

Some Research on the Müller-Lyer Illusion

Excerpts from

Woodworth, R. S. (1938). *Experimental Psychology*. New York: Henry Hold and Company, 644-650.

Heymans (1895): "The average strength of the illusion was about 25%. This occurred when the obliques were 1/4 as long as the horizontal segments and made only a small angle with the horizontal. The amount of the illusion was proportion to the cosine of the angle between the obliques and the horizontal, being zero when this angle was 90° and increasing to its maximum when the angle was almost zero."

"Judd (1899) found the illusory effects were not confined by any means to the main lines of the Müller-Lyer figure. All parts within and adjacent to the figure were affected; all the space relations in the immediate neighborhood were distorted by the arrangement of the figure."

"Judd (1902,1905) made a systematic study of this practice effect. *O* [Observer] was not informed of his error but simply examined the figure time after time, each time setting the apparatus to a subjective equality [PSE]. The illusion gradually diminished to near zero and this was true of all three of the illusions tried, the Müller-Lyer, Poggendorff, and Zöllner. The practice effect held good, however, only for the original position of the figure. If it were reversed right and left, the illusion returned in full strength, and in some *O*s was exaggerated, but in others was overcome by a relatively small amount of further practice. The illusion was revived even in the original figure by standing off and looking at it casually as a whole."

Judd's subject made 600 settings, 25 per day. At the beginning the line between the outward obliques was 17% longer when set at perceived equality than the line between the inward obliques. After 600 trials, the difference had decreased to about 2%.

"Benussi (1904) instructed *O* in one case to observe with a whole-perceiving attitude, in another case with a part-isolating attitude. The Müller-Lyer illusion was greater in the whole-perceiving attitude than in the part-isolating. When the main and oblique lines were white on a black background the average difference in lengths was 4.95 units with the whole-perceiving attitude and 1.02 units with the part-isolating attitude."

Favreau, O. E. (1977). *Disillusioned*. *American Psychologist*, 568 - 571.

The author measured the line lengths of the Müller-Lyer illusion as illustrated in 18 introductory textbooks. As she was unclear about the way the lines "should" be measured, she measured twice. One length, the outside length was from one end of the illusion to the other. The other length, the inside length was from the inside of the "arrow head" to the inside of the "arrow head" at the other end. The two parts of the illusion had a mean difference of 2.43 mm for the inside measurement. For the outside measurement the mean difference in the halves of the illusion was 0.76 mm. The author reported this research in a humorous way and indirectly chastising authors and publishers for fudging the phenomenon.

The article includes the two reviewer's comments. One (E. Fantino) believes the proper measurement process is to measure the outward pointing arrow head component in the outside manner and the inward pointing arrow head component in the inside manner. When these measurements are compared then 12 of the 20 pairs are within 0.5 mm of being equal (8 are identical). "Of the remaining 8, 7 distort the illusion in the direction of making the illusion more difficult to achieve." Fantino expresses concern that the "best" students may measure the illusion in the same way Favreau and become "disillusioned" with psychology.

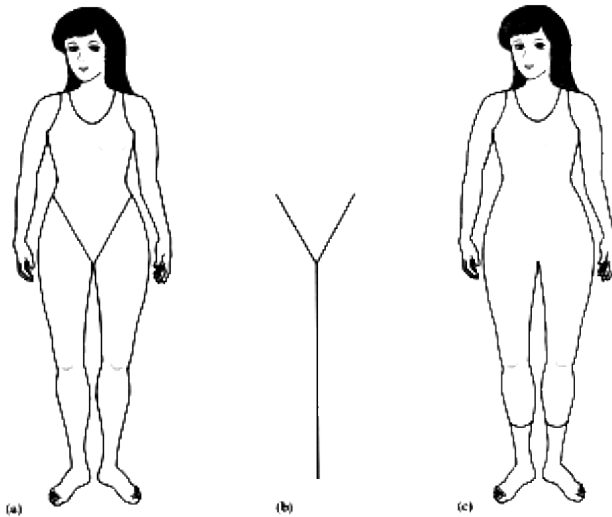
Practical Applications of the Müller-Lyer Illusion

Gillan, D., & Schmidt, W. (1999). The effect of the Müller-Lyer illusion on map reading. *Perception & Psychophysics*, 61 (6), 1154 - 1167.

"One important reason for studying visual illusions is that they can influence real-world perception as people interact with human-made displays. Three experiments examined how the Müller-Lyer illusion affects distance judgments and decision-making in the complex graphical context of a map by having subjects estimate the lengths of road segment lines framed by inward-going or outward-going wings in actual maps, in control displays that had the map context removed, and in simulated maps. The experiments showed that (1) outward-going wings led to higher distance estimates than did inward-going wings to the same extent both with and without the map context, (2) decisions based on distances determined from maps were affected by Müller-Lyer elements in the maps, and (3) map readers' measurement behavior influenced the effect of the Müller-Lyer elements in maps. The discussion focuses on how certain display manipulations and task manipulations affect the Müller-Lyer illusion. In addition, the discussion addresses the instances in which using a map might be affected by misestimation due to Müller-Lyer elements." [Abstract of Article]

Morikawa, K. (2003). Last but not least: An application of the Müller-Lyer Illusion. *Perception*, 32(1), 121-123.

"Although most illusory figures published in scientific articles are very simple and abstract, visual illusions are not confined to vision laboratories. They also occur in nature and our daily life (Gregory and Gombrich 1973).



The facet of human culture that takes advantage of visual illusions most actively is probably clothing. Clothes manufacture and fashion magazines keep touting dresses that make you look slender, boots that make your legs look longer, jackets that make you look younger, and so on. One well-known flattering effect is the apparent lengthening of legs by high-cut bathing suits (see figure). It is obvious that, when viewed from the side, a high-cut bathing suit exposes a larger area of the hip, which looks like an extension of the leg thus making the leg appear longer. However, there is a possibility that a high-cut bathing suit makes the legs look longer even when the actual length of the legs is clearly visible in a frontal view. The present study refers to this effect as the high-cut leg illusion.

To the best of the author's knowledge, this possibility has not been scientifically tested. The first purpose of the present study is to demonstrate this illusion." [Introductory paragraph of the article.]