



California Training Institute

Science-Based Solutions to Human Factor Issues

Does My Eye See What the Camera Sees? ¹

Not Even Close!

To comprehend the fallacy of the camera as a fully accurate documentation of an event, we must understand the physiology of the human visual experience, and compare it to the capability of the camera. First, we must recognize that although objects may be within our visual field, they may not always be perceived at a conscious level. Whether or not individual objects in one's visual field are actually seen or perceived depends on specific, dynamic factors, involving issues related to age, line of sight, visual acuity, the limitations of peripheral vision, expectancy, the task being performed, and the character of surrounding activity and other visual distractions. The subconscious brain can process 400 billion bits of information per second but we are only aware of 2,000 of those. In terms of visual stimulus the conscious brain can only effectively process about 1% of visual information taken in. Specific neurons selectively filter out unimportant information.

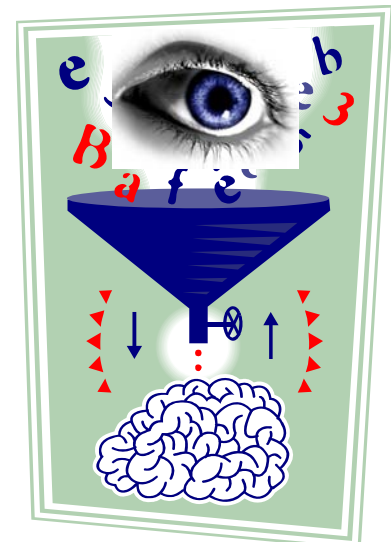
We accept that the camera can provide HD quality at all its viewable angles, while the human eye falls far short in relative performance. The physiology of the eye ensures that a similar HD version of acuity is only available within the 1-2 degree angle of the fovea, with vision sharply decreasing towards the periphery ². Visual perception must occur before reaction can take place, and the analysis of what an officer perceives or does not perceive in their surrounding environment, must take into account that most objects in our visual field are perceived below the conscious level. A simple example is walking. Normal line of sight during the walking process is about 10 degrees downward from horizontal. This means that objects at or near one's feet, to the far left or right, or overhead, must be seen in peripheral vision, a relatively poor means of perceiving detail.

The popular Taser International body camera has a 130 degree lens. At 30 feet the FOV is 130 feet, or 65 feet left and right of center. In human vision, the normal useful field of view (or UFOV) is the visual area over which information can be extracted at a brief glance, without eye or head movements. ³ Under optimal, normal stress situations, the visual field of attention in human vision is approximately 55 to 60 degrees, or at 30 feet, approximately 33 feet total. However, we must consider the context of a use of force event and the resulting increases in stress / arousal to our optimal vision.

A camera experiences no stress, and therefore has no resulting decreases in visual capability. Conversely, while involved in a critical incident, the effects of stress on an officer's vision can be dramatic and sometimes devastating. ³

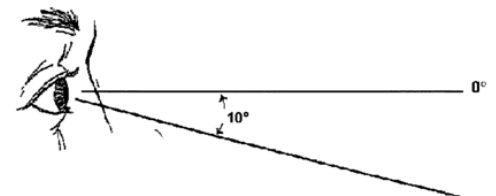
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400 billion bits/second



2,000 bits/second

Visual Processing = 1%



SOURCE: U.S. Department of Defense, Human Design Criteria for Military Systems, Equipment and Facilities, 31 December 1974.



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Eye vs. Camera

Stress is often simply described as an individual's comparison between the task load, and their ability to successfully deal with that load. Arousal is easily defined as the body's physiological response to stress. Use of force incidents are chaotic and violent, typically causing high levels of arousal. This drastic increase in arousal activates the limbic system's fight or flight mechanisms, in turn causing hormones and neurotransmitters to be released throughout the body. These hormones and neurotransmitters are both a help and a hindrance to our survival experience. We can become stronger and more focused, but also lose fine motor skills and make incorrect decisions. Specifically relating to our visual abilities, stress does not decrease our FOV, but does cause our UFOV to narrow.

So far we've discussed the physiology of the human eye in comparison to the mechanisms of a camera and the profound differences between the two, based on human physiology. The next element of great importance is memory! The camera provides a simple reenactment of events from its mechanical view, without change to its mechanism by stress. A camera simply lays down images on film that can be replayed over and over again. The human memory is a weave of events and specific experiences, stored in different areas of the brain and tenuously attached to one another. The camera playback is linear. The human memory pattern is a complicated web of anatomy, physiology and psychology that must be mined for information. Once again we must consider stress and arousal in this comparison.

Deploying cameras in police cars and on individual officers is a positive step forward. Studies have already shown that use of force decreases and fewer citizen complaints are received; officer's professionalism has increased, and some experts say the camera increases officer safety. As stated, we support this position and believe all officers should be using this technology. However, an under-examined area of great concern is the need for a full comprehension of the strengths and limitations of the non-mechanical human being wearing the device. People are not mechanisms and they function completely different than a machine. There will be variations between what the human sees and what the camera records. Those discrepancies are where our training focus lies, and where education in the science of human behavior is the key. Human performance education is a proven method to reduce liability to departments, and to save officers from criminal prosecution or unwarranted discipline.

To read the complete article and obtain additional information on body cameras go to the CTI website at www.cti-home.com

1. <http://www.cti-home.com/wp-content/uploads/2014/01/Efficacy-of-Police-Body-Cameras.pdf>
2. http://www.faa.gov/pilots/safety/pilotsafetybrochures/media/pilot_vision.pdf
3. [http://www.cti-home.com/articles-documents/ Visual Field Calculator](http://www.cti-home.com/articles-documents/VisualFieldCalculator)

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