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Article Title:
I’ve Grown Accustomed to *That* Face?
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The new normal. Even distorted views of familiar faces become commonplace in the brain.

Brain cells, like Henry Higgins in *My Fair Lady*, grow accustomed to a familiar face—so much so that repeatedly viewing a distorted face will make the normal face look odd. This process, known as visual adaptation, is enhanced by sleep and may be an essential component of memory, a new study finds.

After multiple exposures to a striking visual pattern, neurons in the retina and visual cortex of the brain fire less frequently the next time you see the pattern. By devoting less energy to familiar sights, the brain is free to concentrate on the next new thing that comes along; the original image becomes a routine perception. Scientists think that this allocation of mental resources is crucial to our ability to perceive and interpret our surroundings.

Whether visual adaptation is a prelude to memory formation is another question, one that intrigued cognitive neuroscientist Thomas Ditye of University College London. Because sleep strengthens memory, Ditye and colleagues decided to test whether visual adaptation also improves after some shuteye.

The researchers asked a group to view a computer screen on which distorted images of the faces of actors George Clooney and Angelina Jolie flashed for periods of 0.5 to 6 seconds. The images were “extended”—stretched until they achieved the blown-up look of a fun house mirror. The object of the test was to determine whether the brain would adapt to images and begin seeing the distorted faces as normal. The volunteers, however, believing their reaction time was being tested, merely pressed a button whenever they saw the image.

Later, they watched a sequence of images that included photos of the original faces and images in which the two actors’ faces were extended or compressed from side to side. Subjects rated the faces as looking compressed, extended, or normal by pressing the corresponding button on a computer keyboard. About half of the volunteers had their initial viewing in the afternoon and then went home for a normal night’s sleep and saw the subsequent images the next morning. The other subjects first saw the distorted faces in the morning and were tested again 12 hours later, with no sleep in between.

Compared with subjects who stayed awake, the sleepers were more likely to adapt to the distorted face [1] so that they perceived the normal face as squashed or compressed, the team reports online today in the *Proceedings of the Royal Society B*.

To rule out the possibility that different times of day, or various sights during the day, had influenced the subjects’ perception, the investigators repeated the experiment with another group of participants who all took a 90-minute nap at the same time while electroencephalography sensors recorded the electrical activity in their brains. These nappers perceived the original faces to be compressed, whereas a group who simply wore a blindfold for 90 minutes didn’t show this adaptation. What’s more, the nappers judged more of the normal images as extended if they spent more time in rapid eye movement sleep—the phase when some kinds of memory, including perceptual memory, are processed.

Ditye explains that researchers thought adaptation influenced only perception, not learning or memory. “Our study suggests that it might be an early stage of the memory process, since, like memory, it is strengthened during sleep,” he says.

The finding extends the range of functions affected by sleep, according to cognitive neuroscientist Takeo Watanabe of Brown University. What the study doesn’t do, he says, is identify a different role for sleep in learning versus adaptation. There are two different theories on how sleep assists in memory consolidation, Watanabe explains. Either we replay during sleep what we learned during the day, or we learn too much while awake and remove the excess during sleep, enhancing the information that is important. “What the researchers found in this study can be explained by either theory,” he observes.

Links:
[1] http://rspb.royalsocietypublishing.org/lookup/doi/10.1098/rspb.2013.1698