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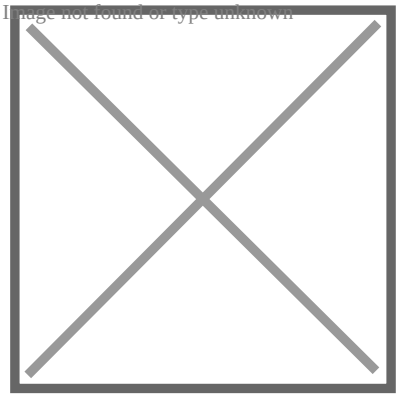

Ebbinghaus illusion

Description

he **Ebbinghaus illusion** or **Titchener circles** is an optical illusion of relative size perception. Named for its discoverer, the German psychologist Hermann Ebbinghaus (1850–1909), the illusion was popularized in the English-speaking world by Edward B. Titchener in a 1901 textbook of experimental psychology, hence its alternative name.[1] In the best-known version of the illusion, two circles of identical size are placed near to each other, and one is surrounded by large circles while the other is surrounded by small circles. As a result of the juxtaposition of circles, the central circle surrounded by large circles appears smaller than the central circle surrounded by small circles.

Recent work suggests that two other critical factors involved in the perception of the Ebbinghaus illusion are the distance of the surrounding circles from the central circle and the completeness of the annulus, which makes the illusion comparable in nature to the Delboeuf illusion. Regardless of relative size, if the surrounding circles are closer to the central circle, the central circle appears larger and if the surrounding circles are far away, the central circle appears smaller. While the distance variable appears to be an active factor in the perception of relative size, the size of the surrounding circles limits how close they can be to the central circle, resulting in many studies confounding the two variables.[1]

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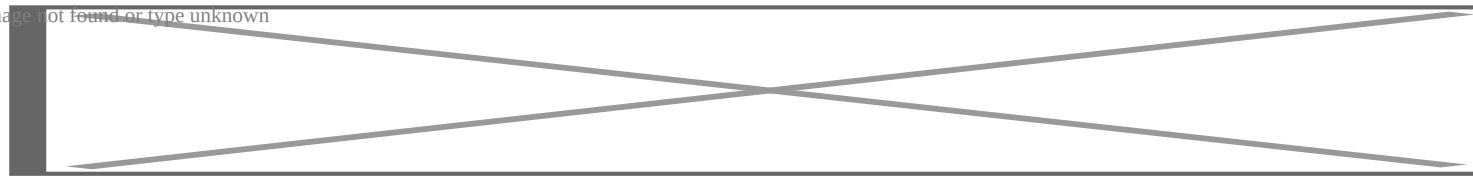

Further References

Franz, V. H., Bülthoff, H. H., & Fahle, M.. (2003). Grasp effects of the Ebbinghaus illusion: Obstacle avoidance is not the explanation. Experimental Brain Research

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“The perception-versus-action hypothesis states that visual information is processed in two different streams, one for visual awareness (or perception) and one for motor performance. previous reports that the ebbinghaus illusion deceives perception but not grasping seemed to indicate that this dichotomy between perception and action was fundamental enough to be reflected in the overt behavior of non-neurological, healthy humans. contrary to this view we show that the ebbinghaus illusion affects grasping to the same extent as perception. we also show that the grasp effects cannot be accounted for by non-perceptual obstacle avoidance mechanisms as has recently been suggested. instead, even subtle variations of the ebbinghaus illusion affect grasping in the same way as they affect perception. our results suggest that the same signals are responsible for the perceptual effects and for the motor effects of the ebbinghaus illusion. this casts doubt on one line of evidence, which used to strongly favor the perception-versus-action hypothesis.”
Haffenden, A. M., Schiff, K. C., & Goodale, M. A.. (2001). The dissociation between perception and action in the Ebbinghaus illusion: Nonillusory effects of pictorial cues on grasp. Current Biology

Plain numerical DOI: 10.1016/S0960-9822(01)00023-9
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“According to a recently proposed distinction [1] between vision for perception and vision for action, visually guided movements should be largely immune to the perceptually compelling changes in size produced by pictorial illusions. tests of this prediction that use the ebbinghaus illusion have revealed only small effects of the illusion on grasp scaling as compared to its effect on perception [2-4]. nevertheless, some have argued that the small effect on grasp implies that there is a single representation of size for both perception and action [5]. recent findings, however, suggest that the 2-d pictorial elements, such as those comprising illusory backgrounds, can sometimes be treated as obstacles and thereby influence the programming of grasp [6]. the arrangement of the 2-d elements commonly used in previous studies examining the ebbinghaus illusion could therefore give rise to an effect on grasp scaling that is independent of its effect on perceptual judgements, even though the two effects are in the same direction. we present evidence demonstrating that when the gap between the target and the illusion-making elements in the ebbinghaus illusion is equidistant across different perceptual conditions (figure 1a), the apparent effect of the illusion on grasp scaling is eliminated.”
Franz, V. H., & Gegenfurtner, K. R.. (2008). Grasping visual illusions: Consistent data and no dissociation. In Cognitive Neuropsychology

Plain numerical DOI: 10.1080/02643290701862449
DOI URL
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“The finding that the ebbinghaus/titchener illusion deceives perception but not grasping is usually seen as strong evidence for goodale and milner’s (1992) notion of two parallel visual systems, one being conscious and deceived by the illusion (vision-for-perception) and the other being unconscious and not deceived (vision-for-action). however, this finding is controversial and led to studies with seemingly contradictory results. we argue that these results are not as contradictory as it might seem. instead, studies consistently show similar effects of the illusion on grasping. the perceptual effects are strongly dependent on the specific perceptual measure employed. if, however, some methodological precautions are used, then these diverse perceptual results can be reconciled and point to a single internal size estimate that is used for perception and for grasping. this suggests that the ebbinghaus illusion deceives a common representation of object size that is used by perception and action.”
Franz, V. H., Gegenfurtner, K. R., Bülthoff, H. H., & Fahle, M.. (2000). Grasping visual illusions: No evidence for a dissociation between perception and action. Psychological Science

Plain numerical DOI: 10.1111/1467-9280.00209
DOI URL
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“Neuropsychological studies prompted the theory that the primate visual system might be organized into two parallel pathways, one for conscious perception and one for guiding action. supporting evidence in healthy subjects seemed to come from a dissociation in visual illusions: in previous studies, the ebbinghaus (or titchener) illusion deceived perceptual judgments of size, but only marginally influenced the size estimates used in grasping. contrary to those results, the findings from the present study show that there is no difference in the sizes of the perceptual and grasp illusions if the perceptual and grasping tasks are appropriately matched. we show that the differences found previously can be accounted for by a hitherto unknown, nonadditive effect in the illusion. we conclude that the illusion does not provide evidence for the existence of two distinct pathways for perception and action in the visual system.”
Song, C., Schwarzkopf, D. S., & Rees, G.. (2011). Interocular induction of illusory size perception. BMC Neuroscience

Plain numerical DOI: 10.1186/1471-2202-12-27
DOI URL
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“BACKGROUND:the perceived size of objects not only depends on their physical size but also on the surroundings in which they appear. for example, an object surrounded by small items looks larger than a physically identical object surrounded by big items (ebbinghaus illusion), and a physically identical but distant object looks larger than an object that appears closer in space (ponzo illusion). activity in human primary visual cortex (v1) reflects the perceived rather than the physical size of objects, indicating an involvement of v1 in illusory size perception. here we investigate the role of eye-specific

signals in two common size illusions in order to provide further information about the mechanisms underlying illusory size perception.nnresults:we devised stimuli so that an object and its spatial context associated with illusory size perception could be presented together to one eye or separately to two eyes. we found that the ponzo illusion had an equivalent magnitude whether the objects and contexts were presented to the same or different eyes, indicating that it may be largely mediated by binocular neurons. in contrast, the ebbinghaus illusion became much weaker when objects and their contexts were presented to different eyes, indicating important contributions to the illusion from monocular neurons early in the visual pathway.nnconclusions:our findings show that two well-known size illusions – the ponzo illusion and the ebbinghaus illusion – are mediated by different neuronal populations, and suggest that the underlying neural mechanisms associated with illusory size perception differ and can be dependent on monocular channels in the early visual pathway."
Doherty, M. J., Campbell, N. M., Tsuji, H., & Phillips, W. A.. (2010). The Ebbinghaus illusion deceives adults but not young children. Developmental Science

Plain numerical DOI: 10.1111/j.1467-7687.2009.00931.x
DOI URL
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"The sensitivity of size perception to context has been used to distinguish between 'vision for action' and 'vision for perception', and to study cultural, psychopathological, and developmental differences in perception. the status of that evidence is much debated, however. here we use a rigorous double dissociation paradigm based on the ebbinghaus illusion, and find that for children below 7 years of age size discrimination is much less affected by surround size. young children are less accurate than adults when context is helpful, but more accurate when context is misleading. even by the age of 10 years context-sensitivity is still not at adult levels. therefore, size contrast as shown by the ebbinghaus illusion is not a built-in property of the ventral pathway subserving vision for perception but a late development of it, and low sensitivity to the ebbinghaus illusion in autism is not primary to the pathology. our findings also show that, although adults in western cultures have low context-sensitivity relative to east asians, they have high context-sensitivity relative to children. overall, these findings reveal a gradual developmental trend toward ever broader contextual syntheses. such developments are advantageous, but the price paid for them is that, when context is misleading, adults literally see the world less accurately than they did as children."
Rose, D., & Bressan, P.. (2002). Going round in circles: Shape effects in the Ebbinghaus illusion. Spatial Vision

Plain numerical DOI: 10.1163/15685680252875165
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"The ebbinghaus illusion has traditionally been considered as either a sensory or a cognitive illusion, or some combination of these two. cognitive contrast explanations take support from the way the illusion varies with the degree of shape similarity between the test and inducing elements; we show, however, that contour interaction explanations may account for this result too. we therefore tested these

alternative theories by measuring the illusion with different test shapes as well as different inducer shapes, in all combinations. we found that for angular or hexagonal test shapes there is no similarity effect, and for some shape combinations there is no significant illusion, in contradiction to both of the traditional hypotheses. instead, we suggest that an integrated model of visual processing is needed to account for the illusion."
de Fockert, J., Davidoff, J., Fagot, J., Parron, C., & Goldstein, J.. (2007). More Accurate Size Contrast Judgments in the Ebbinghaus Illusion by a Remote Culture. Journal of Experimental Psychology: Human Perception and Performance

Plain numerical DOI: 10.1037/0096-1523.33.3.738
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"The ebbinghaus (titchener) illusion was examined in a remote culture (himba) with no words for geometric shapes. the illusion was experienced less strongly by himba compared with english participants, leading to more accurate size contrast judgments in the himba. the study included two conditions of inducing stimuli. the illusion was weaker when the inducing stimuli were dissimilar (diamonds) to the target (circle) compared with when they were similar (circles). however, the illusion was weakened to the same extent in both cultures. it is argued that the more accurate size judgments of the himba derive from their tendency to prioritize the analysis of local details in visual processing of multiple objects, and not from their impoverished naming."
Metin, B., & Tavil, A.. (2014). Environmental assessment of external wall cladding construction. Architectural Science Review

Plain numerical DOI: 10.1080/00038628.2013.862610
DOI URL
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"In the ebbinghaus size illusion, a central circle surrounded by small circles (inducers) appears bigger than an identical one surrounded by large inducers. previous studies have failed to demonstrate sensitivity to this illusion in pigeons and baboons, leading to the conclusion that avian species (possibly also nonhuman primates) might lack the neural substrate necessary to perceive the ebbinghaus illusion in a human-like fashion. such a substrate may have been only recently evolved in the primate lineage. here, we show that this illusion is perceived by 4-day-old domestic chicks. during rearing, chicks learnt, according to an observational-learning paradigm, to find food in proximity either of a big or of a small circle. subjects were then tested with ebbinghaus stimuli: two identical circles, one surrounded by larger and the other by smaller inducers. the percentage of approaches to the perceptually bigger target in animals reinforced on the bigger circle (and vice versa for the other group) was computed. over four experiments, we demonstrated that chicks are reliably affected by the illusory display. subjects reinforced on the small target choose the configuration with big inducers, in which the central target appears perceptually smaller; the opposite is true for subjects reinforced on the big target. this result has important implications for the evolutionary history of the neural substrate involved

in the perception of the ebbinghaus illusion."
Parron, C., & Fagot, J.. (2007). Comparison of Grouping Abilities in Humans (Homo sapiens) and Baboons (Papio papio) With the Ebbinghaus Illusion. Journal of Comparative Psychology

Plain numerical DOI: 10.1037/0735-7036.121.4.405
DOI URL
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"This research comparatively assessed grouping mechanisms of humans (n = 8) and baboons (n = 8) in an illusory task that employs configurations of target and surrounding circles arranged to induce the ebbinghaus (titchener) illusion. analyses of response behaviors and points of subjective equality demonstrated that only humans misjudged the central target size under the influence of the ebbinghaus illusion, whereas baboons expressed a more veridical perception of target sizes. it is argued that humans adopted a global mode of stimulus processing of the illusory figure in our task that has favored the illusion. by contrast, a strong local mode of stimulus processing with attention restricted to the target must have prevented illusory effects in baboons. these findings suggest that monkeys and humans have evolved modes of object recognition that do not similarly rely on the same gestalt principles."
Franz, V. H.. (2003). Planning versus online control: Dynamic illusion effects in grasping?. Spatial Vision

Plain numerical DOI: 10.1163/156856803322467491
DOI URL
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"The planning/control model of action assumes that grasping is sensitive to the context of an object only in early stages of the movement (planning), but not in later stages (control). in consequence, the effects of context-induced illusions (such as the ebbinghaus/titchener illusion) should decrease during a grasping movement. here, we tested this claim by reanalysing a large data set (n = 26) on grasping in the ebbinghaus illusion. contrary to the predictions of the planning/control model, we found that the effects of the illusion did not decrease over time. instead, the illusion effects stayed remarkably constant."
Vishton, P. M., Stephens, N. J., Nelson, L. A., Morra, S. E., Brunick, K. L., & Stevens, J. A.. (2007). Planning to reach for an object changes how the reacher perceives it. Psychological Science

Plain numerical DOI: 10.1111/j.1467-9280.2007.01965.x
DOI URL
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"Three experiments assessed the influence of the ebbinghaus illusion on size judgments that preceded

verbal, grasp, or touch responses. prior studies have found reduced effects of the illusion for the grip-scaling component of grasping, and these findings are commonly interpreted as evidence that different visual systems are employed for perceptual judgment and visually guided action. in the current experiments, the magnitude of the illusion was reduced by comparable amounts for grasping and for judgments that preceded grasping (experiment 1). a similar effect was obtained prior to reaching to touch the targets (experiment 2). the effect on verbal responses was apparent even when participants were simply instructed that a target touch task would follow the verbal task. after participants had completed a grasping task, the reduction in the magnitude of the illusion remained for a subsequent verbal-response judgment task (experiment 3). overall, the studies demonstrate strong connections between action planning and perception."
Plodowski, A., & Jackson, S. R.. (2001). Vision: Getting to grips with the Ebbinghaus illusion. Current Biology

Plain numerical DOI: 10.1016/S0960-9822(01)00170-1
DOI URL
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"It is well known that visual illusions can have a dramatic effect upon our visual perception of such properties as an object's size. it remains the subject of much debate, however, whether visual illusions have a similar influence on visually guided actions. recent studies have thrown new light on this debate."
Kopiske, K. K., Bruno, N., Hesse, C., Schenk, T., & Franz, V. H.. (2016). The functional subdivision of the visual brain: Is there a real illusion effect on action? A multi-lab replication study. Cortex

Plain numerical DOI: 10.1016/j.cortex.2016.03.020
DOI URL
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"It has often been suggested that visual illusions affect perception but not actions such as grasping, as predicted by the 'two-visual-systems' hypothesis of milner and goodale (1995, the visual brain in action, oxford university press). however, at least for the ebbinghaus illusion, relevant studies seem to reveal a consistent illusion effect on grasping (franz & gegenfurtner, 2008. grasping visual illusions: consistent data and no dissociation. cognitive neuropsychology). two interpretations are possible: either grasping is not immune to illusions (arguing against dissociable processing mechanisms for vision-for-perception and vision-for-action), or some other factors modulate grasping in ways that mimic a vision-for perception effect in actions. it has been suggested that one such factor may be obstacle avoidance (haffenden schiff & goodale, 2001. the dissociation between perception and action in the ebbinghaus illusion: nonillusory effects of pictorial cues on grasp. current biology, 11, 177-181). in four different labs (total n = 144), we conducted an exact replication of previous studies suggesting obstacle avoidance mechanisms, implementing conditions that tested grasping as well as multiple perceptual tasks. this replication was supplemented by additional conditions to obtain more conclusive results. our results confirm that grasping is affected by the ebbinghaus illusion and demonstrate that

this effect cannot be explained by obstacle avoidance."
Nakamura, N., Watanabe, S., & Fujita, K.. (2008). Pigeons perceive the Ebbinghaus-Titchener circles as an assimilation illusion.. Journal of Experimental Psychology. Animal Behavior Processes

Plain numerical DOI: 10.1037/0097-7403.34.3.375
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"A target circle surrounded by larger 'inducer' circles looks smaller, and one surrounded by smaller circles looks larger than they really are. this is the ebbinghaus-titchener illusion, which remains one of the strongest and most robust of contrast illusions. although there have been many studies on this illusion in humans, virtually none have addressed how nonhuman animals perceive the same figures. here the authors show that the ebbinghaus-titchener figures also induce a strong illusion in pigeons but, surprisingly, in the other direction; that is, all five successfully trained pigeons judged the target circle surrounded by larger circles to be larger than it really is and vice versa. further analyses proved that neither the gaps between target and inducer circles nor the cumulative weighted surface of these figural elements could account for the birds' responses. pigeons are known to show similarities to humans on various cognitive and perceptual tasks including concept formation, short-term memory, and some visual illusions. our results, taken together with pigeons' previously demonstrated failure at visual completion, provide strong evidence that pigeons may actually experience a visual world too different for us to imagine."
Danckert, J. A., Sharif, N., Haffenden, A. M., Schiff, K. C., & Goodale, M. A.. (2002). A temporal analysis of grasping in the Ebbinghaus illusion: Planning versus online control. Experimental Brain Research

Plain numerical DOI: 10.1007/s00221-002-1073-1
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"Recent work has shown that pictorial illusions have a greater effect on perceptual judgements than they do on the visual control of actions, such as object-directed grasping. this dissociation between vision for perception and vision for action is thought to reflect the operation of two separate streams of visual processing in the brain. glover and dixon claim, however, that perceptual illusions can influence the control of grasping but that these effects are evident only at early stages of the movement. by the time the action nears its completion any effect of illusions disappears. glover and dixon suggest that these results are consistent with what they call a 'planning and control' model of action, in which actions are planned using a context-dependent visual representation but are monitored and corrected online using a context-independent representation. we reanalysed data from an earlier experiment on grasping in the ebbinghaus illusion in which we showed that maximum grip aperture was unaffected by this size-contrast illusion. when we looked at these data more closely, we found no evidence for an effect of the illusion even at the earliest stages of the movement. these findings support the suggestion that the initial planning of a simple object-directed grasping movement in this illusory context is indeed refractory to the effects of the illusion. this is not to suggest that more deliberate and/or complex

movements could not be influenced by contextual information."
Pickett, C. L.. (2001). The effects of entitativity beliefs on implicit comparisons between group members . Personality and Social Psychology Bulletin

Plain numerical DOI: 10.1177/0146167201275001
DOI URL
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"The present research indicates that perceivers' beliefs about a group's level of entitativity can affect the extent to which group members are implicitly compared with one another. to find evidence for these implicit comparisons, a variation of the ebbinghaus illusion was used. exp 1 (n = 258) demonstrated that an identical set of faces produced a greater illusion (indicating greater implicit comparison) when the faces were said to represent fraternity/sorority members than when the faces were said to represent men or women born in the month of may. exp 2 (n = 118) replicated these results and also demonstrated that participants' prior beliefs about how entitative these groups are predicted the magnitude of the ebbinghaus illusion produced. these findings indicate that entitativity beliefs can have implicit effects on judgment such that members of highly entitative groups are subject to greater intragroup comparison than are members of nonentitative groups. (psycinfo database record (c) 2002 apa, all rights reserved)"
Haffenden, A. M., & Goodale, M. A.. (1998). The effect of pictorial illusion on prehension and perception . Journal of Cognitive Neuroscience

Plain numerical DOI: 10.1162/089892998563824
DOI URL
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"The present study examined the effect of a size-contrast illusion (ebbinghaus or titchener circles illusion) on visual perception and the visual control of grasping movements. seventeen right-handed participants picked up and, on other trials, estimated the size of 'poker-chip' disks, which functioned as the target circles in a three-dimensional version of the illusion. in the estimation condition, subjects indicated how big they thought the target was by separating their thumb and forefinger to match the target's size. after initial viewing, no visual feedback from the hand or the target was available. scaling of grip aperture was found to be strongly correlated with the physical size of the disks, while manual estimations of disk size were biased in the direction of the illusion. evidently, grip aperture is calibrated to the true size of an object, even when perception of object size is distorted by a pictorial illusion, a result that is consistent with recent suggestions that visually guided prehension and visual perception are mediated by separate visual pathways."
Sovrano, V. A., Albertazzi, L., & Rosa Salva, O.. (2014). The Ebbinghaus illusion in a fish (Xenotoca eiseni). Animal Cognition

Plain numerical DOI: 10.1007/s10071-014-0821-5
DOI URL

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“The tendency of fish to perceive the ebbinghaus illusion was investigated. redtail splitfins (xenotoca eiseni, family goodeidae) were trained to discriminate between two disks of different sizes. then, fish were presented with two disks of the same size surrounded by disks of large or small size (inducers) arranged to produce the impression (to a human observer) of two disks of different sizes (in the ebbinghaus illusion, a central disk surrounded by small inducers appears bigger than an identical one surrounded by large inducers). fish chose the stimulus that, on the basis of a perception of the ebbinghaus illusion, appeared deceptively larger or smaller, consistent with the condition of training. these results demonstrate that redtail splitfins tend to perceive this particular illusion. the results are discussed with reference to other related illusions that have been recently observed to be experienced by fish (such as the navon effect), and with regard to their possible evolutionary implications.”
Glover, S., & Dixon, P.. (2002). Dynamic effects of the Ebbinghaus illusion in grasping: Support for a planning/control model of action. Perception and Psychophysics

Plain numerical DOI: 10.3758/BF03195791
DOI URL
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“A distinction between planning and control can be used to explain the effects of context-induced illusions on actions. the present study tested the effects of the ebbinghaus illusion on the planning and control of the grip aperture in grasping a disk. in two experiments, the illusion had an effect on grip aperture that decreased as the hand approached the target, whether or not visual feedback was available. these results are taken as evidence in favor of a planning/control model, in which planning is susceptible to context-induced illusions, whereas control is not. it is argued that many dissociations between perception and action may better be explained as dissociations between perception and on-line control.”
Káldy, Z., & Kovács, I.. (2003). Visual context integration is not fully developed in 4-year-old children. Perception

Plain numerical DOI: 10.1068/p3473
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“Long-range horizontal interactions supporting contour integration were found to be weaker in children than in adults (kovács et al, 1999 proceedings of the national academy of sciences of the usa 96 12204-12209). in the present study, integration on a larger scale, between a target and its context was investigated. contextual modulation of the percept of a local target can be directly measured in the case of geometric illusions. we compared the magnitude of a size contrast illusion (ebbinghaus illusion or titchener circles) in children and adults. 4-year-old children and adults performed 2afc size

comparisons between two target disks in the classical ebbinghaus illusion display and in two other modified versions. we found that the magnitude of the illusion effect was significantly smaller in children than in adults. our interpretation is that context integration is not fully developed in 4-year-old children. closer-to-veridical-size estimations by children demonstrate that the perception of the local target is less affected by stimulus context in their case. we suggest that immature cortical connectivity is behind the reduced contextual sensitivity in children."
Byosiere, S. E., Feng, L. C., Woodhead, J. K., Rutter, N. J., Chouinard, P. A., Howell, T. J., & Bennett, P. C.. (2017). Visual perception in domestic dogs: susceptibility to the Ebbinghaus–Titchener and Delboeuf illusions. Animal Cognition

Plain numerical DOI: 10.1007/s10071-016-1067-1
DOI URL
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"Susceptibility to geometrical visual illusions has been tested in a number of non-human animal species, providing important information about how these species perceive their environment. considering their active role in human lives, visual illusion susceptibility was tested in domestic dogs (canis familiaris). using a two-choice simultaneous discrimination paradigm, eight dogs were trained to indicate which of two presented circles appeared largest. these circles were then embedded in three different illusory displays; a classical display of the ebbinghaus-titchener illusion; an illusory contour version of the ebbinghaus-titchener illusion; and the classical display of the delboeuf illusion. significant results were observed in both the classical and illusory contour versions of the ebbinghaus-titchener illusion, but not the delboeuf illusion. however, this susceptibility was reversed from what is typically seen in humans and most mammals. dogs consistently indicated that the target circle typically appearing larger in humans appeared smaller to them, and that the target circle typically appearing smaller in humans, appeared larger to them. we speculate that these results are best explained by assimilation theory rather than other visual cognitive theories explaining susceptibility to this illusion in humans. in this context, we argue that our findings appear to reflect higher-order conceptual processing in dogs that cannot be explained by accounts restricted to low-level mechanisms of early visual processing."
Duemmler, T., Franz, V. H., Jovanovic, B., & Schwarzer, G.. (2008). Effects of the Ebbinghaus illusion on children's perception and grasping. Experimental Brain Research

Plain numerical DOI: 10.1007/s00221-007-1229-0
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"We investigated the development of the ebbinghaus illusion in children's perception and grasping. a previous study (hanisch et al. 2001) had reported negative illusion effects on 5- to 12-year-olds' grasping as compared to their perception. we attempted to replicate this finding and to test different hypotheses based on a direct influence of the context elements on the trajectories of the fingers which could explain this reversal of the illusion effects. for 5- to 7- and 9- to 11-year-olds we observed the classical illusion effects in perception. illusion effects were perfectly similar for perception and grasping

in 9- to 11-year-olds, while there was a non-significant trend toward smaller illusion effects in grasping for the 5- to 7-year-olds. this could be due to a slightly different effect of the illusion on younger children's grasping. however, it seems clear that there are no qualitative changes, as a reversal of the illusion effects in grasping of younger children. finally, we show that our grasping data conform well to the motor literature for children's grasping, thereby strengthening our conclusions."
Massaro, D. W., & Anderson, N. H.. (1971). Judgmental model of the Ebbinghaus illusion. Journal of Experimental Psychology

Plain numerical DOI: 10.1037/h0031158
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"Two experiments studied the ebbinghaus illusion as a function of four stimulus variables: the size of the context circles, the number of context circles, the dis- tance between the context circles and the center circle, and the size of the center circle. the results provided a quantitative test of a judgmental model that con- siders the ebbinghaus illusion to be comparative in nature. the context circles, then, serve as standards or yardsticks, and the center circle is judged partly relative to them. the model provided a reasonably good description of the mag- nitude of the illusion as a function of the several stimulus variables. the"
Roberts, B., Harris, M. G., & Yates, T. A.. (2005). The roles of inducer size and distance in the Ebbinghaus illusion (Titchener circles). Perception

Plain numerical DOI: 10.1068/p5273
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"Although the ebbinghaus illusion is commonly used as an example of a simple size-contrast effect, previous studies have emphasised its complexity by identifying many factors that potentially influence the magnitude of the illusion. here, in a series of three experiments, we attempt to simplify this complexity. in each trial, subjects saw a display comprising, on one side, a target stimulus surrounded by inducers and, on the other, an isolated probe stimulus. their task was to indicate whether the probe appeared larger or smaller than the target. probe size was adjusted with a one-up, one-down staircase procedure to find the point of subjective equality between probe and target. from these experiments, we argue that the apparent effects of inducer size are often confounded by the relative completeness of the inducing surround and that factors such as the similarity of the inducers and target are secondary. we suggest a simple model that can explain most of the data in terms of just two primary and independent factors: the relative size of the inducers and target, and the distance between the inducers and the target. the balance between these two factors determines whether the size of the target is underestimated or overestimated."
Category

1. General

Tags

1. context effects
2. contextual judgments
3. framing
4. visual perception

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