susskind, & Anderson, 2008; Haberman, Harp, & Whitney, 2009; Rhodes & Jeffery, 2006), enabling them to track variability in these expressions. In the current work (Study 1), we test the hypothesis that exposure to within-person variability in facial emotion causes perceivers to believe that a person has a variable personality.

Ecological Variability as a Signal of Human Trait Variability

Perceivers may attribute relatively variable personalities to individuals who exhibit relatively variable facial expressions, but the broader purpose of this article is to explore if accumulated exposure to within-person variability in facial expressions shapes perceivers' entity and incremental lay theories. Put differently, we test the idea that perceivers derive their entity and incremental lay theories from the extent to which they observe within-person variability in facial expressions. Indeed, any two perceivers are likely to differ in the extent to which their neighbors, coworkers, relatives, and casual acquaintances exhibit within-person variabil-

ity in facial emotion. Although all or most people exhibit some variability in their facial expressions over time, individuals differ in the degree to which they exhibit different facial expressions and social contexts can encourage or discourage expressivity or emotions (Friedman & Miller-Herringer, 1991; Matsumoto, 1990). Accordingly, perceivers also differ with respect to their encounters with within-person variability in facial emotion and these perceived differences may account, in part, for perceiver differences in lay theories.

Although people rarely encounter disembodied faces, they do devote the vast majority of their visual attention to faces when they see other people (Birmingham, Bischof, & Kingstone, 2008; Klin, Jones, Schultz, Volkmar, & Cohen, 2002; Ro, Russell, & Lavie, 2001). Combined with the speed and effortlessness with which perceivers extract social meaning from facial emotions (e.g., Lamer, Reeves, & Weisbuch, 2015; McAndrew, 1986; Murphy & Zajonc, 1993), the social ubiquity of facial expressions makes them an excellent candidate through which perceivers may learn about their social worlds (cf. Ambady & Weisbuch, 2010; Weisbuch & Adams, 2012). For example, single facial expressions can inform perceivers about the dangers or opportunities in their immediate environment (for a review, see Weisbuch & Adams, 2012). Yet people also appear to track others' facial expressions over time (e.g., Haberman et al., 2009) such that accumulated exposure can teach people about the more enduring qualities of their social worlds. For example, accumulated exposure to negative facial expressions can teach people that they are not valued, and can thus reduce perceivers' self-esteem (Lamer et al., 2015).

Accumulated exposure to facial expressions may also be an important means through which people learn about the variability (vs. stability) of human traits. Facial expressions are present any time people encounter each other: even so-called "neutral" expressions reflect some muscle activity and perceivers interpret these expressions as emotional (Lee, Kang, Park, Kim, & An, 2008; Russell & Fehr, 1987; Somerville, Kim, Johnstone, Alexander, & Whalen, 2004). Repeated encounters therefore provide perceivers with information about within-person variability in facial emotion and these cues are rapidly and effortlessly processed for their psychological meaning (McAndrew, 1986; Murphy & Zajonc, 1993). Accordingly, facial emotions provide a socially ubiquitous and low effort means for perceivers to learn about the extent to which people, in general, have relatively variable (vs. stable) traits. In the current work, we test several postulates of this broader hypothesis.

The approach taken here owes a small debt to theories of information sampling, which posit that perceivers' cognitions follow from the unique sample of information that perceivers have encountered (Juslin & Fiedler, 2006; Juslin, Winman, & Hansson, 2007). For example (cf. Juslin & Fiedler, 2006), beliefs about causes of death may be biased by media coverage of those and other causes. First, the sampling approach implies that a sample of one person provides little information about the population as this once person may be unique—the sample provides no information about the degree of variability between persons. Hence, we expected within-person variability in facial emotion to influence perceivers' beliefs about the broader population of humans, but only when more than one identity exhibits such variability. Second, broad judgments about the population are thought to be derived from the sample active in short-term memory (Juslin et al.,

2007). Accordingly, even though most adults have encountered (at least) thousands of faces in their lives, we here expected to observe an influence of a small set of faces.¹ These postulates were initially tested in Studies 1–2.

A second set of postulates regards the scope of lay theories influenced by exposure to facial emotion. There is evidence that people draw attributions to personality, competence, and morality on the basis of facial emotions but there is little evidence that people draw inferences of race on the basis of facial emotion. For example, perceivers attribute personality dominance and affiliativeness, respectively, to those exhibiting angry and happy facial expressions, and other traits are associated with various facial expressions (Knutson, 1996; Montepare & Dobish, 2003). Similarly, people infer competence from both angry (Tiedens, 2001) and highly positive expressions (Said et al., 2009). Accordingly, within-person variability in facial emotion may lead perceivers to draw inferences of within-person variability in personality and intelligence. We expected this pattern to emerge but also considered an alternative: Exposure to within-person variability in facial emotion may cause perceivers to infer that traits are variable in general. Lay theories are separable but related (Dweck, Chiu, & Hong, 1995), so it is possible for any social factor to influence variance shared by lay theories. However, the degree of generalization to other lay theories should depend on the closeness of the relationship between the observed characteristic and the lay theory in question. Accordingly, in Study 3, we examined the extent to which exposure to within-person variability in facial emotion influenced perceivers' endorsement of lay theories relevant to emotion (e.g., intelligence) and lay theories less relevant to emotion (e.g., race). We expected such exposure to influence the belief that intelligence is a dynamic quality but not to influence the belief that race is a dynamic quality.

The Current Research: Facial Emotion Variability and Lay Person Theories

We have argued that beliefs about the stability of psychological traits might be influenced by observing within-person variability in facial emotion. We first examine this idea with respect to a single individual. Specifically, in Study 1 we examine how perceivers' impressions of personality stability in an individual are influenced by variability in that individual's facial expressions. We expected exposure to multiple expressions of a single individual to influence impressions of that individual, but not of all people. Although it would not be unheard of for exposure to a single individual to influence general beliefs (e.g., Henderson-King & Nisbett, 1996), adults' beliefs about people are less likely to be influenced by exemplars as the number of exemplars decreases (Weber & Crocker, 1983). The facial behavior of a single exemplar may thus be insufficient to change perceivers' beliefs about people. Overall, we expected variability in the facial emotion of a single exemplar to influence the degree to which people attribute trait variability to that exemplar but not to people in general. We tested these hypotheses in Study 1.

Consistent with information sampling, we expected a more general effect to emerge only when people gain sufficient evidence of within-person variability, as would occur by perceiving a number of people who exhibit such variability. This more general hypothesis is tested in Studies 2–4, where we examine how

perceivers' incremental and entity lay theories are shaped by their observation of within-person variability in facial emotion. In Study 2, we test the hypothesis that perceivers' lay theories about personality change (vs. stability) are influenced by seeing multiple individuals exhibiting within-person variability (vs. stability) in facial emotion. In Study 3, we examine the same hypothesis with respect to lay theories about variability (vs. stability) in intelligence, morality, and race. Study 4 is an exact replication of Study 2 but with an additional control condition to test the extent to which the effects depend on exposure to within-person variability in facial emotion versus exposure to variability in facial emotion more generally.

Study 1

In Study 1 we examined whether exposure to variability in an individual person's facial emotion influences perceivers' impressions of that individual. Specifically, we hypothesized that people would attribute greater variability in personality to individuals who exhibited facial emotion variability than to individuals who exhibited facial emotion stability. Exposure to a single person's facial expressions was not expected to change perceivers' beliefs about all humans.

Participants

Mechanical Turk (for guidelines on recruitment, see Buhrmester, Kwang, & Gosling, 2011) was used to recruit 225 participants (146 male; $M_{age} = 29$), and as in all studies reported here, were initially told that the study regarded memory for images.² Participants were randomly assigned to facial-stability or facial-change conditions.

Materials

For study materials, seven "models" were selected from the NimStim collection (Tottenham et al., 2009). For each model, seven images (fear, anger, joy, surprise, disgust, sadness, neutral) were selected. For the facial-stability images, a single emotion image was taken from each model and that image was replicated with seven different background colors (for an example of one model, Figure 1). Each model was thus shown with only one emotion, but that model + emotion pairing was shown seven

¹ The current work thus provides an experimental model for the influence of within-person variability in facial emotion on perceivers' endorsement of incremental and entity lay theories. The experimental conditions are intended to model frequent exposure to within-person variability versus stability in facial emotion, and we expect to observe a small but reliable influence. We would expect such exposure to have a much larger influence over the course of a lifetime, but we do not take a developmental approach here and thus do not provide an estimate of the size of such a (hypothetical) lifetime effect.

² We limited our sample to relatively young participants—those aged 45 or under—to roughly parallel the young-adult age range that was used to validate the sample of facial emotions used here. That is, the NimStim face set (Tottenham et al., 2009) depicts young adults and was validated on the basis of ratings from young adults. Hence, the facial emotion images depicted should be perceptible by persons within the age range of our sample. The human subjects' protocol for these studies required that all healthy adults be allowed to participate: Data from these participants were thus excluded after data collection.



Figure 1. Top panel: An example of a single identity within the facial-change condition. Bottom panel: An example of a single identity within the facial-stability condition. Note that in both conditions participants were exposed to a total of seven identities. Thus both conditions were exposed to 49 images. (Adapted from the NimSTim face database). See the online article for the color version of this figure.

times. Participants assigned to this condition viewed one randomly determined model displaying a single emotion in seven different images (with a changing background color). Hence, each participant saw a total of seven images.

The facial-variability images used the same seven models, but each model was shown exhibiting each of the seven emotions (see Figure 1). Background color did not change in the facial-change condition. Participants assigned to this condition thus viewed one randomly determined model displaying seven different emotions. Hence, each participant saw a total of seven images.

Procedure

Participants viewed the seven photographs appropriate to their condition. As in all studies in the current work, randomly ordered photographs were presented for five seconds each. Participants then completed target judgments in which they were asked to indicate their agreement (1-*strongly disagree* to 6-*strongly agree*) with these statements: “This person’s personality changes more often than other people,” “Compared to other people, it would be MORE difficult to get this person to change their personality” (reverse-scored), and “This person is the sort that often changes ‘who’ they are” ($\alpha = .74$). These items were modified from existing scales of lay theories (see Study 2) to emphasize changes within the specific pictured person. Responses to these items were averaged into a single index. Finally, participants completed a well-established three-item scale of entity and incremental theories of personality (e.g., “The kind of person someone is something very basic about them and it can’t be changed very much”) ranging from 1 (*very strongly disagree*) to 6 (*very strongly agree*) (Chiu, Hong, & Dweck, 1997). Responses were reverse-scored such that higher scores were consistent with endorsement of incremental theories, and averaged into a single index ($\alpha = .82$).

Results and Discussion

An independent samples *t* test revealed that participants in the facial-variability condition were indeed more likely to believe that the target person had a changeable personality ($M = 3.74$, $SD = 1.07$) than participants in the facial-stability condition ($M = 2.82$, $SD = 0.88$), $t(218.128) = 7.04$, $p < .001$, $r_{pb} = .43$.³ Hence, perceivers drew inferences of personality dynamism from the degree to which they saw a target person exhibit facial (emotion) changes. As expected, exposure to change or stability in a single

face did not influence perceivers’ beliefs about the tendency for humans’ personalities to change (vs. remain stable). That is, there was no significant influence of experimental condition on endorsement of incremental versus entity theories, $t(223) = .49$, $p = .63$, $r_{pb} = .03$. Indeed, a 2 (experimental condition) \times 2 (individual, people in general) analysis of variance (ANOVA) with repeated measures on the latter factor revealed a statistically significant interaction, $F(1, 223) = 28.85$, $p < .001$, $r_{pb} = .34$, such that exposure to within-person variability (vs. stability) in facial emotion had a significantly stronger influence on beliefs about the pictured individual than beliefs about people in general. Building on these results, in Study 2 we examined the degree to which perceivers draw conclusions about people in general after exposure to multiple faces exhibiting stability or change.

Study 2

Participants

Fifty-two undergraduates⁴ at a private university were randomly assigned to facial-stability or facial-change conditions (modified from Study 1).

Procedure

Participants in the facial-variability condition viewed all seven models, with each model exhibiting seven different emotions (i.e., seven targets displayed emotional variability) whereas participants in the facial-stability condition viewed all seven models with each exhibiting a single emotion (i.e., seven targets displayed emotional consistency, but with a changing background color). In the facial-stability condition, each model posed a different emotion from the next. Thus, in both conditions, participants were exposed seven times to each of seven emotions. Hence, each participant saw a total of 49 images. Finally, participants completed the entity and incremental theories scale used in Study 1.

³ Levene’s test was significant, $F(1, 223) = 5.21$, $p = .02$, reflecting larger variability in the facial-change than in the facial-stability condition (see *SDs* in text). We therefore report corrected *t* test results.

⁴ Participant gender was recorded separately in this study. This data was collected during a pretest but lost during Max Weisbuch’s laboratory move from Tufts University to the University of Denver.

Results and Discussion

As expected, participants in the facial-variability condition were more likely to endorse incremental personality theories ($M = 2.78$, $SD = .75$) than were participants in the facial-stability condition ($M = 2.24$, $SD = .86$), $t(50) = 2.39$, $p = .02$, $r_{pb} = .32$. Consistent with hypotheses, then, exposure to several faces that each exhibited changes in facial emotion (relative to within-person stability) increased the extent to which participants thought that personality was dynamic. These findings suggest that social cognition adapts to facial patterns across individuals and time, implicating an important role for social ecology in folk psychological theories.

Study 3

Study 3 examined if the influence of within-person facial variability was limited to lay theories of personality or if such influence extends to other lay theories. There exist a variety of lay theories regarding stability and change, including lay theories of intelligence, morality, and racial categories (e.g., Dweck & Leggett, 1988; Williams & Eberhardt, 2008). These lay theories appear to be independent but related, in that people who endorse incremental theories in one domain exhibit a small tendency to do so in other domains (Dweck, Chiu, & Hong, 1995). Study 3 examines the extent to which exposure to within-person variability in facial emotion influences endorsement of any lay theory associated with stability and change, or conversely, if such influence is domain-specific.

We favored a weak hypothesis of domain-specificity, in which lay theories would be more strongly influenced to the extent that the domain in question is related to emotion. Indeed, perceivers make inferences of moral character and intelligence on the basis of specific facial emotions (e.g., Rozin et al., 1999; Said et al., 2009; Tiedens, 2001). For example, angry expressions are associated with upholding the virtue of autonomy but disgust expressions are associated with upholding the virtue of divinity (Rozin et al., 1999). In the domain of intelligence and competence, angry facial expressions and highly positive facial expressions index more competence than other negative facial expressions. Hence, an individual who exhibit angry, disgusted, and happy expressions may be attributed different moral codes and levels of intelligence at different times. Conversely, and although prejudiced individuals exhibit some reaction time differences on racial categorization according to facial emotion (Hugenberg & Bodenhausen, 2004), it is unlikely that people would draw quite different racial category inferences of the same person simply on the basis of a facial expression difference. With respect to terminology introduced earlier, within-person variability in facial emotions provides a relevant information sample from which to base judgments of within-person variability in morality and intelligence but not a relevant sample from which to base judgments about the stability or dynamism of racial categories (e.g., can a person switch racial categories?; Williams & Eberhardt, 2008).

Participants

Mechanical Turk was used to recruit 109 participants (62 female). As in Study 1 the sample was restricted to persons under the age of 45 ($M_{age} = 28$).⁵

Procedure

Participants were randomly assigned to the facial-variability or facial-stability conditions from Study 2 but responded to questionnaire items regarding entity and incremental theories of intelligence and morality. Questionnaire items were nearly identical to those from Study 2 but instead of personality, questions regarded “intelligence” and “moral character” (see Dweck, Chiu, & Hong, 1995 for reliability and validity). After reverse-scoring, items were averaged into an intelligence index ($\alpha = .91$) and a morality index ($\alpha = .87$). Participants also completed a 22-item race essentialism scale (Williams & Eberhardt, 2008) including items such as, “in 200 years, society will use basically the same racial categories” and “a person’s race is fixed at birth” ($\alpha = .85$).

Results and Discussion

A 2 (facial-variability, facial-stability) \times 2 (morality, intelligence) ANOVA with repeated-measures on the second factor revealed a main effect of theory-type, such that participants were more likely to endorse incremental theories of morality ($M = 3.83$; $SD = 1.12$) than intelligence ($M = 3.54$; $SD = 1.29$), $F(1, 107) = 4.71$, $p = .03$, $r_{pb} = .20$. More importantly, the predicted main effect of face exposure (variability vs. stability) also emerged, $F(1, 107) = 4.52$, $p = .036$, $r_{pb} = .20$, demonstrating that participants exposed to facial variability were more likely to endorse incremental theories than were participants exposed to facial stability. The same pattern emerged for both types of lay person theories. Simple t tests demonstrated that participants in the facial-variability condition endorsed incremental morality-theories ($M = 4.08$; $SD = 1.14$) more than participants in the facial-stability condition ($M = 3.61$; $SD = 1.08$), $t(107) = 2.21$, $p = .03$, $r_{pb} = .21$. The same pattern emerged for endorsement of incremental intelligence theories ($M_{Facial-variability} = 3.72$, $SD_{Facial-variability} = 1.27$; $M_{Facial-stability} = 3.38$; $SD_{Facial-stability} = 1.30$) but this difference was not significant, $t(107) = 1.32$, $p = .19$, $r_{pb} = .13$. Although t tests were thus significant for morality but not intelligence the main effect of facial-change (vs. facial-stability) on lay theory endorsement was not qualified by a theory-type interaction, $F(1, 107) = .28$, $p = .60$, $r_{pb} = .05$, suggesting that the effects of face perception on endorsement of incremental theories were similar for morality and intelligence theories.

Finally, there was no influence of experimental condition on race essentialism, $p = .87$. This null finding illustrates a potential boundary condition for the influence of facial-emotion versus stability on perceivers’ person theories of change and stability. Such influence may be limited to lay theories about change and stability that can be explicitly linked to facial emotion. That is, perceivers may draw explicit inferences about changes to psychological characteristics from changes to facial emotion they are not likely to explicitly believe that someone has changed race because that person has changed facial expression.

⁵ This sample size reflects nine exclusions. First, we did not set a minimum for the prior “approval rate” and seven participants were excluded for improbably speedy completion of the study or failure to complete the study. An additional participant was excluded for answering outcome measures hours after image presentation. A final participant was excluded for prior completion of the study (he participated twice; we excluded the second completion).

In general, Study 3 demonstrates that exposure to within-person facial emotion variability (vs. stability) causes people to endorse incremental theories of morality and intelligence. This effect did not extend to beliefs about the fluidity versus essentialism of race, suggestive of a boundary condition for these effects—exposure to within-person variability in facial emotion may only influence lay theories regarding mental states and traits. Either way, it is clear that exposure to within-person variability in facial emotion does not influence beliefs about variability in the world *in general*, but seems specific to variability in person dispositions.

Study 4

A built-in confound to the facial-stability and facial-variability conditions in Studies 2–3 is that only the facial-change conditions include different people exhibiting any given emotion. For example, fear was exhibited by a single individual in the facial-stability condition but by seven different individuals in the facial-variability condition. Perhaps it was not within-individual variability (vs. stability) in facial emotion that influenced lay theories but simply the observation of an emotion expressed by seven different people (in the within-person variability condition) versus a single person (in the within-person stability condition). We examined this alternative in Study 4.

Participants

Sixty-seven undergraduate students at a private university (42 female) were randomly assigned to facial-variability, facial-stability, or diversity conditions.⁶

Procedure

To isolate the role of individual change within the facial-change condition, we included a new diversity condition, which included 49 unique models exhibiting one of seven facial emotions. As in the other two conditions, each emotion was exhibited a total of seven times. This condition depicts neither individual facial-variability nor facial-stability—no individual is pictured more than once. According to our theorizing, the diversity images should be considered a control condition. Otherwise, methods were identical to Study 2 and lay theories of personality were measured.

Results and Discussion

Consistent with hypotheses, *t* tests demonstrated that participants in the facial-change condition endorsed incremental theories ($M = 3.93$; $SD = 1.11$) more than participants in the facial-stability condition ($M = 3.19$; $SD = 1.01$), $t(47) = 2.38$, $p = .02$, $r_{pb} = .33$, and marginally more than the diversity condition ($M = 3.44$; $SD = 0.94$), $t(44) = 1.53$, $p = .13$, $r_{pb} = .23$. The latter two conditions did not differ from one another, $t(37) = 0.81$, $p = .43$, $r_{pb} = .13$. Consistent with these findings, an independent-groups (facial-variability, facial-stability, diversity) ANOVA revealed a significant main effect, $F(2, 64) = 3.21$, $p = .047$.

General Discussion

Beliefs about the dynamism of human behavior are surely influenced by one's broader system of beliefs and by the intellec-

tual arguments of others (e.g., Chiu, Hong, & Dweck, 1997, Study 5). Our findings suggest that endorsement of incremental person theories is also influenced by the perception of facial emotion. People exposed to a social context with considerable within-person variability in facial emotion were more likely than others to endorse incremental theories about psychological characteristics such as personality and morality.

Facial expressions are—by definition—temporary, and a variety of psychologically meaningful facial expressions appear to exist. Yet despite a voluminous literature detailing how people interpret and respond to others' facial expressions, little work has examined how people interpret and respond to within-person variability in facial expressions. The current studies represent an initial step in filling this gap in theorizing and evidence. Yet this work also opens up new avenues of research on facial expressions of emotion. First, it is clear that people differ in emotional expressivity, such that some people exhibit greater intensity and thus variability in their facial emotions whereas other people may be relatively stoic and exhibit little change in facial expression. Consequently, people with expressive neighbors and coworkers may be more likely to endorse incremental lay theories than people with relatively stoic neighbors and coworkers. Thus, one avenue for future work is to examine how expressive social contexts—for example, theater communities—might shape lay theories. More generally, we have attempted to illustrate how the facial expressions present in the social environment can shape lay theories. There are reasons to suspect that other patterns of facial expressions may broadly shape perceivers' lay theories. For example, a person who encounters more angry than happy facial expressions may believe that people tend to be more aggressive than friendly. Such influences of the broader environment of facial emotion on lay theories are an important avenue for future work.

These findings also raise some interesting and important questions that could be resolved in future research. First, we suspect that the observed effects unfold somewhat unintentionally, as participants here perceived faces under the guise of a memory test and prior to knowing they would report their lay theories. Hence, their goal was not to “learn about people in general” as they were exposed to faces. However, their responses to the lay theory items clearly required introspection so it possible that intentional reporting of beliefs is necessary for these effects to emerge. Hence, to characterize the intentional or unintentional nature of the observed effects, future research could employ more implicit measurement of lay theories. A second question regards the extremity and number of facial expressions employed here. As this article represents the first (to our knowledge) investigation of facial emotion variability on social beliefs, we used canonical, rather than subtle, versions of facial emotions to test hypotheses with a relatively strong manipulation. However, prior work suggests that even subtle differences in facial expressions can produce large differences in personality attributions (Todorov & Porter, 2014; Montepare & Dobish, 2003) so we suspect that (more common) subtle within-person variability in facial emotion influences perceivers

⁶ This final sample reflects exclusions from participants who did not complete the entire study ($n = 6$) and data from piloted graduate students with knowledge of the study ($n = 5$).

lay theories, given a greater number of face encounters that would naturally occur over weeks, months, and years.

Another avenue for research is to examine the relationship between face perception mechanisms and endorsement of lay theories. The findings detailed in this article suggest that people keep track of within-person variability in facial emotion but we do not capture how people track such variability. One possibility is that people use face-space to maintain a representation of variability among an individual's facial expressions (cf. Ellamil et al., 2008). That is, people are thought to mentally represent the faces that they encounter by comparing them to the population of faces that they have previously encountered (Rhodes & Jeffery, 2006). The broader population of faces is represented through many dimensions of facial features and configurations, and for each dimension population average and variability are stored. Facial emotions constitute one (or multiple) such dimensions (Ellamil et al., 2008). Hence, the population of faces a person has encountered are visually represented in multidimensional face-space with some evidence that people maintain separate (but overlapping) "face-spaces" for separate facial identities (Rhodes & Jeffery, 2006). Thus, people might link multidimensional representations of faces with theories of human behavior. In other words, people may refer to visual representations of faces in face-space to derive their beliefs about human characteristics. A second possibility is that people keep a more semantic record, developing an online impression of the stability of an individual (as in Study 1) and then discarding specific representations of individual's specific facial emotions in favor of a summary evaluation of each encountered individual (cf. Hastie & Park, 1986). Future work could use vision science methodologies to begin to disentangle these two (nonmutually exclusive) possibilities for how people come to link visual exposure of within-person variability to theories of human dispositions.

One final direction for future work is to examine the time course of the observed effects. In the studies reported above, lay theories were measured only a few minutes after visual exposure to faces, leaving open the possibility that the observed effects are not long-lasting. Moreover, participants in these studies certainly had prior exposure to within-person variability (or stability) in their daily lives and we thus do not claim that our experimental model tests the creation of lay theories via exposure to facial emotion. Instead, we test the possibility that exposure to within-person facial emotion can influence lay theories. Yet even if the observed effects were brief, these findings still demonstrate that perceivers' lay theories are contextualized by repeatedly encountered faces. This sort of contextualization may be difficult for humans to avoid—at least to the extent that they have neighbors, coworkers, friends, or people that they see semiregularly. The existence of such relationships ensures that perceivers repeatedly encounter faces, and are therefore regularly exposed to facial change or stability. Hence, in daily life these effects might accumulate and be long-lasting, potentially explaining how lay theories are created, maintained, or changed in the individual mind. The fact that perceivers' lay theories were contextualized by repeatedly encountered faces suggests that it may be possible to predict perceivers' lay theories from the expressive variability of neighbors, coworkers, and other peers.

Across several studies, change or stability in the emotional features of faces influenced cognitively elaborated beliefs about

the extent to which psychological characteristics are malleable or stable. More generally, the current findings suggest that folk psychological beliefs might be traced to the physical features of social environments. Beyond folk theories of human stability and change, individual differences in the endorsement of other "person theories" might fruitfully be explained with reference to individual differences in the sorts of faces that people encounter. Higher order social-cognitive structures such as lay theories have enormous influence on daily living (Plaks, Levy, & Dweck, 2009), yet might emerge from subtle but meaningful elements of the social environment.

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