Change blindness

Description

Change blindness is a perceptual phenomenon that occurs when a **change** in a visual stimulus is introduced and the observer does not notice it. For example, observers often fail to notice major differences introduced into an image while it flickers off and on again.

Further References

Kentridge, R. W.. (2015). Change Blindness. In International Encyclopedia of the Social & Behavioral

Sciences: Second Edition

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“Change blindness is a phenomenon in which major changes to a visual scene go unnoticed. there are many methods of inducing change blindness, for example, by presenting a blank image between presentation of the original and changed pictures. change blindness is thought to occur when visual attention is prevented from being drawn to the change. detecting the changes requires a comparison between the changed state of the picture and a visual memory of its original state. without visual attention the memory may not be retrieved at all or the available memory may lack sufficient visual detail for a change to be registered. change blindness is employed as a tool for studying visual attention and has obvious real-world implications for tasks such as driving.”
Simons, D. J., & Rensink, R. A.. (2005). Change blindness: Past, present, and future. Trends in Cognitive Sciences

Plain numerical DOI: 10.1016/j.tics.2004.11.006
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“Change blindness is the striking failure to see large changes that normally would be noticed easily. over the past decade this phenomenon has greatly contributed to our understanding of attention, perception, and even consciousness. the surprising extent of change blindness explains its broad appeal, but its counterintuitive nature has also engendered confusions about the kinds of inferences that legitimately follow from it. here we discuss the legitimate and the erroneous inferences that have been drawn, and offer a set of requirements to help separate them. in doing so, we clarify the genuine contributions of change blindness research to our understanding of visual perception and awareness, and provide a glimpse of some ways in which change blindness might shape future research.”
Masuda, T., & Nisbett, R. E.. (2006). Culture and change blindness. Cognitive Science

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“Research on perception and cognition suggests that whereas east asians view the world holistically, attending to the entire field and relations among objects, westerners view the world analytically, focusing on the attributes of salient objects. these propositions were examined in the change-blindness paradigm. research in that paradigm finds american participants to be more sensitive to changes in focal objects than to changes in the periphery or context. we anticipated that this would be less true for

east asians and that they would be more sensitive to context changes than would americans. we presented participants with still photos and with animated vignettes having changes in focal object information and contextual information. compared to americans, east asians were more sensitive to contextual changes than to focal object changes. these results suggest that there can be cultural variation in what may seem to be basic perceptual processes."
Simons, D. J.. (2000). Current approaches to change blindness. Visual Cognition

Plain numerical DOI: 10.1080/135062800394658
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"Across saccades, blinks, blank screens, movie cuts, and other interruptions, ob- servers fail to detect substantial changes to the visual details of objects and scenes. this inability to spot changes ('change blindness') is the focus of this special issue of visual cognition. this introductory paper briefly reviews recent studies of change blindness, noting the relation of these findings to earlier re- search and discussing the inferences we can draw from them.most explanations of change blindness assume that we fail to detect changes because the changed displaymasks or overwrites the initial display.here i draw a distinction between intentional and incidental change detection tasks and consider how alternatives to the 'overwriting' explanation may provide better explanations for change blindness."
Rensink, R. A.. (2010). Attention: Change Blindness and Inattentional Blindness. In Encyclopedia of Consciousness

Plain numerical DOI: 10.1016/B978-012373873-8.00006-2
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"This article surveys the work done on the phenomena of change blindness and inattentional blindness, two striking forms of perceptual failure caused by the diversion of visual attention. both experimental and theoretical work is covered. the article outlines the extent to which these failures can occur and the implications that they have, both in the laboratory and in everyday life. it also outlines the extent to which these phenomena can be connected to visual attention and other known mechanisms of visual perception, and the implications they have for understanding the link between attention and awareness. © 2009 elsevier inc. all rights reserved."
Beck, D. M., Rees, G., Frith, C. D., & Lavie, N.. (2001). Neural correlates of change detection and change blindness. Nature Neuroscience

Plain numerical DOI: 10.1038/88477
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“Functional magnetic resonance imaging (fmri) of subjects attempting to detect a visual change occurring during a screen flicker was used to distinguish the neural correlates of change detection from those of change blindness. change detection resulted in enhanced activity in the parietal and right dorsolateral prefrontal cortex as well as category- selective regions of the extrastriate visual cortex (for example, fusiform gyrus for changing faces). although change blindness resulted in some extrastriate activity, the dorsal activations were clearly absent. these results demonstrate the importance of parietal and dorsolateral frontal activations for conscious detection of changes in properties coded in the ventral visual pathway, and thus suggest a key involvement of dorsal-ventral interactions in visual awareness”
Levin, D. T., Momen, N., Drivdahl, S. B., & Simons, D. J.. (2000). Change blindness blindness: The metacognitive error of overestimating change-detection ability. Visual Cognition

Plain numerical DOI: 10.1080/135062800394865
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“Recent research has demonstrated that subjects fail to detect large between-view changes to natural and artificial scenes. yet, most people (including psycholo- gists) believe that theywould detect the changes.we report two experiments doc- umenting this metacognitive error. in experiment 1, students in a large general psychology classwere asked if they thought theywould notice the change in four different situations previously tested by levin and simons (1997) and simons and levin (1998). most claimed that they would have noticed even relatively small changes that real observers rarely detected. in experiment 2, subjectswere tested individually and half were asked to predict whether someone else would detect the changes. subjects again overestimated the degree to which changes would be detected, both by themselves and by others. we discuss possible reasons for these metacognitive errors including distorted beliefs about visual experience, change, and stability.”
Cavanaugh, J.. (2004). Subcortical Modulation of Attention Counters Change Blindness. Journal of Neuroscience

Plain numerical DOI: 10.1523/JNEUROSCI.3724-04.2004
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“Change blindness is the failure to see large changes in a visual scene that occur simultaneously with a global visual transient. such visual transients might be brief blanks between visual scenes or the blurs caused by rapid or saccadic eye movements between successive fixations. shifting attention to the site of the change counters this ‘blindness’ by improving change detection and reaction time. we developed a change blindness paradigm for visual motion and then showed that presenting an attentional cue diminished the blindness in both humans and old world monkeys. we then replaced the visual cue with weak electrical stimulation of an area in the monkey’s brainstem, the superior colliculus,

to see if activation at such a late stage in the eye movement control system contributes to the attentional shift that counters change blindness. with this stimulation, monkeys more easily detected changes and had shorter reaction times, both characteristics of a shift of attention."
Simons, D. J., & Chabris, C. F.. (1999). Gorillas in our midst: Sustained inattentional blindness for dynamic events. Perception

Plain numerical DOI: 10.1068/p281059
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"With each eye fixation, we experience a richly detailed visual world. yet recent work on visual integration and change direction reveals that we are surprisingly unaware of the details of our environment from one view to the next: we often do not detect large changes to objects and scenes ('change blindness'). furthermore, without attention, we may not even perceive objects ('inattentional blindness'). taken together, these findings suggest that we perceive and remember only those objects and details that receive focused attention. in this paper, we briefly review and discuss evidence for these cognitive forms of 'blindness'. we then present a new study that builds on classic studies of divided visual attention to examine inattentional blindness for complex objects and events in dynamic scenes. our results suggest that the likelihood of noticing an unexpected object depends on the similarity of that object to other objects in the display and on how difficult the priming monitoring task is. interestingly, spatial proximity of the critical unattended object to attended locations does not appear to affect detection, suggesting that observers attend to objects and events, not spatial positions. we discuss the implications of these results for visual representations and awareness of our visual environment."
Simons, D. J., & Ambinder, M. S.. (2005). Change blindness: Theory and consequences. Current Directions in Psychological Science

Plain numerical DOI: 10.1111/j.0963-7214.2005.00332.x
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"People often fail to notice large changes to visual scenes, a phenomenon now known as change blindness. the extent of change blindness in visual perception suggests limits on our capacity to encode, retain, and compare visual information from one glance to the next; our awareness of our visual surroundings is far more sparse than most people intuitively believe. these failures of awareness and the erroneous intuitions that often accompany them have both theoretical and practical ramifications. this article briefly summarizes the current state of research on change blindness and suggests future directions that promise to improve our understanding of scene perception and visual memory."
Galpin, A., Underwood, G., & Crundall, D.. (2009). Change blindness in driving scenes. Transportation Research Part F: Traffic Psychology and Behaviour

Plain numerical DOI: 10.1016/j.trf.2008.11.002

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“One of the key perceptual errors that contributes to accidents on the road is ‘looking but failing to see’. though this has previously been attributed to failures of attention or time gaps, the recent change blindness literature suggests another alternative. researchers have proposed that we have a poor memory for the visual world, and as such, participants find it very hard to notice a change between two successive pictures providing the transients that normally catch attention are masked. such masking can occur naturally due to blinks and saccadic suppression. it is suggested that these effects may contribute to accident liability. an experiment was undertaken to test the application of the change blindness paradigm to the driving domain. it was predicted that experienced drivers may have greater visual persistence for changed targets in a road scene provided they are relevant to a driver’s parsing of the road (i.e. if the targets are potential hazards such as pedestrians, rather than changes in background scenery). the experiment required drivers and non-drivers to view a complex driving-related visual scene that was constantly interrupted by a flash once per second. during the flashes one item in the scene was changed. this target was manipulated according to location and semantic relevance. results showed an interaction between central and peripheral items with semantic relevance. participants found it hard to detect central items that were inconsequential, relative to other classifications of targets. no effect of experience was noted. the results are discussed in relation to the general theoretical literature and their potential applications to the driving domain. © 2008 elsevier ltd. all rights reserved.”
Simons, D. J., Chabris, C. F., Schnur, T., & Levin, D. T.. (2002). Evidence for preserved representations in change blindness. Consciousness and Cognition

Plain numerical DOI: 10.1006/ccog.2001.0533
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“People often fail to detect large changes to scenes, provided that the changes occur during a visual disruption. this phenomenon, known as ‘change blindness,’ occurs both in the laboratory and in real-world situations in which changes occur unexpectedly. the pervasiveness of the inability to detect changes is consistent with the theoretical notion that we internally represent relatively little information from our visual world from one glance at a scene to the next. however, evidence for change blindness does not necessarily imply the absence of such a representation – people could also miss changes if they fail to compare an existing representation of the pre-change scene to the post-change scene. in three experiments, we show that people often do have a representation of some aspects of the pre-change scene even when they fail to report the change. and, in fact, they appear to ‘discover’ this memory and can explicitly report details of a changed object in response to probing questions. the results of these real-world change detection studies are discussed in the context of broader claims about change blindness. © 2002 elsevier science (usa).”
JOHANSSON, P., HALL, L., & SIKSTRÖM, S.. (2008). FROM CHANGE BLINDNESS TO CHOICE BLINDNESS.

PSYCHOLOGIA

Plain numerical DOI: 10.2117/psysoc.2008.142
DOI URL
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“The phenomenon of change blindness has received a great deal of attention during the last decade, but very few experiments have examined the effects of the subjective importance of the visual stimuli under study. we have addressed this question in a series of studies by introducing choice as a critical variable in change detection (see johansson, hall, sikström, & olsson, 2005, johansson, hall, sikström, & tärning, 2006). in the present study, participants were asked to choose which of two pictures they found more attractive. for stimuli we used both pairs of abstract patterns and female faces. sometimes the pictures were switched during to choice procedure, leading to a reversal of the initial choice of the participants. surprisingly, the subjects seldom noticed the switch, and in a post-test memory task, they also often remembered the manipulated choice as being their own. in combination with our previous findings, this result indicates that we often fail to notice changes in the world even if they have later consequences for our own actions.”
(WHO), W. H. O.. (1972). Change the Definition of Blindness. World Health Organization

Plain numerical DOI: 10.1007/s10803-013-1958-9
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“This study investigated the role of parental autism spectrum disorder (asd), attention-deficit/hyperactivity disorder (adhd), and depressive symptoms on parenting stress in 174 families with children with asd and/or adhd, using generalized linear models and structural equation models. fathers and mothers reported more stress when parenting with their child with asd and/or adhd than when parenting with the unaffected sibling; they also experienced more stress than a norm population. depressive symptoms were most pronounced in the parents of children with asd and asd+adhd. spouse correlations were found for asd, depression, and parenting stress. paternal asd and maternal adhd symptoms were related to increased parenting stress, and parental adhd symptoms with depressive symptoms and parenting stress. the results highlight the increased burden of raising a child with asd and/or adhd and the reciprocal relationship this has with parents’ asd, adhd, and depressive symptoms, and levels of stress.”
O’Regan, J. K., Rensink, R. A., & Clark, J. J.. (1999). Change-blindness as a result of “mudsplashes”. Nature

Plain numerical DOI: 10.1038/17953
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“Change-blindness1,2 occurs when large changes are missed under natural viewing conditions because they occur simultaneously with a brief visual disruption, perhaps caused by an eye movement3,4, a flicker5, a blink6, or a camera cut in a film sequence7. we have found that this can occur even when the disruption does not cover or obscure the changes. when a few small, high-contrast shapes are briefly spattered over a picture, like mudsplashes on a car windscreen, large changes can be made simultaneously in the scene without being noticed. this phenomenon is potentially important in driving, surveillance or navigation, as dangerous events occurring in full view can go unnoticed if they coincide with even very small, apparently innocuous, disturbances. it is also important for understanding how the brain represents the world”
Landman, R., Spekreijse, H., & Lamme, V. A. F.. (2003). Large capacity storage of integrated objects before change blindness. Vision Research

Plain numerical DOI: 10.1016/S0042-6989(02)00402-9
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“Normal people have a strikingly low ability to detect changes in a visual scene. this has been taken as evidence that the brain represents only a few objects at a time, namely those currently in the focus of attention. in the present study, subjects were asked to detect changes in the orientation of rectangular figures in a textured display across a 1600 ms gray interval. in the first experiment, change detection improved when the location of a possible change was cued during the interval. the cue remained effective during the entire interval, but after the interval, it was ineffective, suggesting that an initially large representation was overwritten by the post-change display. to control for an effect of light intensity during the interval on the decay of the representation, we compared performance with a gray or a white interval screen in a second experiment. we found no difference between these conditions. in the third experiment, attention was occasionally misdirected during the interval by first cueing the wrong figure, before cueing the correct figure. this did not compromise performance compared to a single cue, indicating that when an item is attentionally selected, the representation of yet unchosen items remains available. in the fourth experiment, the cue was shown to be effective when changes in figure size and orientation were randomly mixed. at the time the cue appeared, subjects could not know whether size or orientation would change, therefore these results suggest that the representation contains features in their ‘bound’ state. together, these findings indicate that change blindness involves overwriting of a large capacity representation by the post-change display. © 2002 elsevier science ltd. all rights reserved.”
Davies, G., & Hine, S.. (2007). Change blindness and eyewitness testimony. Journal of Psychology: Interdisciplinary and Applied

Plain numerical DOI: 10.3200/JRLP.141.4.423-434
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“The authors explored the relevance of research on change blindness to eyewitness identification and testimony under intentional and incidental memory conditions. participants (n = 80, 40 men and 40 women) viewed a video enactment of a burglary in which the identity of the burglar changed at the halfway point of the film. half of participants were briefed to remember the content, and the other half were not. all were tested for the recall of the content, awareness of the change, and ability to identify either or both of the burglars. some 61% of participants did not notice the identity change. rates of detection were significantly higher in participants in the intentional condition, who also recalled significantly more detail from the film. awareness of change was also significantly related to content recall scores and accuracy of identification of both burglars. the results illustrate the interrelation between the eyewitness and change blindness literatures. copyright © 2007 heldref publications.”
Sela, L., & Sobel, N.. (2010). Human olfaction: A constant state of change-blindness. Experimental Brain Research

Plain numerical DOI: 10.1007/s00221-010-2348-6
DOI URL
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“Paradoxically, although humans have a superb sense of smell, they don’t trust their nose. furthermore, although human odorant detection thresholds are very low, only unusually high odorant concentrations spontaneously shift our attention to olfaction. here we suggest that this lack of olfactory awareness reflects the nature of olfactory attention that is shaped by the spatial and temporal envelopes of olfaction. regarding the spatial envelope, selective attention is allocated in space. humans direct an attentional spotlight within spatial coordinates in both vision and audition. human olfactory spatial abilities are minimal. thus, with no olfactory space, there is no arena for olfactory selective attention. regarding the temporal envelope, whereas vision and audition consist of nearly continuous input, olfactory input is discreet, made of sniffs widely separated in time. if similar temporal breaks are artificially introduced to vision and audition, they induce ‘change blindness’, a loss of attentional capture that results in a lack of awareness to change. whereas ‘change blindness’ is an aberration of vision and audition, the long inter-sniff-interval renders ‘change anosmia’ the norm in human olfaction. therefore, attentional capture in olfaction is minimal, as is human olfactory awareness. all this, however, does not diminish the role of olfaction through sub-attentive mechanisms allowing subliminal smells a profound influence on human behavior and perception.”
Henderson, J. M., & Hollingworth, A.. (2003). Global transsaccadic change blindness during scene perception. Psychological Science

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“Each time the eyes are spatially reoriented via a saccadic eye movement, the image falling on the

retina changes. how visually specific are the representations that are functional across saccades during active scene perception? this question was investigated with a saccade-contingent display-change paradigm in which pictures of complex real-world scenes were globally changed in real time during eye movements. the global changes were effected by presenting each scene as an alternating set of scene strips and occluding gray bars, and by reversing the strips and bars during specific saccades. the results from two experiments demonstrated a global transsaccadic change-blindness effect, suggesting that point-by-point visual representations are not functional across saccades during complex scene perception."
Fernandez-Duque, D., & Thornton, I. M.. (2000). Change detection without awareness: Do explicit reports underestimate the representation of change in the visual system?. Visual Cognition

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"Evidence from many different paradigms (e.g. change blindness, inattentional blindness, transsaccadic integration) indicate that observers are often very poor at reporting changes to their visual environment. such evidence has been used to suggest that the spatio-temporal coherence needed to represent change can only occur in the presence of focused attention. in four experiments we use modified change blindness tasks to demonstrate (a) that sensitivity to change does occur in the absence of awareness, and (b) this sensitivity does not rely on the redeployment of attention. we discuss these results in relation to theories of scene perception, and propose a reinterpretation of the role of attention in representing change."
Nelson, K. J., Laney, C., Fowler, N. B., Knowles, E. D., Davis, D., & Loftus, E. F.. (2011). Change blindness can cause mistaken eyewitness identification. Legal and Criminological Psychology

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"RnThe current study investigated the effects of change blindness and crime severity on eyewitness identification accuracy. this research, involving 717 subjects, examined change blindness during a simulated criminal act and its effects on subjects' accuracy for identifying the perpetrator in a photospread. subjects who viewed videos designed to induce change blindness were more likely to falsely identify the innocent actor relative to those who viewed control videos. crime severity did not influence detection of change; however, it did have an effect on eyewitness accuracy. subjects who viewed a more severe crime ($500 theft) made fewer errors in perpetrator identification than those who viewed a less severe crime ($5 theft). this research has theoretical implications for our understanding of change blindness and practical implications for the real-world problem of faulty eyewitness testimony. "
Category

1. Cognitive science
2. General psychology
3. Neuropolitics
4. Psychopolitics
5. Social psychology

Tags

1. attention
2. focus
3. limitations of perception

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