Do you really need those eyeglasses?

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Most of us use the numbers 20/20 unthinkingly, basically as a synonym for good vision. We take it on faith that 20/20 is an accurate measure of some biological reality. But how straightforward is visual acuity in fact? After all, those eye charts in your optometrist's office measure not only the sharpness of the image on your eye's retina, but also your brain's interpretation of that information. How much liberty does the interpreting mind take with this biological reality?

New research is beginning to focus on the psychological dimensions of vision—with some surprising results. The studies are from the Harvard University laboratory of Ellen Langer, whose books *Mindfulness* and *Counterclockwise* challenge many of our assumptions about our physical limitations—especially the limitations we associate with aging. In the new studies, Langer and her colleagues manipulated various beliefs about vision to see if mind-set can affect something as basic as eyesight.

Langer's experiments are always innovative. In one of the vision studies, for example, she started with the widespread belief that Air Force pilots have excellent vision. That's not an unfounded belief in fact, because 20/20 vision is a prerequisite for fighter pilot training. To exploit this belief, she recruited a group of students from MIT's ROTC program, many of who aspire to be pilots. She tested their vision with standard eye charts, and then asked some of the volunteers to "become pilots" by flying a flight simulator. She specifically instructed them to actively imagine themselves as pilots, as they used the throttle, compass and other trappings of an actual cockpit to execute flight maneuvers. They even wore green army fatigues to enhance their role-playing.

No mention was made of vision, neither to the "pilots" nor to the controls, who merely sat in a stationary cockpit. After a short time, Langer surreptitiously measured all the volunteers' vision. She had four aircraft "approach" from the front, each with a serial number on the wing. The volunteers were told to read the serial numbers on the four wings which, unbeknownst to them, were the equivalent of different lines on an eye chart. Langer was in effect administering the optometrist's standard eye exam, under the guise of flight simulation.

And what did she find? Unmistakably, the "pilots" showed greater improvement in vision. Four of ten volunteers could see better after playing pilot, compared to none of the controls. Langer reran this experiment, in one case telling the controls they could motivate themselves to have better vision and in another actually giving them eye exercises. But the pilots still outperformed them. In other words, simply believing that pilots have good vision was enough to sharpen the volunteer-pilots' eyesight.

This was obviously an elaborate experiment, and the number of volunteers was necessarily small. So Langer decided to explore the question in a completely different way. In a second experiment, she exploited the belief that athletes have good vision—again not an unreasonable assumption since vision generally enhances coordination. To test this idea, she tested the eyesight of a larger group of volunteers,

then had some of them do jumping jacks, while others simply skipped around them room. She wanted all of the volunteers to be equally aroused physically, but she figured that psychologically, jumping jacks would be seen as more athletic than skipping. And indeed when she retested their eyesight, the results echoed those from the pilot study. Fully a third of the volunteers had better vision after acting athletically; only one of the skippers showed such improvement.

Now keep in mind that the volunteers did not in fact differ at all on athleticism. All that differed was their psychological mind-set, as a result of jumping or skipping. And it appeared that psychology was enough to sharpen their view of the world.

Langer ran a final experiment, this one using the actual optometrist's eye chart—or versions of it. She wanted to test the power of two common beliefs that most of us take with us when we have our eyes examined: One, that it will be easy to read the top lines of the eye chart. And two, that it will be increasingly difficult to read the farther down the chart one reads. I think it's fair to say that most adults share those beliefs.

But what if the chart is switched around? That's what Langer did. She created two eye charts that looked in most ways like the standard chart, except for this: In one case, the letters became not smaller but progressively larger moving down the chart. In the other, the chart started not with the huge E, but with a line that would normally be about two-thirds of the way down. In other words, she administered eye exams that exploit fundamental assumptions about optometrists' eye charts.

And again, psychology trumped biology. As reported on-line this week in the journal *Psychological Science*, the volunteers saw letters that they normally couldn't see when the chart was shifted or reversed. They believed they would be able to read the top of the chart, and so they did—regardless of the actual font size. Taken together, these experimental results suggest that our vision may be compromised, at least in part, by our mindless beliefs.

Wray Herbert also writes regularly for the *Huffington Post*, where this article first appeared. His book, *On Second Thought: Outsmarting Your Mind's Hard-Wired Habits*, will be published by Crown in September.