Summer 2013 Prosopagnosia Research Center

Face to Face

Prosopagnosia Research & Community

Welcome to our seventh edition of *Face to Face*! In this issue we are proud to present information on both new and classic face perception research, as well as a continued look at first hand experiences on the face recognition spectrum. As always, we look forward to hearing your feedback and questions, and hope that you will enjoy this issue's stories and science!

-Prosopagnosia Research Center (faceblind@faceblind.org)

Recognizing Difference

You may have seen the 60 Minutes piece on Prosopagnosia with Lesley Stahl in 2012. In addition to featuring a number of prosopagnosics, Lesley also spoke with someone who is a "super recognizer" – someone who seems to never forget a face. After the piece aired, we started receiving emails from people who thought they too are super recognizers. Our group has investigated super recognizers in the past, and this flurry of new communication has inspired us to expand our investigations in new directions.*

Recently, we traveled to meet some of these people, and our conversations about their face recognition experiences were similarly as interesting as those we've had with many of you! One in particular grabbed our attention because of how comparable it seemed to some of the personal frustrations you've shared with us. We hope this story will provide an interesting window into another world that seems entirely different, but might not be so different after all…
**(Click here or Google "60 Minutes Prosopagnosia" to watch!)*

"How wonderful it must be," someone recently speculated, "to know that you know who you know." But, I protest, a year and a half ago, I didn't.

Some friends were passing around a facial recognition test online and reporting their scores. Before taking the test, I honestly could not have predicted how I would do on it, and imagined that I would score quite low on it. I've had a lifelong anxiety about recognizing people, feeling that there was some mechanism other people have that I don't. Social interactions often feel awkward, as if I can't figure out the proper timing. If approaching someone coming from far away, *when* do I say hello? Why do people react as if I am bothering them with my greeting?

Until I found out that I'm extremely good at recognizing faces - a "super-recognizer" - I assumed it had something to do with having been a bookish loner as a kid. Maybe I failed to figure out some social script everyone else seemed to know - that you can't simply…

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An Inability to Grasp the 'Whole Face'

Throughout interviews with those who experience prosopagnosia we've found a common thread – *many* comment on their difficulty in visualizing a full face. Some have said they can call to mind images of specific facial features of those close to them, but cannot visualize all the parts of the face together. Others have said they get lost in the parts of a face and it's like they can't see the forest for the trees. In published literature both acquired and developmental prosopagnosics have complained that they are unable to grasp the "whole" face. So, does this mean that this difficulty in seeing or visualizing the face as a whole is fundamental to prosopagnosia?

The ability to see a face as a whole has been widely studied by researchers and is thought to be one of the key ways in which face processing is distinct from object processing. Though definitions of this 'holistic processing' of faces vary, it has commonly been described as the simultaneous integration of parts and spacing information into a single coherent visual representation. Research has also shown that greater holistic processing is associated with enhanced face recognition abilities. Though there exists good evidence that holistic processing is lacking in cases of acquired prosopagnosia, evidence for holistic processing deficits in *developmental* prosopagnosics (DPs) has been incomplete and inconsistent. The face inversion effect, the oldest (1969) and most established task used to measure holistic processing, has consistently shown that those with neurotypical face recognition skills recognize upright faces significantly better than inverted faces. In contrast, developmental prosopagnosics often show less of an inversion effect, or no effect at all, suggesting limited holistic processing. Unfortunately, these results do not specify the source of DPs' holistic processing limitations. For example, when you alter variables of inversion tasks – such as showing target and test images at the same time or sequentially, or testing with only front-view faces or across viewpoints – the results don't change significantly, meaning we don't learn much about the underlying mechanisms in play.

A second classic measure of holistic processing – the Composite Effect (1987) - asks viewers to judge whether two face top-halves are the same or different when they are aligned or misaligned with bottom face-halves. The advantage one gets for making this judgment when the halves are misaligned is what indicates holistic processing. The Composite task has shown inconsistent results in DPs, potentially because DPs' strategies may differ from control participants.

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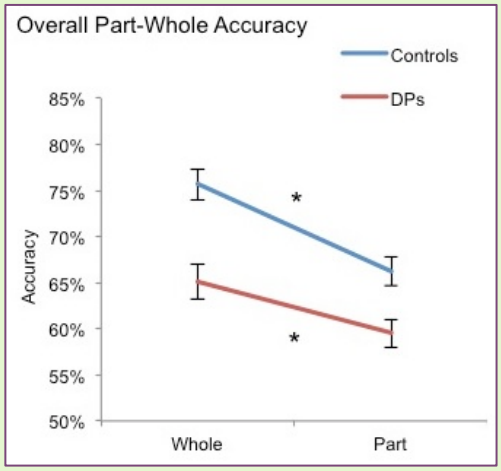
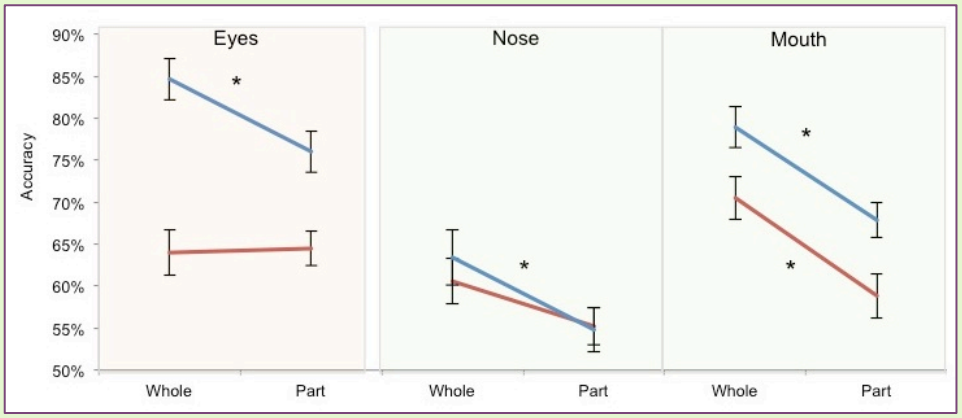
We chose to explore holistic processing in developmental prosopagnosia with a third task called the Part-Whole task (1993). In the Part-Whole task, the participant briefly studies a whole target face and is required to identify this face when tested with either two whole faces (that differ in the eyes, nose, or mouth parts), or two sets of eyes, noses, or mouths in isolation. As the part tested for each trial is randomized, to succeed participants must attend to the whole of the target face rather than trying to remember individual pieces. To test yourself, look at the whole face on this page outlined in red (to mimic test conditions look at it for only one second), and then turn to the bottom of the next page to see if you can identify which of the two options match the target face. Come back to this page and look at the whole face outlined in blue, and then turn to the bottom of the last page to see the test image. Not knowing which face part will change within the whole, or on which individual part you'll be tested is what taps into holistic processing, so to get the full effect don't flip back and forth between them! Was it easier or harder to identify the correct answer when the part-change was within the context of the full face? For most, it is significantly easier, but if you have prosopagnosia, it might not be!

In our study, we had 38 participants who have prosopagnosia and 38 who do not, the average participant age being early to mid-30s. Our goal was to determine whether DPs showed differences in holistic processing from neurotypical individuals, as well as to analyze the processing of the mouth, nose, and eyes regions separately to hopefully clarify the source of potential holistic deficits.



Overall (looking at all face part trial types combined) we found that participants without prosopagnosia showed a 10% holistic advantage (whole trials minus part trials, 76% accurate on whole trials, 66% on part trials) and those with developmental prosopagnosia showed half the size of that holistic advantage, scoring 65% on whole trials and 60% on part trials. However, when we compared whole and part scores for each of the three face regions, we found an unexpected pattern. Rather than showing a deficit on each face part that combined to an overall deficit in holistic processing, those with prosopagnosia only showed a holistic deficit in the eye region - their holistic advantage for the mouth region was nearly identical to neurotypical individuals! We also found a trend indicating that those DPs who are more proficient at face recognition show more holistic processing of the mouth region (the opposite trend is found in those without prosopagnosia).

It's important to note that the differences in holistic processing between the eyes and mouth trials could not be explained by DPs attending to the mouth more at the expense of the eyes. We investigated this possibility by comparing accuracy on part trials only for each of the face regions between our two groups. If a participant was attending more to the mouth region over the eyes region, this would have increased performance on part trials as well as whole trials. When we broke down this data we found that not only were those with prosopagnosia actually performing the best on eyes parts trials, the ratios of performance were very similar between our two groups.



Though there is the least amount of data from prosopagnosics on this task (only one report using the standard version), out of the three traditional holistic processing measures it may have the most potential in quantifying and localizing deficits. Advantages are that it requires attending to all the inner components of the face at once, and that it can allow for measurement of participants' strategy by looking for differences between processing of the different face parts. For example, if someone were always focusing on a particular face part (for now, let's say the mouth) and not the whole face when shown the target image, they would always get the part trials for the eyes and nose wrong, and that would give us specific information about their processing strategy. These advantages are especially interesting as the research literature is abundant with indication that the eye region is most important to successful face recognition.

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...greet people as if you expect them to acknowledge you back. These episodes became more frequent as I began attending academic conferences as a graduate student in literature; I was pained that professional hierarchy seemed to prevent mutual acknowledgment from established scholars who attended my presentations.

As a young Ph.D. in the worst academic job market in recent memory, I worried about why I was introducing myself ten and fifteen times to people whose acquaintance I thought I had sufficiently made a decade ago. There is a ritual we repeat about twice a year. I say hello warmly, there is a moment of confusion, and then a wary hand extends while the eyes drop in search of a nametag.

Finally, a few years ago, I decided I had had enough. "I'm getting pretty sick of this," I declared to one man who had - yet again - asked a mutual friend to introduce us. "Is there any point at which you could condescend to know who I am?" As a slightly more advanced scholar, one who had repeatedly expressed an interest in my work, he had struck me as artificially cold, as if acknowledging me as familiar would place some weight of obligation on him.

"Carrie!" he exclaimed. "Of course I know you. I'm so sorry. I have this thing called prosopagnosia; I wouldn't recognize my own wife if I ran into her at the grocery store. Besides," he stammered, "you cut your hair." It was true. I had recently traded a lion's mane of dark blonde curls for the buzz-cut of a 1950s midwestern boy. For people like me, incidental aspects of appearance like hair, weight, age, and makeup don't have anything to do with recognition. I know that I know people, even if I don't remember from when or where. When I visit my old neighborhood in Brooklyn, I can tell you who moved there in the three years since I left, and who are the old-timers.

Living in New York City poses a vast array of bizarre dilemmas for the super-recognizer. Does the man at the next table at this restaurant *know* that we had an awkward date seven years ago that ended in tears? Is the woman coming toward me on this sidewalk someone I have very fond feelings for because I know her or - *Hello! How are you?* - oh no, it's Kathleen Turner, whom I definitely do not know socially. Is the former student who got a B- (the most loathed of all freshman English grades) avoiding me in this clothing shop because he resents me, or because he has no idea who I am?

Now that I have some idea that my facial perception is abnormal, I have a way to pause the paranoid thinking that super-recognition can inspire. Maybe it's *not* that I'm Frankenstein's monster, doomed to imagine friendships with people who have no reason to know who I am. Maybe it's *not* that I have chosen a career in which established people snub the precariously employed. Maybe it's just that I cut my hair, and now I need to reintroduce myself.

The instant my colleague at the conference said "prosopagnosia," I slapped my forehead and explained that I'd recently found out that I might have "whatever the opposite of that is." We were both mortified (I still am) and ended up trading stories about the way that abnormal facial recognition can make something like a professional event seem like a minefield.

In my own work, I study the ways that poets, novelists, and philosophers of the eighteenth century represented sensory perception. How do you get a reader to feel along with a text when you don't know how that reader might feel - or see, hear, taste, or smell - anything? Authors of that time disagreed fundamentally about how people perceive the world - what it *feels* like to love, hit, kiss, or recognize a face.

Laurence Sterne proposed an elegant solution to this problem in his novel *Tristram Shandy*. As the narrator begins to introduce an attractive widow late in the book, he announces that he will not attempt to describe her beauty, lest his reader have a very different idea of what loveliness is. Instead, next to a blank page, he invites you to get a pen and "paint her to your own mind." At the same time that you feel invited to represent your idea of a beautiful face, you realize you are never more completely alone than when thinking about perception.

Considering the problem of such a wide range of facial recognition ability, I am learning the limitations of only knowing my own mind, and that the speculations I make about the behavior of others have been necessarily based on my own perception. It is a great relief to find that recognition is not a moral failure, nor a social one. Having a language to talk about it with those who perceive differently has been the most important discovery. *V - Carrie Shanafelt, Assistant Professor of English, Grinnell College*

What are these pictures doing here? Read the other article on page 1!

What's Going On…

The Centre for Face Processing Disorders at Bournemouth University (UK) has created an e-petition to lobby for prosopagnosia to become a formally recognized condition. To get the issue debated in the House of Commons they need 100,000 signatures on the petition.

To read the petition and add your signature, visit:
http://prosopagnosiaresearch.org/awareness/e-petition

An Inability to… - continued from pg. 2

This work has several implications for prosopagnosia. It suggests that the eye region is the most difficult area of the face for prosopagnosics to 'see' in a holistic manner, even when they are paying attention to that region. This is likely because the many elements (e.g., eyebrows, eyelids, eyelashes, etc.) and the complex topography of the eye region overwhelm prosopagnosics' holistic processing abilities. It also somewhat distinguishes prosopagnosia from autistic spectrum disorders (ASD); it is commonly found that individuals with ASD do not attend to the eye region because they find it socially aversive. In contrast, prosopagnosics may attend to the eye region and typically make eye contact, but simply do not have the perceptual abilities to process the eye region holistically. Future work understanding more about how prosopagnosics process the eye region could not only lead to a better understanding of the underlying mechanisms, but also lead to the development of useful treatments. ∇ *by Sarah Cohan & Dr. Joe DeGutis*

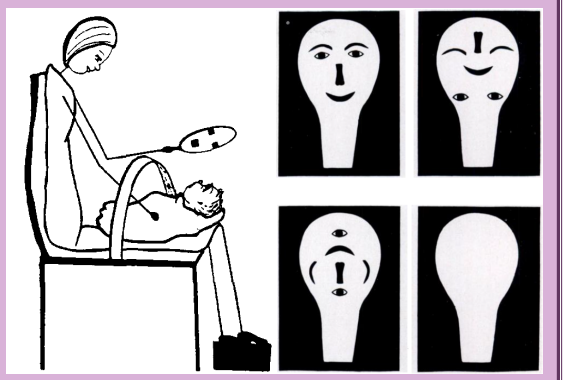
To read more about this research and view images from the actual test used, visit
www.visionlab.harvard.edu/Members/Ken/Papers/173DeGutisHolisticProso2012.pdf

The Classics

In this section, we summarize a classic paper in face recognition research. If you would like access to the original article, or want to know more about follow-up studies, please e-mail lab member Dr. Lucia Garrido at garridolucia@gmail.com.

Goren, Sarty, & Wu (1975). Visual following and pattern discrimination of face-like stimuli by newborn infants. *Pediatrics, 56*, 544-549.

This study showed that newborn babies follow face-like patterns with their heads and eyes for longer, when compared to other visual stimuli. This happens with babies tested just a few minutes after birth.



The researchers tested babies about nine minutes after they were born. With each baby, one researcher held them on their lap, and showed them one stimulus at a time, rotating the stimulus around the baby's head (see figure). The stimuli were the ones shown in the figure (face-like pattern, two stimuli with scrambled face parts, and a blank head shape), and they were presented in a random order. Importantly, the researchers could not see which stimulus the baby was looking at. The results showed that newborn babies follow or track the face-like patterns for longer than the other stimuli. Because babies show this behavior with no or very little visual experience of the world, these results suggest innate preferences and brain mechanisms devoted to faces, and thus have been very influential for theories of face recognition. ∇