



## When physical similarity matters: Mechanisms underlying affective learning generalization to the evaluation of novel faces

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### HIGHLIGHTS

- ▶ Participants learned to associate faces with behaviors and judged morphs of the faces.
- ▶ Learning generalized to morphs despite presence of relevant behavioral information
- ▶ Learning generalized while participants were under cognitive load
- ▶ Learning generalized despite instructions to disregard physical similarity
- ▶ Learning generalization is a powerful and relatively automatic process

### ARTICLE INFO

#### Article history:

Received 7 August 2012

Revised 7 February 2013

Available online 16 February 2013

#### Keywords:

Face learning  
Perceptual similarity  
Overgeneralization  
Trait impressions  
Automaticity

### ABSTRACT

In two experiments, participants first learned to associate faces with negative, neutral, or positive behaviors and then evaluated morphs of these faces with novel faces. Across both experiments, participants evaluated new (morph) faces that were similar to familiar negative faces more negatively than new (morph) faces that were similar to familiar positive faces. This learning generalization effect was present when participants' judgments of the new (morph) faces were a) based not only on facial appearance but also on relevant behavioral information (Experiment 1); b) made under cognitive load (Experiment 2); and c) made under instructions not to use similarity information (Experiment 2). The findings of the experiments suggest that learning generalization based on facial physical similarity is a powerful and relatively automatic process, which likely influences face evaluation across a range of circumstances.

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### Introduction

Similarity plays a fundamental role in perception, learning, and judgment. In fact, similarity is so central to our thinking that it is difficult to define. As Quine (1969) noted, "The dubiousness of this notion is itself a remarkable fact. For surely there is nothing more basic to thought and language than our sense of similarity; our sorting of things into kinds" (pg. 116). Within the domain of face perception, physical similarity is important for both face recognition and face categorization, and serves as a basic organizing principle of models of face representation (O'Toole, 2011; Rhodes & Jeffery, 2006; Rhodes & Leopold, 2011; Valentine, 1991).

Physical similarity also plays an important role in face evaluation: even when a face does not belong to a category, physical similarity to that category can act as a cue influencing people's impressions of that person. In line with this idea, people's impressions of others have been found to be sensitive to similarity along a number of dimensions, including health, age, emotion, and gender (Oosterhof & Todorov,

2008; Todorov, Said, Engell, & Oosterhof, 2008; Zebrowitz, 1996; Zebrowitz & Montepare, 2008). For example, using connectionist modeling, Zebrowitz, Fellous, Mignault, and Andreoletti (2003) found that judgments of attractiveness vary with the physical similarity of normal faces to faces with genetic anomalies, while judgments of babyfacedness vary with similarity of adult faces to the faces of babies. Similarly, both computational modeling and behavioral studies suggest that trait judgments of emotionally neutral faces result from similarity of those faces to faces expressing emotion (Montepare & Dobish, 2003; Oosterhof & Todorov, 2008, 2009; Said, Sebe, & Todorov, 2009; Zebrowitz, Kikuchi, & Fellous, 2010). To give an example, when Oosterhof and Todorov (2008) created a model representing people's trustworthiness judgments of emotionally neutral faces, they found that faces at extreme ends of the trustworthiness spectrum looked like they were expressing anger and happiness, respectively.

Although the studies mentioned above investigated how different types of physical similarity influence initial evaluation of faces, there is also evidence that these cues continue to color impressions even in more naturalistic interactions. Looking at cases in small claims court, Zebrowitz and McDonald (1991) found that babyfacedness and attractiveness influenced legal outcomes, despite the fact that judges are supposed to be making decisions based solely on the evidence

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presented to them. More generally, a series of meta-analyses found that attractive children and adults are judged and treated more positively than unattractive children and adults in a range of settings, even by those who know them (Langlois et al., 2000). Thus, appearance not only matters for initial impressions, but also continues to exert an influence even as interactions unfold.

The current work investigates a type of similarity rooted in individual experience: similarity to familiar others. Physical similarity to familiar others has previously been shown to influence impressions based on facial appearance (DeBruine, 2002, 2005; Günaydin, Zayas, Selcuk, & Hazan, 2012; Hill, Lewicki, Czyzewska, & Schuller, 1990; Kraus & Chen, 2010; Lewicki, 1985; Tanner & Maeng, 2012; Verosky & Todorov, 2010; Zebrowitz, 1996; Zebrowitz, Bronstad, & Lee, 2007; Zebrowitz, Wieneke, & White, 2008). For instance, people who believed that they were going to interact with someone whose facial features resembled their significant other were likely to infer that this interaction partner possessed characteristics of their significant other (Kraus & Chen, 2010). While this finding illustrates that facial resemblance can trigger transference of significant others' characteristics to strangers (Andersen & Cole, 1990), other work indicates that the processes by which physical similarity influences person evaluation need not be limited to significant others (Hill et al., 1990; Lewicki, 1985).

In Verosky and Todorov (2010), participants learned to associate faces with negative, neutral, and positive behaviors. Then, participants evaluated the trustworthiness of a series of morphs of novel faces with the familiar faces. Participants generalized their impressions of the familiar faces to the similar-looking novel faces, such that novel faces similar to faces associated with negative behaviors were evaluated more negatively than novel faces similar to faces associated with positive behaviors.

While Verosky and Todorov (2010) demonstrated that it is possible for social face environments to shape face preferences, it did not speak to the mechanisms underlying the effect. In the current work, we used the paradigm developed in Verosky and Todorov (2010) to investigate the possibility that use of physical similarity in the evaluation of faces is relatively automatic. Given the importance of physical similarity for face processing, it is not difficult to imagine that information about similarity to familiar others is readily available to people as they evaluate novel faces.

In the first experiment, we were interested in whether physical similarity to known others would continue to influence impressions in the presence of relevant behavioral information. If similarity to known others is treated in the same way as other appearance-related information, we would expect that it would continue to influence impressions. If however, use of physical similarity is more deliberate, we might expect that the effect would be dampened or disappear in the presence of information diagnostic for the impression.

In the second experiment, we used two experimental manipulations to explore participants' control over their use of similarity. First, in order to see whether participants could change their use of similarity information, we instructed them to either include similarity to familiar others in their judgments or to disregard it and we compared learning generalization in those conditions to learning generalization in a baseline condition without instructions. Second, we introduced a cognitive load manipulation: to the extent that use of similarity information is efficient, load should not interfere with learning generalization.

## Experiment 1

As a starting point, Experiment 1 examined whether people would continue to use physical similarity in their judgments even when there was other information available. Although appearance is often one of the first cues observers have about another person, information about their actions becomes increasingly available over time. Past research has shown that these actions have large effects on observers'

evaluations of the person (Bliss-Moreau, Barrett, & Wright, 2008; Carlston & Skowronski, 1994; Carlston, Skowronski, & Sparks, 1995; Crawford, Skowronski, Stiff, & Scherer, 2007; Skowronski, Carlston, Mae, & Crawford, 1998; Todorov & Uleman, 2002, 2003, 2004). This raises the following question: Is physical similarity to a known other simply something people rely on when there is no other information available or does it continue to color impressions as people learn more information about the person in question?

Physical similarity does not provide evidence as to the true underlying similarity between individuals, but a person's own actions can give valuable clues as to their character. Therefore, to the extent that use of physical similarity in evaluation is strategic, we might expect that people will cease to rely on this information as other information becomes available. Along these lines, Lewicki (1985) examined use of physical resemblance as a case study for what people do when they need to make a decision, but do not have sufficient information to do so. He found that when participants had a pleasant versus unpleasant interaction with an initial experimenter this affected whether they chose to interact with a second experimenter who resembled the first (both had short hair and eye glasses). While the assumption in this study was that the physical resemblance would only matter insofar as there was no other information available, this was never explicitly tested.

On the other hand, to the extent that physical similarity is treated like other sources of appearance related information, we might expect that it would continue to matter even in the presence of other behavioral information. People tend to show agreement in their judgments based on facial appearance and such appearance related information is integrated with behavioral information (Baron, Gobbini, Engell, & Todorov, 2011; Rudoy & Paller, 2009; Todorov & Olson, 2008). For example, Todorov and Olson (2008) presented trustworthy- and untrustworthy-looking faces with negative and positive behaviors and found that both the appearance of a face and the valence of behavior influenced evaluation.

The first study was designed to investigate whether learning generalization would persist even in the presence of relevant behavioral information. Participants first saw one face paired with a negative vignette, one with a neutral vignette, and one with a positive vignette (see Appendix A). Then, they were asked to evaluate a series of morphs of novel faces with the familiar faces. These new (morph) faces were presented alone, replicating Verosky and Todorov (2010), or with concurrent negative, neutral, or positive behaviors. Pairing faces with brief behavioral descriptions is a powerful manipulation, which has previously been found to change impressions of others (Bliss-Moreau et al., 2008; Todorov & Uleman, 2002, 2003, 2004). For instance, viewing faces paired with trait-implying behaviors for as little as 2 s leads to forming of corresponding trait associations with the faces (Todorov & Uleman, 2003). Given the strength of this manipulation, we were interested in whether physical similarity to the familiar faces would continue to influence evaluation of the new (morph) faces even when those faces themselves were presented with behavioral information. If participants take both behavior and physical similarity into account in their evaluation of the new (morph) faces, we should see an effect of concurrent behavioral information on evaluation of the new (morph) faces, as well as an effect of learning generalization.

## Method

### Participants

Seventy-two participants were recruited at a local shopping mall and completed the task at a booth in the mall for payment. Data from one participant who entered the same response for every face were excluded from further analysis.

### Stimuli

Stimuli consisted of 39 photographs of men with neutral facial expressions taken from a set of 62 digital black-and-white photographs

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