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The catch-up or fallback illusion

Why we accidentally slow-down people on the motorway and lose football matches

Movement and orientation in space is an everyday experience. But it is also a fundamental theoretical problem for science. How does a moving observer perceive the relative movement between two other persons or objects? Despite its everyday relevance, this "perceptual three-body problem" is largely unexplored. Dr. Tobias Meilinger from the department of Prof. Bülthoff at the Max Planck Institute (MPI) for Biological Cybernetics and Dr. Bärbel Garsoffky and Prof. Dr. Stephan Schwan from the Leibniz Institute for Knowledge Media (IWM) examined under which circumstances the perception of movement is distorted - and thus an illusion arises.

The experiment: A human being in motion. While the person is walking, she/he watches two other people. One seems to be following the other. The question to the observer: Can the persecutor catch up with the person pursued? The special feature of the study is the combination of two sources of movement – one's own and the movements of two targets in the environment. This is when we are talking about a triangular relationship which has a decisive influence on the observer's perception - and thus also on conclusions and decisions. Also in assessing whether the pursuer can catch up. Under certain circumstances, this leads to a distorted perception and thus misjudgment - in other words, an illusion arises.

Caption: An observer sees two runners moving away from her/him. Due to a distortion of perception, the rear appears to be faster than it is in reality – a catching-up illusion arises.

The result of the investigation: To assess the relative movement away from or towards an observer, the perception is often distorted - either a catch-up or a fallback illusion is created. In other words, depending on the observer's own speed, the pursuer seems to either reach the persecuted person or fall back. The scientists showed that these illusions arise from a changed perception of distance. Just as the dashed centerlines on a road seem to be shorter the further away they are, and the longer the closer they are. This also changes the perceived distance between two runners and thus the illusion if and when they catch up with each other.

But how does the illusion affect everyday life? Let's take two examples of perception from driving a car and football games. On the motorway: I'm driving on the left-hand lane of the motorway. Two cars are driving on the right-hand lane. The question: Can I foresee that the rear one wants to change to my lane? My assessment is influenced by the fact that I drive fast myself. I don't notice that the rear car accelerates, because the fallback illusion hides that. The driver, however, starts to overtake, comes onto my track and slows me down. The distortion of her/his distance to the front car causes me to underestimate its true speed. A similar case on the football field: The striker from my team dashes to the

opponent's goal, followed by an opposing player. I myself follow slower and want to play her/him the ball, but I overestimate the speed of the catching-up opponent due to the illusion and therefore I don't pass the ball on, missing the chance to score.

Whether on the street or on the football pitch, distortion of perception can lead to considerable disadvantages in both cases: I have to slow-down, the striker does not get the decisive pass. Possible countermeasures could be to point out to drivers or players that there is such a distortion and thus misjudgment. Or: teach autonomous cars to take into account human perception distortion to prevent dangerous situations. Or: speed limits on motorways. In this way, the strong differences in speed variances that lead to distortion of perception can be avoided.

Original Publication:
www.nature.com/articles/s41598-017-17158-8

Please read an interview about the study with Tobias Meilinger. (Link)

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Video Clip:
https://owncloud.tuebingen.mpg.de/index.php/s/VlolmnykWMzZuRC

Caption:
Two runners move away from a static observer, keeping the same distance to each other. However, the pursuer seems to catch up and illustrates the uplifting illusion. The videos in the experiment ended after 1.5 seconds and the speed of pursuers and observers varied.

Max-Planck-Institut for Biological Cybernetics
The Max Planck Institute for Biological Cybernetics works in the elucidation of cognitive processes. It employs about 300 people from more than 40 countries and is located at the Max Planck Campus in Tübingen, Germany. The Max Planck Institute for Biological Cybernetics is one of 83 research institutes that the Max Planck Society for the Advancement of Science maintains in Germany and abroad.

Leibniz-Institut für Wissensmedien
The Leibniz-Institut für Wissensmedien (IWM) in Tuebingen analyses teaching and learning with digital technologies. In a multidisciplinary environment, around 80 scientists from cognition, behavioural and social sciences work on solving research questions concerning individual and collective knowledge acquisition in media environments. Since 2009, the IWM and the University of Tuebingen jointly run Germany's first Leibniz-WissenschaftsCampus "Informational Environments".
Internet address: www.iwm-tuebingen.de.

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Anhang Two runners move away from a static observer, keeping the same distance to each other. However, the pursuer seems to catch up and illustrates the uplifting illusion. http://idw-online.de/de/attachment61145

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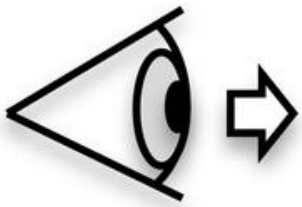

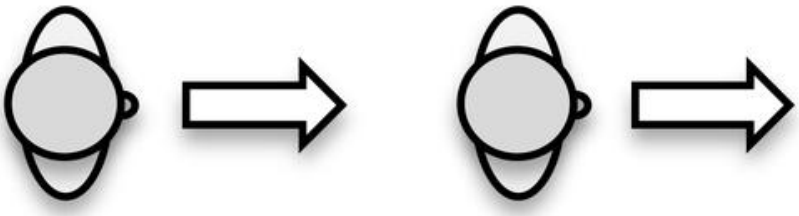

An observer sees two runners moving away from her/him. Due to a distortion of perception, the rear appears to be faster than it is in reality – a catching-up illusion arises.
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