Name of concept
Change blindness

Key reference
(Simons & Levin, 1997)

Description
Change blindness refers to the phenomenon that people fail to detect a change in visual stimuli. The effect is shown in many experiments, ranging from people swapping places while the participant is momentarily distracted, to people watching a video of a group of people throwing balls to each other, and the participants failing to notice a person in a gorilla suit walking through the frame halfway through the video. Change blindness can influence the way we remember past events, but also on how well we can rely on our attention to not miss certain important bits of information, such as in traffic situations or crisis situations. Change blindness is in part considered to be an attention problem, with people overestimating how much attention they can have to various elements in a specific context at the same time. Change blindness can be dangerous especially when people have been presented with the same type of visual cues for a prolonged period. In those cases, the expectation can be that as nothing has changed so far, a new change is also less likely. This can lead to reduced response times when changes do occur, or even missing the change completely, as the level of attention has dropped. At the end of this document, you can find several videos that provide examples of change blindness that can be used in class.

Application within the field of cybersecurity

Change blindness is used most often by scammers and cybercriminals when pretending to be a legitimate source. For example, scammers who send phishing emails will try to mimic as closely as possible the regular way in which end-users and customers are addressed, but even if small mistakes in the wording or lay-out of these messages are made, many people don't recognise these differences as such. The same applies to websites set up by scammers, where the lay-out might in fact be slightly different to the real genuine website, but people do not notice these small changes. Another example of change blindness in cybersecurity comes from attacks on organisations where documents within the organisation are altered. For instance, there have been cases where cybercriminals gained access to the invoice template of the organisation and altered the bank details of where the money for the invoice should be sent to. The financial employees in the organisation did not catch this change in the form and sent out invoices with the payment details of the cybercriminals, so that unexpecting clients and other businesses transferred money to these criminals instead of the organisation they thought they were dealing with.

Annotated bibliography

Dasgupta et al. (2017). Dasgupta and colleagues investigated which human factors play a role in streaming data analysis. They discuss change blindness as a potential threat to successful analysis of streaming data, and suggest that any tool that visualises streaming data for

analysis should put change blindness as a priority in their design to avoid unwanted delays and missed indicators in the analysis.

DeValk & Elmqvist (n.d.). The authors built a tool to observe dynamic network traffic over time. This tool was developed based on interviews with specialists, and one of the goals was to attenuate possible change blindness issues that could cause a delay in detecting suspicious network traffic. They achieved this by making the visuals of consistent traffic more transparent, thereby reducing its visibility, and creating a larger level of contrast with new types of network traffic that might require investigation.

Simons & Levin (1997). Simons and Levin provide an overview of examples of change blindness. They focus on both real-world instances of change blindness, but also cover changes in photographs and videos that go unnoticed when participants are presented with these different photos and video shots.

References

Dasgupta, A., Arendt, D. L., Franklin, L. R., Wong, P. C., & Cook, K. A. (2018, February). Human factors in streaming data analysis: Challenges and opportunities for information visualization. In *Computer graphics forum* (Vol. 37, No. 1, pp. 254-272).

DeValk, K., & Elmqvist, N. Riverside: Dynamic Visualization of Network Traffic for Situation Awareness in Computer Security.

Simons, D. J., & Levin, D. T. (1997). Change blindness. *Trends in cognitive sciences, 1*(7), 261-267.

Videos

The Invisible Gorilla experiment
https://www.youtube.com/watch?v=vJG698U2Mvo

In this study, participants had to count how often people in a video would throw a ball at each other, and afterwards were asked whether they noticed anything out of the ordinary. Many people did not see a person in a gorilla suit walking through the frame in the video.

The Door Study
https://www.youtube.com/watch?v=FWSxSQsspiQ

A real world setting where someone asks for directions, people come by with a door, obstructing the view. The person asking for directions has then switched places with someone else and the unknowing participant does not observe this change.

Colour changing card trick
https://www.youtube.com/watch?v=v3iPrBrGSJM

A simple card trick video, but after the card trick, the magician suggests people might have missed part of the trick, which is then revealed.