New Science may explain how players see and produce the huge density and range of reads, strokes and moves - from stills to sprints on court!

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Time, space, velocity (speed), spatial and depth perception from 'stills' to explosive moves of players, rackets, balls on court have a huge range that are at best recognized in Player/Coach language(s) – they elude scientific language let alone quantification! These result in the 'Yin and Yang' of the rally with it's cyclical 'read-get-stroke' - a hallmark of Squash! But in terms of understanding their components they remain an elusive black box even to the best of Squash Players.

Now using neuropathologies and neuroimaging of the much slower moves and stills of everyday life which are far more easily quantified, doctoral student *Zhengang Lu* and his colleague *Xueting Li* working in the laboratory of *Dr.Ming Meng* may have shed some light on the court, in an article published in *Neuroimage* and condensed in *ScienceDaily* (1,2). They identified the 'where' of stills and the 'what' of moves discerned by the dorsal and ventral pathways of the brain, respectively! What is more the dorsal and ventral pathways continuously interacted with each other instead of working separately. These results would be consistent with the explosive and yet fluid moves of Squash Players across the huge density and range of cyclical 'reads-gets-strokes' of a rally! This is especially so at the Pro levels.

Finally on court these details have to all be caught by the Players brain working in fractions of a second. They are missed by current cameras and TV which at best record a blur! As pointed out elsewhere, other sports are neither as dependent nor as completely disadvantaged by the lack of systems in capturing this detail and then communicating it on TV. The article from *ScienceDaily* follows below.

How our brains see the world (*ScienceNews*, 11.18.2015)

Summary:

A new study reveals how the brain understands motion and still objects to help us navigate our complex visual world. The findings have a number of potential practical applications, ranging from treatment for motion blindness to improved motion recognition algorithms used in airport and other public security systems.

Zhengang Lu, a doctoral student in Psychological and Brain Sciences at Dartmouth College, and his colleagues have revealed how the brain understands motion and still objects to help us navigate our complex visual world.
Credit: Zhengang Lu

A Dartmouth study reveals how the brain understands motion and still objects to help us navigate our complex visual world.

The findings have a number of potential practical applications, ranging from treatment for motion blindness to improved motion recognition algorithms used in airport and other public security systems.

The study appears in the journal *Neuroimage*.

"By analyzing how terrorists would move in public spaces and incorporating this action signature into pattern recognition algorithm, better accuracy of recognition of terrorist suspects may be achieved than with facial-feature based recognition algorithm," says co-lead author *Zhengang Lu*, a doctoral student in Psychological and Brain Sciences.

Our brain's visual system consists of a "where" (dorsal) pathway and a "what" (ventral) pathway. A normally function brain can imply motion from still pictures, such as the speed line in cartoons being interpreted as motion streaks of a still object. However, patients with lesions to the dorsal pathway know where objects are but have difficulty recognizing them, while patients with lesions to the ventral pathway have trouble recognizing objects but no problem locating them.

To survive in a dynamic world, the sensitivity of the human visual system for detecting motion cues is a critical evolutionary advantage. For example, people with akinetopsia (the inability to perceive motion) have difficulty crossing the street because they can't gauge oncoming traffic -- they see moving objects as a series of stills, like an object moving under strobe lights. People with object agnosia (the inability to recognize objects) have difficulty navigating everyday life.

The Dartmouth researchers studied neural activity to understand how the brain processes motion in still pictures of animate and inanimate objects. Their findings showed that the brain may process motion differently based on whether it is animate motion or inanimate motion. This suggests the brain not only categorizes objects into animate versus inanimate, but it knows the location of objects based on whether they are animate or inanimate.

"Our findings suggest the brain's two visual pathways interact with each other instead of being separate when processing motion and objects," Lu says. "To fully understand a complex scene when multiple objects moving at different speed, the brain combines the motion signal with the knowledge of how a particular object will move in the world. Our results might not be able to provide treatment directly, but they suggest that treatment for people with motion blindness and object agnosia should consider the functional interaction between these two pathways."

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Story Source:

Journal Reference:

1. Zhengang Lu, Xueting Li, Ming Meng. **Encodings of implied motion for animate and inanimate object categories in the two visual pathways**. *NeuroImage*, 2016; 125: 668 DOI: 10.1016/j.neuroimage.2015.10.059
2. Scientists shed light on how our brains see the world, *ScienceDaily* (November 18, 2015) http://www.sciencedaily.com/releases/2015/11/151118180544.htm#