

The gestalt laws of perceptual organisation psychology essay



In the early 20th Century, Gestalt psychologists attempted to explain how sensory information is interpreted, stating that the brain creates a perceptual experience greater than the sum of its parts in standard and predictable ways (Gross, 2010). Their laws of perceptual organisation explain perceptual segregation; how visual information, which otherwise would look like random patterns of colour (Hayes & Orrell, 1993), is divided into Gestalten (organised wholes) through the invariable application of certain principles of perceptual encoding (Quinlan & Dyson, 2008). This essay will outline and evaluate the Gestalt laws, with particular focus on the principles of figure/ground organisation, closure and common fate.

First, an overview of the Gestalt principles; in order to perceive an object, it must be distinguished from its surroundings. The Gestalt principle of figure/ground organisation states that this is determined by the size, shape and surroundedness of the object (Gross, 2010). Once the figure has been identified, it is organised into a meaningful form by principles which can be subsumed by the law of Prägnanz (or 'meaning') (Eysenck & Keane, 2010), which states that of the possible "geometrically possible organisations, that one will actually occur which possesses the best, simplest and most stable shape" (Koffka, 1935, p. 138). This also illustrates the minimum principle (the preferred organisation is the simplest) (Quinlan & Dyson, 2008). These include the principles of proximity and similarity (closer and similar objects are grouped), good continuation (we try to preserve continuity and avoid interruptions to lines), common fate (elements which appear to move together are grouped together) and closure (missing parts of a figure are filled in to complete it) (Eysenck & Keane, 2010).

Figure/ground perception is central as it is the basis for all object recognition, including face recognition (Hayes & Orrell, 1993). The principle of figure/ground organisation describes figure/ground segregation, the identification of the figure (the object of central interest) – the smaller, symmetrical, distinct shape (there is also a preference for horizontal or vertical areas to be seen as figures), including the contour dividing the figure and ground – and the less important, indistinct, asymmetrical, larger background (Bruce, Green, & Georgeson, 1996; Eysenck & Keane, 2010). This can be demonstrated by the example of Rubin's Vase (see figure) in which the figure and ground are ambiguous – they are similar sizes, both distinct shapes, and neither surrounds the other fully. This means that either the vase or the silhouettes can be perceived as the figure, and as we can't see both as figures simultaneously, the figure appears to alternate between the vase and the faces (Gross, 2010). The Gestaltists believed that figure/ground perception was innate, a concept supported by Fantz (1966, as cited in Hayes & Orrell, 1993) who found that infants only a few days old preferred human faces and patterns to plain shapes – they must therefore have had figure ground perception.

The principle of closure is one of the most important laws and a very strong tendency; for example, when people are briefly shown an incomplete figure and then asked what it is, people identify the complete figure and often don't even realise it was incomplete. It can be demonstrated by the experience of stroboscopic motion – when we see a series of images in rapid succession, we link them up and consequently see one moving picture, the basis for films (Hayes & Orrell, 1993) and flip books. Another example is the stellar

constellations (Bruce et al., 1996), such as Orion, which we see as a complete figure despite it just being a series of unconnected dots.

The law of common fate states that objects with the same direction and speed are grouped together, and is demonstrated in nature by camouflaged animals – they only become visible when they move (Bruce et al., 1996).

Johansson (1973) conducted an experiment in which he attached lights to the joints of an actor and then filmed him walking in the dark, so that only the lights were visible. When he was at rest, people saw the lights as random, but as soon as he moved, people recognised the bright spots as a human moving and could identify his movements (e. g. walking, running, dancing) and even gender. Further research by Cutting and Kozlowski (1977) found that participants could even identify their friends who were filmed in the same way; this suggests that the principle of common fate involves more than just grouping objects with the same speed and direction.

The Gestalt laws of perceptual organisation have, however, been criticised for having low ecological validity (generalisability to other situations) – they were based on experiments involving 2-D single-object line drawings (Eysenck & Keane, 2010), and although their results have been replicated in similar research (Gross, 2010), results from 3-D arrays, which are argued to have higher ecological validity, have not consistently supported the laws (Eysenck, 1993); the real-life application of the laws is limited by the fact that they were based on experiments involving artificial figures.

However, some less artificial research does support the Gestalt laws – Elder and Goldberg (2002) used pictures of natural objects and found that the

principles of proximity and good continuation were important when determining which contours belonged to which objects (Eysenck & Keane, 2010). Also, the laws have been successfully utilised in real-life situations, even before they were identified by the Gestaltists. For example, Ancient Japanese Ninja warriors used them to travel undetected and incur their reputation of being 'invisible'; they wore clothes which camouflaged them against their background and acted at dusk, making use of figure-ground segregation. To avoid being perceived due to common fate, they moved very slowly at the edge of people's fields of vision and tried to remain motionless where possible. They also used the principles of similarity and proximity to assume non-human shapes and be perceived as part of a group of natural objects such as trees (Hayes & Orrell, 1993). This successful use of the laws demonstrates that they are ecologically valid, despite having been based on limited research.

Various psychologists, including Greene (1990), have also criticised the laws for being extremely vague and imprecise. For example, the idea of a 'good' or 'simple' shape is not defined (Bruce et al., 1996). However, definitions have at least been attempted – Attneave (1954) described a 'good' shape as one with a high degree of internal redundancy (it is easy to predict the structure of an unseen part from the visible part), and Hochberg and Brooks (1960) found in their experiment that more complex, asymmetrical and discontinuous shapes were more likely to be perceived as 3-D shapes, and therefore a 'simple' shape is a symmetrical, continuous one (Bruce et al., 1996). This demonstrates that the idea of a 'good' and 'simple' shape can, in fact, be expressed precisely.

Another criticism is that Gestaltists underestimated the influence of object familiarity and 'objective set' on perceptual organisation (Bruce et al., 1996). For example, Geisler et al. (2001) used pictures to study contours of natural objects and found that other, non-Gestalt principles better predicted performance, suggesting that we use our past knowledge when making decisions about contours (Eysenck & Keane, 2010). This therefore not only contradicts the Gestalt laws, demonstrating that they are not a comprehensive account of perceptual organisation, but also refutes the claim that figure-ground segregation is a bottom-up process - if this were correct, figure-ground segregation would be unaffected by knowledge.

The idea of past experience affecting perceptual grouping is also supported by Kimchi and Hadad (2002), who presented university students with both familiar, upright characters and unfamiliar, inverted characters either with their lines connected or disconnected. They found that grouping occurred within 40ms for all the characters with connected lines and for upright disconnected characters, but grouping for the inverted disconnected characters occurred later. This suggests that past experience affects the grouping of disconnected line figures (experience aided grouping of the upright but not inverted characters), rather than just laws of perceptual organisation as proposed by the Gestaltists.

As mentioned above, the comprehensiveness of the Gestalt laws can be debated. Palmer and Rock (1994) proposed a new fundamental principle of perceptual organisation - uniform connectedness - in which adjacent regions with uniform (or homogenous) visual properties are grouped. They

demonstrated that uniform connectedness dominates over the Gestalt
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principles of proximity and similarity when they conflict and centred a theory around uniform connectedness as the initial method of organisation, prior to Gestalt principles. This addition of an important principle implies that the Gestalt laws are not comprehensive.

However, Han, Humphreys and Chen (1999) measured reaction times to identify known letters comprised of small circles which were grouped by proximity, similarity and uniform connectedness. They found that grouping by proximity was as fast and accurate as by uniform connectedness, suggesting that Palmer and Rock (1994)'s assertion that uniform connectedness occurs first is incorrect, and their criticism of the comprehensiveness of the Gestalt laws can therefore be questioned.

The Gestalt laws of perceptual organisation can, however, still be criticised for being incomplete in that they describe how objects are grouped, whereas other theories, such as Biederman's (1987) recognition-by-components (RBC) theory, provide a much more comprehensive account of how object recognition occurs. According to Biederman (1987), we recognise objects by breaking them down into component parts (such as lines) and then match them and their arrangement to similar 'sketches' stored in memory. We arrange the visual information into 36 basic 3-D geometrical forms called geons ('geometrical icons') which can be combined to construct virtually any object, allowing rapid identification (Kowalski & Westen, 2008). Object recognition was underemphasised in the Gestalt laws, and they can therefore be criticised for not being comprehensive.

Nevertheless, in Roth (1986)'s opinion, the Gestalt principles of perceptual organisation are still the most comprehensive theory of perceptual grouping; and according to Gordon (1989, as cited in Gross, 2010, p. 227) their discoveries are ' part of our permanent knowledge of perception'. Also, Rock and Palmer (1990) make the point that none of the laws have ever been disproved. This suggests that although the laws may not be infallible, they are still comprehensive and accurate in comparison to any alternatives.

However, there is another major flaw in Gestalt theory – it is based on the idea of ' field forces' (doctrine of isomorphism); the concept that underlying every sensory experience there is a structurally similar brain event (i. e. a magnetic ' trace') which would make the output as stable as possible.

However no evidence has been found of this concept, and consequently we have a set of laws which only describe perceptual organisation, with no valid underlying model to explain the processes involved (Bruce et al., 1996).

Finally, there is evidence to support the Gestalt assertion that the whole is more than the sum of its parts – Navon (1977) presented participants with hierarchical character stimuli (smaller, local characters forming a larger, global character) and asked them to name either the global or local letters. It was found that response time for global letters was unaffected by the local letters, but the response time for local letters when they conflicted with the global letters was significantly slower. This supports the Gestalt laws as the Gestalts were perceived better than the individual components, demonstrating that the whole is greater than the sum of its parts.

In conclusion, the Gestalt laws of perceptual organisation describe how perceptual segregation occurs through several important principles which determine figure-ground segregation and how objects are grouped to form Gestalten, including the principles of closure and common fate. Although the Gestalt laws have been criticised for having low ecological validity, various research and examples of real-life applications demonstrate that it does have a reasonable degree of ecological validity. While they could also be argued to be imprecise and incomprehensive, they are still the best theory of perceptual organisation we currently have, and the main remaining criticism is that the doctrine of isomorphism on which it was based has been largely discredited, leaving the Gestalt laws as descriptions rather than explanations of perceptual processes.