

'I never forget a face!'

Josh P. Davis, Ashok Jansari and Karen Lander investigate super-recognisers in the police and the general public

There are large individual differences in face-recognition ability. Prosopagnosics – or sufferers from face blindness appear at one end of the scale. A large body of research has examined this deficit and considerably enhanced our knowledge of how all human's process faces. Far less research has been conducted on super-recognisers who have the extraordinary ability to be able to recognise people they have only seen fleetingly. This article describes recent research conducted on super-recognisers, such as police officers who have used these skills to enhance detection rates.

question

Prosopagnosia has been used to demonstrate that faces and objects are processed using different mechanisms. Might super-recognisers be able to provide further information as to whether faces are processed using specialised neural pathways?

resources

Russell, R., Duchaine, B. & Nakayama, K. (2009). Super-recognizers: People with extraordinary face recognition ability. *Psychonomic Bulletin & Review*, 16, 252–257.
Online test to find out whether you could be a super-recogniser: tinyurl.com/ozypwvb

The August 2011 riots in London and elsewhere shone an extremely negative light on the UK. As well as intense criticism of the lawbreakers, there was some media disapproval of the police response. However, one unit of the Metropolitan Police Service generated positive publicity: the Visual Images, Identifications and Detections Office (VIIDO).

This unit is tasked with the collection, distribution and publication of all crime scene images in London. Over 4000 images were published and many rioters were recognised and apprehended. However, partly due to the high profile of the offences, what had previously been known within police circles became public knowledge. Although most witness (public and police) identifications from such images in London are 'one-offs', a substantial minority are made by a small circle of police officers. One officer identified 190 sometimes heavily disguised rioters, and in 2011, from approximately 5000 images, 20 officers identified 609 suspects. A few regularly identify over 40 per annum, and some have received official commendations.

It is impossible to know the 'ground truth' as to suspect guilt, despite subsequent legal decisions; nevertheless, when confronted with CCTV images, over 75 per cent confess in police interview.

"One officer identified 190 sometimes heavily disguised rioters"

Therefore, some of these officers might feasibly be prime candidates for the title 'super-recogniser,' as first described in a study by Russell et al. (2009), particularly as they also scored extremely highly on a series of unfamiliar and familiar face-recognition tests (Davis et al., 2013).

But what are 'super-recognisers'? What do their extreme capabilities tell us about the functional organisation of the human brain? And would you want to be a super recogniser?

From prosopagnosia to super-recognisers

Most previous research on extreme levels of face-recognition ability has examined prosopagnosics – those suffering 'face blindness'. Acquired prosopagnosia occurs following brain damage, with sufferers losing the ability to recognise familiar faces, while sometimes retaining object-recognition ability (e.g. Rossion et al., 2003). Developmental or congenital prosopagnosia may be the result of

prenatal brain damage, or the consequence of a genetic inheritance (Duchaine et al., 2007; Wilmer et al., 2010). The prevalence of developmental prosopagnosia in the population may be 2 per cent (Kennerknecht et al., 2006),

although some, perhaps surprisingly, appear unaware that they are disadvantaged as they recognise people through voice and other cues.

In contrast, some people feel they are better than average at recognising faces. In a 2009 paper led by a Harvard University postdoctoral researcher, Richard Russell, four such people self-identifying as possessing superior face-recognition ability were scored on standardised unfamiliar face-processing and memory tests, and a familiar face-recognition test. These included the Cambridge Face Memory Test, designed to isolate face-specific mechanisms as the images possess no hair or other identity cues, and a Before They Were Famous Test, in which participants

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attempt to identify photos of celebrities taken mainly when children. All four participants scored close to ceiling, and far in excess of controls. In fact, using the Cambridge Face Memory Test, the researchers found that their 'super-recognisers' performed an equal number of standard deviations above the population mean (2 SD), as those suffering prosopagnosia perform below the mean. They suggest that this level of performance therefore provides a working definition of super-recognition, although further research with a far larger pool of

cortical networks (Duchaine & Nakayama, 2006).

However, alternative 'domain-general' theories suggest that prosopagnosia represents a breakdown in the processes associated with the recognition of objects for which the sufferer possesses expertise, in this case faces (e.g. Kanwisher, 2000; Tarr & Gauthier, 2000). Indeed, there is some neurological evidence that these processes may be employed by experts in other within-class objects. For instance, Gauthier et al. (2000) found that when bird- and car-experts viewed exemplars of their category of expertise, they recruited the same cortical areas – the fusiform gyrus – as most of us use when processing faces. Again, these processes might somehow be more effectively organised in super recognisers.

There is also the faint possibility that some super-recognisers have undergone an unidentified and unobserved cerebral event that has enhanced their face-recognition abilities. In a recent edition of *The Psychologist* individuals were described who, due to a cerebral paradox, subsequently possessed enhanced

cognitive abilities in some other domains (Kapur et al., 2013).

Can we find parallels with other extreme abilities? Artists such as Stephen Wiltshire are able to recreate from memory visual panoramas in extremely fine detail, evidence of photographic or eidetic memory, and this skill might draw on similar processes to those employed by super-recognisers. But faces are special: they are dynamic, they change appearance over time... high performers on the Before they were Famous Test are required to make identity inferences that go beyond

performing a simple match with memory. This all makes super-recognisers particularly intriguing, as the face provides more social cues than just identity – the importance of the face to our understanding of the world starts very early. Newborn infants prefer looking at schematic face shapes over jumbled images (Goren et al., 1975), and appear able to distinguish their mother from other women after two days (Bushnell et al., 1989). Twin studies have revealed that face-recognition ability is heritable (Wilmer et al., 2010), and prosopagnosia has been identified in multiple close family members (e.g. Duchaine et al., 2007). Although there is currently no empirical support for the notion, it might therefore be possible that super-recognisers also share their ability with close relatives.

The police

The 2011 UK riots occurred at approximately the same time as many of the police officers identifying large numbers of suspects from CCTV had completed a battery of familiar and unfamiliar face recognition and matching tests (Davis et al., 2013). Approximately 100 members of the public were also recruited to act as controls. Parts of this research were presented at the Annual Conference of the British Psychological Society Cognitive Psychology Section in September 2012.

The officers were asked about their own face-recognition abilities and whether they thought them to be inherited. Many, but not all, professed a strong self-belief in their own face-recognition skills. However, none suggested that family members were similarly good at face recognition. Nevertheless, the officers did provide insightful anecdotes. One spotted and arrested a robber walking along a busy high street, 18 months after last viewing him in a poor-quality video of an armed robbery. Another arrested a suspect eight months after viewing an E-FIT facial composite. A third recognised a distinctive scar, last seen 10 years previously. Indeed,



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participants is necessary to establish a reliable standard.

The 'super-recognisers' in the Russell et al. (2009) study believed their enhanced abilities to be restricted to the recognition of faces, and not associated with general visual memory. Although no tests were reported to confirm this, it would be consistent with the face-specific deficits in prosopagnosia. The otherwise normal visual acuity and cognitive function seen in this condition provide evidence for theoretical models suggesting that faces are processed by domain-specific

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many claimed identifications were based on idiosyncratic facial features. These could be tattoos or scars, and sometimes 'the eyes'. Some also asserted decisions were often based on gait or distinctive clothing such as designer training shoes.

However, these unstructured interviews did not reveal any meta-cognitive or mnemonic tactic that could distinguish between those scoring high or low on the subsequent face-recognition tasks. Indeed, those officers articulating a greater quantity of information about their own face-recognition 'strategies', often performed worse than other officers on empirical tests of face recognition. Of course, describing a face is a difficult task, and describing how we remember a face may not be possible to articulate.

But just how 'super' are these abilities anyway? Recognising familiar faces from even the poorest images tends to be highly reliable (Bruce et al., 2001; Burton et al., 1999), and most of the identifications made by the officers were of familiar local suspects. This would not require a special talent. Moreover, seemingly extraordinary anecdotes like those described above may, outside of a forensic context, be occasionally experienced by most of us. How would the police officers fare with less familiar targets? The tests showed (Davis et al., 2013) that many of them were superior to the controls on a celebrity-recognition test, even when controlling for those faces the participants claimed they were unfamiliar with and consequently would never have recognised. This test employed highly degraded 12-year-old images, the appearance of some of those depicted had substantially changed, and while some of the celebrities are still regularly in the public eye, some possessed a far lower profile at the time of testing. The police officers were also more accurate than controls on two unfamiliar face recognition tests as well as on a face-matching task requiring no memory, although effect sizes were smaller. The best face recognisers were not particularly good at an object (flowers) recognition test. This would be



Police officers as a group do not tend to be better at face recognition than members of the public

consistent with the anecdotal observations of Russell et al. (2009), that the talent of super-recognisers may be limited to faces.

One interesting observation made by a few of the predominantly white male police officers was that they had identified a far greater number of black than white suspects. These officers also stated the belief they were better at recognising black faces than white faces. Unfortunately however, the battery of tests used in the study all depicted white faces, so this assertion could not be verified. This is a particularly surprising claim as the cross-race effect is one of the strongest findings from the eyewitness identification and face-recognition literature (Meissner & Brigham, 2001), with most people far more accurate at own-race than other-race recognition. However, a belief in one's own face-recognition ability is grounded in the truth (Olsson & Juslin, 1999; Russell et al., 2009), and although this is not necessarily true with faces from other races (Hourihan et al., 2012), these officers' self-evaluations may be accurate. The cross-race effect is also moderated by experience, and it is possible that an enhanced ability to recognise other-race faces may be acquired from extensive contact. For a police officer this may involve specialising in a crime type within a geographical area, populated by those from specific ethnic backgrounds.

Some of the high-performing police officers also suggested that, required to be vigilant, they may have enhanced their face-recognition ability through experience of dealing with large numbers of criminals. This is unlikely to be the entire explanation for their ability, as police officers as a group do not tend to be better at face recognition than members of the public (e.g. Burton et al., 1999). It should also be noted that some of the police officers recorded distinctly average results on many of the tests, even though they were the most successful at suspect recognition from CCTV. Possible explanations include that they found the empirical testing stressful, or that their suspect identifications may be exclusively of highly familiar individuals. Nevertheless, for the police a super-recogniser does not need to be extraordinarily good at face recognition; they just need to meticulously scan the regularly updated large database of published suspect images, occasionally recognising one, while always knowing the vast majority will be unknown.

The general population

As the police officers were being tested, an entirely independent project was coincidentally commencing at London's Science Museum. Ashok Jansari (the second author of this article) organised a three-month 'Live Science' project in an attempt to recruit members of the general public for a replication of the Russell et al. (2009) study in a British context and with a larger sample. The Science Museum study employed the Cambridge Face Memory Test (CFMT) previously used by Russell and colleagues, as well as a modified British Before They Were Famous Test to provide an indication of the prevalence of super-recognisers in the general population. Over 700 museum visitors ranging in age from 6 to 74 took the tests. The results from the study are being prepared for publication, but preliminary results showed that on the

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CFMT, there was a roughly normal distribution with fewer than 10 individuals scoring within the 'super-recognition' criteria of two standard deviations above the mean established by Russell et al. (2009). These results therefore support the suggestions of Russell et al., that less than 2 per cent of the population may be classified as super-recognisers. An important distinction between these studies and the Davis et al. study in which police officers were recruited, is the manner in which individuals were classified into the 'super-recogniser' category. The police officers had all performed exceptionally well at face recognition in an operational role. In contrast, the Science Museum and Russell et al. study classified super-recognisers according to scores on specific cognitive tests. One important issue for future research is to address a reliable working definition of super-recognition, by directly comparing the participants tested in the two British-based studies.

Although few studies have specifically examined super-recognisers, large consistent individual differences in unfamiliar face-identification accuracy have been found across different tasks (e.g. Burton et al., 2010; Megreya & Burton, 2006, 2008). These differences can predict eyewitness accuracy (Bindemann et al., 2012), and even personality (Li et al., 2010). Extraverts are better at face recognition than introverts. There is also a relationship between facial recognition ability and holistic or whole-face processing (Wang et al., 2012). Holistic processing can be demonstrated using the composite face effect in which the top half of one face is placed above the bottom half of a second. Most of us have difficulty deciding whether the upper halves of the two images depict the same, or different individuals. Holistic processing binds the two face halves and the configurations of facial features together. This seems to happen automatically with no conscious control, thereby making a judgement based on simply the top half of the image difficult. This holistic binding is broken when the face parts are misaligned making discrimination of the two halves easier.

Another demonstration of holistic face processing is that most people find the recognition of inverted faces far harder than when they are upright. This was true of the super-recognisers in the sample tested by Russell and colleagues (2009). This suggests that holistic binding may be broken when faces are inverted, so that they are processed in a less efficient feature-by-feature manner. In contrast,

prosopagnosics do not find inverted face processing additionally demanding – they are poor with faces regardless of alignment, suggesting they have to rely on feature-based processing. Indeed, this lack of an ability to bind facial features together holistically may be one of the primary deficits of prosopagnosia. Furthermore, object recognition appears not to be dependent on holistic processing, as objects are less affected by inversion than faces (e.g. Valentine & Bruce, 1986), again adding to evidence for domain-specific processing mechanisms.

A third holistic paradigm is the whole-part effect, in which it is harder to recognise facial features outside the context of a whole face. Recent research with over 300 participants by Wang et al. (2012) found that when the influence of general visual recognition and other cognitive abilities was extracted, holistic processing as independently measured by the whole-part effect and the composite face effect paradigms predicted face-specific recognition ability. The best face

recognisers appear to employ holistic face processing to a greater extent than those who are worse at face recognition. The

authors did not actively recruit super-recognisers,

although with such a large number of participants it might be expected that some participated. These results are consistent with the untested proposal, that whereas prosopagnosia is associated with the breakdown of holistic binding, super-recognisers may potentially possess an enhanced form of holistic processing. This might prove a fruitful topic for future research.

Applications

As noted, very little is currently known about super-recognisers. However, there are many applications for which their unique skills may be suitable. The most obvious would be in surveillance or security roles, such as passport officers. Currently, automatic face-recognition equipment is highly accurate in constrained environmental circumstances. However, when conditions are variable, or the target's appearance has changed, obscured or disguised, computer performance tends to be far worse than humans of normal face-recognition ability. If super-recognisers can more effectively 'see' through these variations, and are able to infer identity from unusual views of faces as the results of the Before They Were Famous Test

suggests, it is possible that they might outperform automatic systems in many circumstances. Media reports often criticise the use of blanket CCTV, and a large body of empirical research has revealed camera installation only has limited crime-reduction effects. There are over 100,000 police officers in the UK. If face-recognition ability is normally distributed, over 2000 officers might be expected to fall within the definition of super-recogniser as suggested by Russell and colleagues (2009). (This also suggests there may be 1000 super-recogniser members of the British Psychological Society!). If the face-recognition skills of all these officers were to be used more effectively, a far greater proportion of suspects might be identified. Following on from this, many criminals believe the likelihood of being caught is low. If perceptions of the general public – and most importantly criminals – were changed by the knowledge that their activities were more likely to be detected, this might have a positive impact on crime deterrence.

We will leave you to consider whether being a super-recogniser, regardless of your occupation, would be a blessing or a curse. However, a hint may be found in Russell's study, where exceptional face-recognition ability, particularly with unfamiliar faces, was perceived by some as a liability. For instance, they might recognise complete strangers in the audience at a theatre, having seen them in similar circumstances previously – 'I do have to pretend that I don't remember (people), however, because it seems like I stalk them' (p.253).

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