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Face Expertise for Unfamiliar Faces: A Commentary on Young and Burton's "Are We Face Experts?"

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Abstract
We present an argument against Young & Burton's recently proposed idea that we should be considered experts only with familiar face identities. We argue that while studying how familiar and unfamiliar face recognition differ is important, findings from this line of research do not conflict with claims of expertise with unfamiliar face identities. Here we outline several points to support the relevance of expertise to the processing of unfamiliar face identity, including discussions of how experience influences unfamiliar face recognition and how an individual differences approach to face recognition can offer critical insight into sources of variability that would be missed with work focused only on comparing familiar and unfamiliar face recognition.

Keywords
face expertise, unfamiliar faces, familiar faces, face recognition

Introduction

Young and Burton (2018, Y&B) recently published an opinion piece titled "Are we face experts?" in which they contrast their research on the importance of familiarity in face identity recognition to the idea that we are experts at face identity recognition more generally (from hereon we use the term "face recognition" to refer to the processing of face identity, as Y&B did). Y&B propose their own definition of expertise, suggesting that expertise should require experience, lead to accurate responses, and be automatic. Their discussion is based in studies revealing that people are not as good as we might like to think when making judgments about unfamiliar face identity, either in the lab or the real world. With unfamiliar faces, we can be fooled by changes in the image (e.g., pose, lighting, expression) that are not as problematic when we deal with familiar faces. This led them to conclude that we have limited expertise with unfamiliar face recognition and thus, can only truly be considered experts with familiar faces.

We argue here that there is no real conflict between previously made claims about expertise for unfamiliar faces (Carey, 1992; Tanaka & Gauthier, 1997) and more recent work suggesting that we perform better, and perhaps using different strategies, with familiar as compared with unfamiliar faces (Burton, Jenkins, Hancock, & White, 2005; Gobbini & Haxby, 2007; Natu & O'Toole, 2011; Ritchie et al., 2015). To be clear, we do not deny the importance of research on the role of familiarity in face recognition. Aside from the theoretical importance of understanding possible qualitative differences in familiar and unfamiliar face processing, there are clearly important applied implications to these results. However, we view research comparing unfamiliar and familiar face recognition as orthogonal to the question of whether we qualify as experts with unfamiliar faces. We explain as much in the following paragraphs, including reasons why we believe the framework proposed by Y&B may benefit

from a consideration of recognition in domains other than faces. In what follows, when we speak of "face recognition," we mean processing faces that are not personally familiar, although they may have been presented before in the context of a study.

The Role of Experience in Face Recognition

Y&B review work that shows unfamiliar face recognition is difficult relative to familiar face recognition, and they note in a sidebar that "recognition of unfamiliar faces is expert only in the restricted sense that it is influenced by experience" (though this does seem contradictory to their claims about the influence of experience on individual differences in unfamiliar face recognition discussed below). We agree that experience influences unfamiliar face recognition, but believe Y&B underplay how extensive this influence might be. Because it is difficult to study people with no face experience, psychologists have for decades used inverted faces as a contrast that provides a simple way to appreciate how much our processing of unfamiliar faces depends on experience (Diamond & Carey, 1986; see Figure 1; Curby & Gauthier, 2009). An obvious question stemming from this research, sidestepped in Y&B's framework, is whether our ability to learn robust representations for familiar people depends on those skills that make unfamiliar upright face recognition much easier than unfamiliar inverted face recognition.

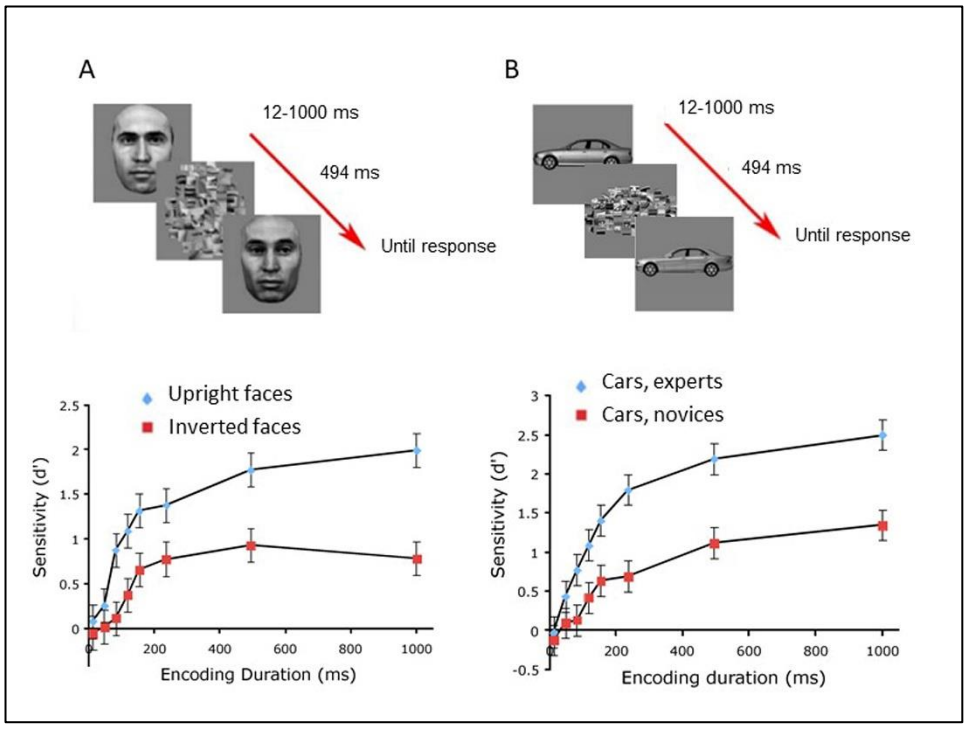

Figure 1. (A) Backward masking experiment with upright unfamiliar faces shows that performance matching identity while ignoring irrelevant image differences, rises above chance between 33 and 70 ms earlier than for unfamiliar inverted faces, not even repeated during the experiment. (B) The same pattern found with upright cars, in car experts vs. car novices. Adapted from Curby & Gauthier (2009).

Another way to deal with the inherent difficulty in studying people with no face experience is to study those with relatively less face experience. Recent work finds that individuals from smaller hometowns show poorer face recognition on average as compared

with those from larger hometowns (Balas & Saville, 2015, 2017; Sunday, Dodd, Tomarken, & Gauthier, in press). Interestingly, the effect has been replicated several times using the Cambridge Face Memory Test (Duchaine & Nakayama, 2006), a task that measures the ability to learn six unfamiliar faces from a few novel viewpoints, while no effect was observed on a test of unfamiliar face matching. Given this work's correlational nature, we cannot be certain what causes this effect, but it seems highly likely that some aspect of experience living in small vs. large hometowns accounts for these effects, thereby challenging Y&B's claim that expertise cannot explain individual differences in unfamiliar face recognition.

In one study (Sunday et al., in press) subjects were also tested with many non-face categories, and face and car recognition were found to be less strongly correlated with general object recognition in people from small, as compared with large, hometowns. In other words, early experience with many instances of a category may change the representations or mechanisms applied to this category. It is currently unknown what aspect of early experience is critical for the specialization of face recognition, whether it is the larger number of unfamiliar faces one may experience in large cities, or whether people in large cities become familiar with more people. Early childhood experience has implications for the processing of unfamiliar faces (De Heering, De Liedekerke, Deboni, & Rossion, 2010; Sangrigoli, Pallier, Argenti, Ventureyra, & De Schonen, 2005) and, possibly, for the manner in which we learn familiar faces too.

We should be studying how different aspects of experience build on each other to develop perceptual expertise. For instance, research on familiarity effects could adopt the approach used in many perceptual expertise studies of seeking to produce hallmarks of face processing with non-face categories. Besides learning whether the effects are face-specific, this approach can speak to whether one kind of learning requires a prior kind of experience. For instance, monkeys who have been face-deprived from birth do not show face-specific activity in their visual system or the preferential looking at faces over hands typically seen in animals with early face experience (Arcaro, Schade, Vincent, Ponce, & Livingstone, 2017). But training studies in adults with non-face objects suggest that some expertise effects can be acquired without this pre-exposure (Chua, Richler, & Gauthier, 2014).

Individual Differences and Experience

Y&B state that expert perception should be accurate (or at least reach a high consensus) but this may only apply to the best of the best performers in any field. Even the best radiologists may encounter specimen ambiguous enough that they may not easily agree. This is why it is helpful to measure performance on a continuum (Gauthier et al., 2014) as there is no single performance threshold that separates novice from expert. We do not wish to argue that performance should play no role in the definition of expertise, but rather that performance in one domain should be placed in the context of performance in a range of domains. Individual differences in face and object recognition have become of increasing interest in recent years. Some studies have addressed the extent to which variability is driven by experience or by stable abilities, in some cases heritable (Shakeshaft & Plomin, 2015). Y&B set as a criterion that expert perception must come from experience, and there is no question that familiarity must reflect experience. But they make some confusing claims about the limits of experience in unfamiliar face processing. They write "While there are substantial interindividual differences in unfamiliar face recognition ability, these are little affected by experience. For example, despite their training and extensive practice, passport officers and others who use face recognition throughout their working lives show the same variability in performance as the rest of the population." However, whether or not the training that passport officers receive leads to better performance with unfamiliar faces does not preclude that they may process unfamiliar human faces much more efficiently than they do

monkey faces, or other equally homogeneous categories. In other words, training with unfamiliar faces may not affect the variability across people in performance with unfamiliar face recognition, but this does not imply experience cannot influence this variability when compared with completely unexperienced categories.

Research suggests that up to half the variance on unfamiliar face tests is heritable (Wilmer et al., 2010), which also means that a great deal of variance remains for experience effects. Indeed, a few hours of experience with a race of faces influences the extent to which new faces of this race are processed holistically (Chua, Richler, & Gauthier, 2014) and can improve perceptual discrimination of unfamiliar exemplars (McGugin, Tanaka, Lebrecht, Tarr, & Gauthier, 2011). In contrast, focusing solely on familiar face recognition makes it difficult to address questions about the origins of individual differences. Given the same experience with a person named Mary, why would someone reach higher performance recognizing her? Is there any evidence that this variability is not explained by differences that can be measured for processing unfamiliar faces? Even with regards to individual differences, we argue it is important to consider expertise effects and familiarity effects together.

While considering new individual differences work on familiar and unfamiliar face recognition, it is important to properly contextualize this work within the field of face expertise research. Specifically, the idea that people may have expertise with face recognition was originally proposed to explain errors with faces, not good face performance (which is difficult to define, especially given lab tasks specifically designed to avoid ceiling effects). When Diamond & Carey presented the idea (1986), they wanted to account for why face recognition is more sensitive to inversion in the picture plane than the recognition of other objects (Yin, 1969). Similarly, when designing methods to train artificial-object expertise in the laboratory (Gauthier & Tarr, 1997; Gauthier, Tarr, Anderson, Skudlarski, & Gore, 1999), the idea was to account for the following: (1) why face recognition is more sensitive to configural transformations than the recognition of other objects (Diamond & Carey, 1986; Rhodes & Mclean, 1990); and (2) why seeing faces engages a part of the fusiform gyrus more than seeing other objects (Gauthier et al., 1999; Tarr & Gauthier, 2000). Exactly how good we are at face recognition was not the targeted phenomenon. In fact, in expertise studies, good face performance is mainly invoked to make the case that people would show much poorer face performance without any experience with faces. In sum, it is not good performance with faces that motivated the notion of expertise with faces, but the surprising errors that more often occur with faces than objects: poor performance with inverted faces (Yin, 1969), inverted faces with inverted features (Thatcher illusion; Thompson, 1980) or face composites (composite effect; Young, Hellawell, & Hay, 1987).

Familiar Face Recognition as a Transferable Skill

Y&B choose to evaluate our ability with unfamiliar faces against performance on what is arguably a different task, that of matching faces with which we have a great deal of experience recognizing. As an analogy, a violinist's performance when sight-reading a new piece could seem unimpressive in comparison to her performance when playing a piece she has practiced for years, but sight-reading remains a complex and interesting skill. Like sight-reading, face recognition is difficult, and even with experience we still make errors. It is interesting that some of these errors can be avoided when we have more experience with a specific face, but such improvements only apply to the specific face and do not transfer to other faces.

It may appear rather trivial whether one wishes to reserve the term "expertise" for performance with highly familiar objects or use the term to account for changes that apply to all exemplars of the class (relative to novice processing). Indeed, we are not particularly concerned with that preference and the focus it

may encourage on one or the other end of the performance spectrum. But what may be counterproductive is to oppose familiarity effects with experience effects that generalize to processing of unfamiliar exemplars. With regard to faces, learning familiar and unfamiliar faces may be related in interesting ways. For instance, do exemplar-specific familiarity effects build on class-general expertise effects? Is holistic processing affected by familiarity? None of the findings that speak to how well we can learn familiar faces bear on what has been learned so far about our expertise with unfamiliar faces, but the theories developed to account for familiar face recognition could be stronger by building on what we have learned so far about expertise with unfamiliar faces. The recognition mechanisms may be the same for two familiar faces, as discussed by Y&B, but familiarity is acquired one face at a time, as we learn idiosyncratic information about each person. Thus, it remains an open question whether the generality mechanisms that allow us to become sufficiently familiar with a person to ignore irrelevant image variability is something that could be considered a transferable skill and whether this mechanism differs from the mechanism used to make unfamiliar faces become familiar. When Y&B write, "In fact our ability to learn the characteristics of a familiar face seems to surmount some of the limitations that are evident with unfamiliar faces," they invoke the skills that we bring to the task of making unfamiliar faces familiar.

Familiarity and Expertise Could Exist Along a Continuum

Expertise studies have generally focused not on efficient face recognition but on how unfamiliar faces are perceived differently from objects and whether expertise with other objects can yield the same effects. Importantly, none of these interesting differences between unfamiliar faces and objects are challenged by Y&B's evidence. Figure 2 shows a continuum of judgments, from easy basic-level object recognition to more difficult subordinate-level judgments, which are more difficult than basic-level judgments when made by novices, but are relatively easier for experts (or at least can be performed as fast as basic-level judgments by experts; see Tanaka & Taylor, 1991). Additional experience with some categories can lead to even better performance for exemplars that are highly familiar. The question of what happens when we learn a face in a variety of visual conditions, and associate it with semantic information, is an important one. However, addressing these questions will not negate the fact that experience also influences the processing of unfamiliar exemplars (e.g., Gauthier & Tarr, 1997; Chua, Richler & Gauthier, 2014). More generally, here we hope to have shown that while studying familiarity effects is certainly a worthwhile pursuit, it may be counterproductive to downplay the expertise we bring to bear when we process the identity of unfamiliar faces.

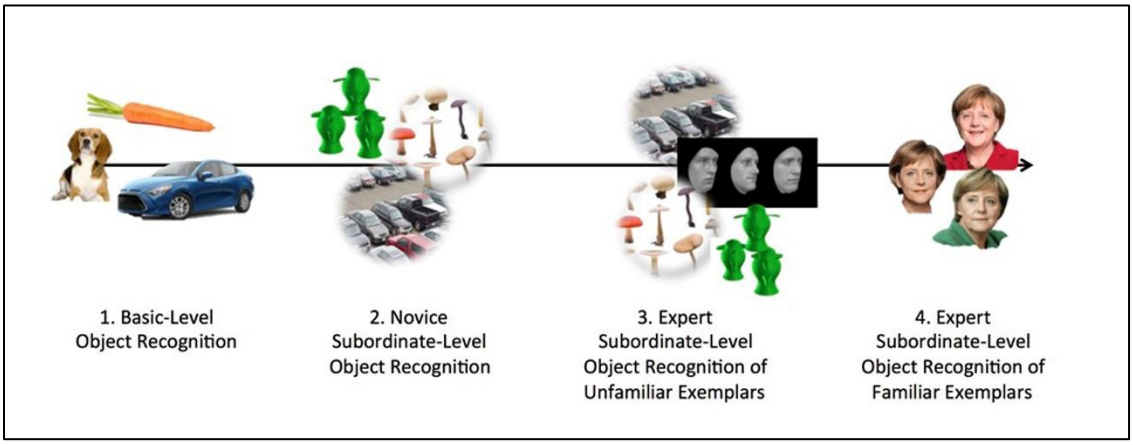

Figure 2. Continuum of object recognition judgments from easiest (left) to hardest (right).

Authors' Declarations

The authors declare that there are no personal or financial conflicts of interest regarding the research in this article.

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